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The purpose of the current study was to examine the relationship between child care program quality and the socioeconomic contexts of the communities in which they operate. The sample, which included nearly all licensed child care providers in North Carolina in 2008, resulted in 6882 programs nested within 619 zip codes and 78 counties. The cross-sectional design integrated data from multiple sources. Child care program characteristics, including rated program quality, were acquired from the North Carolina Division of Child Development. Data from the U.S. Census Bureau was used to measure socioeconomic characteristics of communities at the zip code level. Data from the North Carolina State Head Start Collaboration Office, North Carolina Office of School Readiness, and the North Carolina Division of Child Development were incorporated to examine program funding and subsidy levels from various sources. Data from the North Carolina Partnership for Children were used to identify quality enhancement funds at the county level. Multi-level modeling was utilized to examine the nested data structure of child care programs within communities. Child care quality varied across communities and program quality was modestly correlated when programs were in closer proximity. Program level characteristics, as well as community level socioeconomics were both related to differential quality among child care programs, suggesting that access to high quality child care varies across community contexts.

SOCIOECNOMIC DISPARTIES IN NORTH CAROLINA COMMUNITIES:

ISSUES OF ACCESS AND QUALITY OF LICENCED CHILD CARE

by

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This dissertation represents much heart and sacrifice endured through my graduate school career. Special thanks to my friends and family for their support. You have been my cheerleaders. To Bruce and Betty Farley, Grandpa and Grandma B, for the many early opportunities you created for me to be a researcher. To my graduate school friends and colleagues, you have made this experience most meaningful. To my husband, Geoffrey, for grounding me and loving me. And, to my sweet Simon, for just being.

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

Access to high quality child care for children and families living in and near poverty is a social priority in closing the achievement gap and preventing intergenerational poverty. Helburn and Bergmann (2002) contend, “there is a public interest in good quality child care” (p. 161). This is especially relevant for children living in poverty. Not only are families navigating the social and economic disparities associated with poverty, they must often navigate a multi-tiered child care system with market constraints and undependable quality. Consequently, evaluating the impact of current child care policies, challenging the status quo, and exposing possible vulnerabilities in the child care system is essential to altering the course of millions of young lives involved in licensed child care.

The purpose of the current study was to examine how socioeconomics of community contexts shape access to high quality child care in North Carolina. North Carolina implemented a child care Quality Rating and Improvement System (QRIS) in 1999, rating the quality of licensed child care programs from 1 to 5 stars. Since the inception of the rated license, child care quality in North Carolina has improved. Specifically, the number of child care programs earning 4 and 5 stars increased by 13% for centers and by 16% for family child care homes (North Carolina Rated License Assessment Project, 2005). Despite this increase, in 2005, the large majority of licensed programs (66% of child care centers and 67% of family child care homes) in North Carolina had 3 or fewer stars. With variation in socioeconomics across communities, the impact of the rated license across contexts and access to the highest quality programs is unknown. The purpose of the current study was to fill this gap through an examination of the relationship between child care program quality and the socioeconomic contexts of the communities in which they operate.

The study included five aims that: (a) examined the variation in child care quality across communities of various size (zip codes and counties), (b) examined the relationship between state and federal funding and child care quality, (c) examined the relationship between child care quality and the socioeconomic context of communities, (d) examined the extent to which county level Smart Start funding influences the relationship between the socioeconomic context of communities and child care quality, and (e) examined the socioeconomic contexts of child care programs participating and not participating in the voluntary assessment process.

The study evaluated access to high quality child care across North Carolina communities by utilizing an innovative research design and methodology. Multiple data sources were used in hierarchical linear models with two and three levels to inform future state and national policies that promote equitable access to high quality child care across community contexts.

CHAPTER II

THEORETICAL PERSPECTIVE

The current study was grounded in Urie Bronfenbrenner's bioecological perspective; a framework developed to understand behavioral changes over time and how development is influenced within context. At the heart of the bioecological theory is discovery and verification (Bronfenbrenner, 2005a; Bronfenbrenner & Morris, 2006). These modes of inquiry promote understanding of behavior within and between contexts and inspire scientific-based policies and programs for human well-being. Subsequently, the theory is a natural compass for the study of child care policy. In fact, Bronfenbrenner states, "the course of child care policy and practice is shaped in substantial degree by its broader context in time and place" (Bronfenbrenner, 2005b, p. 281). The bioecological perspective includes several propositions (Bronfenbrenner, 2005). The current study focused on the proposition describing the Process-Person-Context-Time (PPCT) model.

By combining the idea of proximal processes with a person's genetic and social history across time and space, the PPCT model describes developmental outcomes as a *joint function* of the developing person, process, context, and time (Bronfenbrenner & Evans, 2000). The PPCT model is a nested structure to explain and understand the production of developmental outcomes. That is, "a developmental outcome at a later point in time [D_2] is a joint function of the process; characteristics of the developing person; the nature of the immediate, 'face-to-face' environmental context in which the person lives; and the length of the frequency of the time interval [T_2-T_1] during which the developing person has been exposed to the particular process and the environmental setting under consideration" (Bronfenbrenner & Evans, p. 116).

In reference to early childhood programs, children are the developing agents of focus; they represent the person in this model. They come to early childhood programs from genetic histories as well as cultures, families and beliefs about the world which they hold as their own. They enter a shared space with teachers and peers who also bring with them their genetic histories, cultures, families, and beliefs and engage in shared experiences within the classroom across time. Such experiences, learning opportunities, are the very purpose of early childhood programs. Based on their own level of agency, children engage in interactions with peers, teachers, and their surrounding environment including materials that lead to processes (P) which inform their development. These processes however, are also situated within micro and macro-level contexts or the boundaries of programmatic supports and barriers as well as within a larger socioeconomic and political community.

The current study specifically honed in on the relationship among contexts in which children develop. Theoretically, context (C) is broken down into several inter-related systems including the microsystem, mesosystem, exosystem, and macrosystem. Individuals' immediate environments are considered microsystems, the interaction between various microsystems such as home and child care is an example of the mesosystem while influences of environments that indirectly affect the developing person describe the exosystem. All of the systems are embedded within larger societal ideologies and culture embodied by the macrosystem (Bronfenbrenner, 1988).

The current study examined the quality of child care nested within the socioeconomic contexts of communities (at the zip code level) that function within county level funding contexts and under the umbrella of state child care policy. For example, state Quality Rating and Improvement Systems create standards that inform the profession and public about what is required for different levels of quality care and education. These standards subsequently become a part of a dominant understanding of differential quality in early childhood programs which informs the market and may be connected to incentives such as tiered reimbursement rates for subsidy and quality enhancement initiatives. The way in which this policy plays out within communities of varying socioeconomic conditions is unknown.

With standards defined by state Quality Rating and Improvement Systems, identifying differential levels of quality among child care programs, it is especially important to ensure equal access to high quality programs across communities of all socioeconomic strata. For example, community contexts predominately representing populations of low socioeconomic status are likely composed of homes (microsystems) with fewer resources compared to community contexts collectively of higher socioeconomic status. The child care programs within these communities also represent microsystems that families navigate and often which they rely on. Subsequently, the current study examined the relationship between child care quality and the socioeconomic context of communities in which they reside impacted by macro-level policies and county level funding across the state of North Carolina.

Because the macrosystem incorporates social, economic, political, and cultural dynamics, the chronosystem marking historical events and generational residuals influence and are influenced by the macrosystem. The chronosystem, defined by time (T), is integrated within each of the other systems, experienced as small moments (microtime), repeated experiences (mesotime) or historical events and changes (macrotime) (Bronfenbrenner & Morris, 2006). For example, among many cities in North Carolina, segregation in housing and schools lingers despite changes in the law. That is, the socioeconomic conditions among North Carolina communities are likely to be influenced by the historical dynamics of the state including a history of slavery and white supremacy. Furthermore, it is important to understand the multidirectional and dynamic nature of context involving all five systems (micro, meso, exo, macro, and chrono). However, the current study tests the nature in which current child care policy in the state (macrosystem) informs child care quality (microsystems) nested within community contexts of varying socioeconomic conditions and county funding. Although beyond the purview of the current study, characteristics of the exosystem in this model may be inferred with community socioeconomics and county funding indirectly affecting children's learning experiences through the quality of child care.

CHAPTER III

REVIEW OF LITERATURE

The current review of literature first examines the national socioeconomic context of young children and their families. Secondly, evidence from intervention and program-based models is presented as support for investing in young children. Third, child care quality in relation to children's developmental outcomes, especially among children living in and near poverty is described. This section further offers evidence that indicates unequal access to high quality programs based on race and class. Fourth, child care market constraints are explained followed by issues of affordability and subsidy. Finally, current policy decisions and quality enhancement efforts are presented as well as information about the North Carolina context where the current study takes place.

Socioeconomic Context of Communities

Based on Bronfenbrenner's PPCT model, child care programs are situated within community contexts (Bronfenbrenner, 2005b). Variation in community contexts is attributed to socioeconomic structures (Hartsock, 1986). To ensure social justice for our youngest citizens, an examination of the socioeconomic context of communities and child care quality is needed. In the current study community context is described by the socioeconomic conditions within a designated area such as zip codes and counties. Furthermore, socioeconomics is defined as "of, relating to or involving a combination of social and economic factors" (Marriam-Webster, 2008). Additionally, the National Center of Education Statistics (2008) defines socioeconomic status as a measure of "relative economic and social ranking."

Both social and economic factors are important characteristics of socioeconomics and are included by the United States Census Bureau (2007). Economic factors are an important part of community context because they represent the monetary wealth of a community (e.g. average income, home ownership). Social factors are an important part of community context because they represent the social power of a community in relationship to the dominant culture (e.g. race/ethnicity, education level). The social and economic factors of socioeconomics form complex intersections. Examining the socioeconomic context of communities in relationship to child care quality may inform policies that may protect against inequities in early learning experiences faced by our most vulnerable children, children in poverty. Furthermore, in a review of social programs as part of the Urban Institute's Assessing the New Federalism project, Adams, Tout and Zaslow (2007) calls for additional research to "disentangle" (p. 10) reasons for differential child care quality experienced by children of different socioeconomic backgrounds. The current study provides information about the child care programs operating within communities of varying socioeconomics and incorporates the state and federal funding allocated to programs to accommodate children in need.

National Context

Twenty-two percent or 5.5 million children under six in the United States are a part of families that are poor, below the federal poverty line (Wight & Chau, 2009). The federal poverty line is based on a formula that was initially calculated in 1963 to assess risk factors of low income families; today, the federal poverty line for a family of four is $22,050 (National Center for Children in Poverty, 2010). According to the National Center for Children in Poverty, it is estimated that families require twice the amount assigned by the federal limits to meet their basic needs. Subsequently, families earning between the federal poverty line and 200% of the limit are experiencing economic disparity. With this in mind, 44% or 11.1 million children younger than six years old live with families that are considered low-income, below the 200% poverty threshold. Since 2000, this number increased by 17%, suggesting a growing pattern of economic disparity among America's youngest citizens and their families.

When considering the number of young children living in poor and low income families, it is even more alarming to learn that the majority (74%) have at least one parent working full or part time (Wight & Chau, 2009). Specifically, 8% of young children that are poor (below the poverty line) have a parent employed full time and another 44% have a parent employed part time or part year. Expanding these statistics to include low-income families (200% the poverty line), 29% of low-income children have a parent employed full time and another 74% have a parent employed part time or part year. One reason for the high rates of employment among the poor and low-income population is likely a result of the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996, requiring recipients of government assistance (Temporary Assistance to Needy Families; TANF) to work with strict time limits for assistance.

Moving parents with young children into the labor force requires them to find alternative care – often from a variety of arrangements – for their children including both regulated and unregulated options (Scott, London, & Hurst, 2005). Regulations vary by state but tend to include provisions for basic health and safety (Adams, Tout, & Zaslow, 2007). The types of care low-income children attend include center-based care (24%) family child care (6%), relative care (25%), and babysitters (3%) with 37% cared for in two or more settings. Quality among these programs is variable and the types of care families access is based on several factors. Adams, Tout, and Zaslow outline factors that affect children's child care arrangements including parent comfort levels with differing child care arrangements, personal circumstances (financial, access to friends/family, employment status/schedule, location/transportation), availability and accessibility of neighborhood programs, quality of options, cost of options, and awareness of options. "To add to the complexity," according to Adams, Tout, and Zaslow, "all these factors can interact dynamically" (p. 12) and are situated in a market-based system, with the exception of limited program-based models like Head Start and public Pre-K, which do not tend to align with parental work schedules and typically require additional care arrangements. Therefore, parents are left to navigate a child care market that "does not produce uniformly good care" (Helburn & Bergmann, 2002). As a result of competing policies, there is market failure among the child care industry, restricting choices that families have for the care and education of their children (Gordon & Chase-Lansdale, 2001). According to Loeb, Fuller, Kagan, & Carol (2004), "under strong and immediate pressure to work outside the home, low-income mothers may be constrained in their choices, depending on the stock of care options available locally" (p.48).

Because there are a disproportionate number of young children of color living in or near poverty, when examining the complexities of poverty, the intersection of race and class must be a part of the discussion. Currently, 64% of Black, 64% of Hispanic, 30% of White, 28% of Asian, and 69% of American Indian children birth through five years old live in low-income households (White & Chau, 2009). Additionally, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) of 1996 requires families receiving government assistance to work, expanding the demand for child care among poor families and disproportionately affecting Black, Latino, and American Indian children.

Program-Based and Intervention Models

Over time we have learned from successful intervention and program-based models that investing in young children, especially those most at risk, better prepares them for school and reaps long term social and economic benefits for society (Heckman, 2010; Cunha & Heckman, 2006). Furthermore, the academic and social benefits gained from intentional intervention models supports national expansion focused on improving the learning environments of young children, especially those with multiple risk factors (Waldfogel, 2002; Duncan, Ludwig, & Magnuson, 2007). In fact, in an extensive review of public policies, the greatest social and economic outcomes are yielded when investments are made during the early years compared to later in life (Heckman; Cunha & Heckman). Such investments are based on invention studies that include the Abecedarian Project (Campbell & Ramey, 1994; Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Ramey & Ramey, 2004), the Infant Health and Development Project (McCormick et al., 2006; Lee, 2005), the Perry Preschool Project (Yoshikawa, 1995; Schweinhart & Weikart, 1997), and the Chicago Child Parent Centers (Clements, Reynolds, & Hickey, 2004). Studies of program-based models, funded by state and federal government for the purpose of increasing the supply of high quality child care, include Early Head Start and Head Start (Love, Kisker, et al., 2005; U.S. Department of Health and Human Services, 2010; Abbott-Shim, Lamber, & McCarty, 2003) and public pre-Kindergarten (National Institute for Early Education Research, 2010; LoCasale-Crouch, et al., 2007) which also suggest promising results for young children in need (Adams, Tout, & Zaslow, 2007).

More specifically, in the Abecedarian Project significant differences between experimental and control groups were detected in IQ as early as 18 months with young children in the child care intervention model scoring significantly better (Campbell & Ramey, 1994). Overall, at age 4 the child care intervention had a large effect on IQ (.73 to 1.45; Ramey & Ramey, 2004). These effects endured through the initial test period of 8 years and continued into adolescence. In a follow up study when the children were 21 years old, treatment effects were slightly larger for children receiving both the early intervention and the school-age intervention; however, the child care intervention reaped the most benefit (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002). In addition to academic related outcomes, children in the child care intervention completed more years of school, were less likely to repeat a grade, were less likely to be placed in special education, were more likely to work in a skilled job, and were less likely to have a child during the teen years (Ramey & Ramey; Campbell, Ramey, Pungello, Sparling, & Miller-Johnson). The Abecedarian Project was replicated in a randomized clinical trial with low birth weight, premature infants in the Infant Health and Development Program (McCormick et al., 2006; Lee, 2005). Results indicated that children experiencing the intervention benefited from higher cognitive scores and fewer behavior problems with similar longitudinal impact of the Abecedarian Project at age 18 (McCormick et al., 2006).

Children that participated in the Perry Preschool Project (Yoshikawa, 1995) reaped long term social and economic benefits. Based on the longitudinal social and economic impact study of the project, it was estimated that for every $1.00 spent on the project, $7.00 was returned to society (Schweinhart & Weikart, 1997). The children of this project obtained more schooling and engaged in fewer problems with the law.

Similarly, in the Chicago Child Parent Centers preschool participants faired best in kindergarten word analysis, eighth grade reading, were less likely to experience juvenile delinquency, and more likely to complete high school (Clements, Reynolds, & Hickey, 2004).

In a study of Early Head Start young children had better cognitive and socio-emotional development at age 3 compared to children not participating in Early Head Start, with the children attending programs adhering most closely to the federal program performance standards exhibiting the best outcomes (Love, Kisker, et al., 2005). Furthermore, the National Head Start Impact Study revealed positive gains in cognitive, social, emotional, and health related outcomes for children in Head Start (U.S. Department of Health and Human Services, 2010). Additionally, in a study of Head Start with random assignment, children in the program group exhibited significantly faster growth rate in receptive vocabulary and phonemic awareness compared to the comparison group (children on the waiting list; Abbott-Shim, Lamber, & McCarty, 2003). Children scoring lowest at the initial test and included in the Head Start program exhibited the greatest gain, suggesting the most impact of the intervention for those most at risk.

In response to the achievement gap, many states are implementing public pre-K programs (National Institute for Early Education Research, 2010). Based on several reviews of pre-K programs across the nation, many pre-K programs are reporting improved outcomes for children at risk (e.g. Hustedt, Barnett, Jung, & Goetze, 2009; Gormley, Phillips, & Gayer, 2008, Peisner-Feinberg & Schaaf, 2008). However, some inequities among pre-K programs still seem to exist. In a recent study of 692 pre-school classrooms across 11 states children in poverty and children of color were more likely to be in lower quality public pre-K classrooms compared to their more affluent peers (LoCasale-Crouch, et al., 2007). More specifically, cluster analysis revealed that the highest quality classrooms “contained more Caucasian teachers than expected, teachers with more pre-kindergarten experience, and a lower student/teacher ratio” (p. 10). Additionally, these classrooms were least likely to have children of color or children in poverty attending them. In contrast, the lowest quality classrooms “contained fewer Caucasian and more African American teachers...a lower student/adult ratio..longer program days…and were more likely to receive Head Start funding” (p. 12). Additionally, these classrooms had the highest proportion of children of color and children in poverty. This study is alarming considering that one of the goals of public pre-K is to better prepare at risk children for kindergarten. For example, the pre-K program in North Carolina, More-at-Four, is targeted to four year olds at risk in order to better prepare them for school. The program is implemented in public schools, Head Start programs, and in community-based child care programs (North Carolina Office of School Readiness, 2010b). Children attending More-at-Four have demonstrated improved outcomes in the areas of language/literacy, math, general knowledge, and behavioral skills (Peisner-Feinberg & Schaaf, 2008).

Based on intensive intervention programs, it is estimated that for every $1.00 spent on improving early childhood education environments for young children in poverty, $8.00 to $14.00 is saved as a result of later academic, social, and economic productivity (Duncan, Ludwig, & Magnuson, 2007). Due to the multiple risk factors facing children from poor and low-income families, the positive effects associated with high quality learning environments in child care seem to be especially important (Evans, 2004). Participating in formal child care may be one way to improve school readiness among children living in and near poverty, a goal of intervention and program-based models. Furthermore, child care quality has important implications for children living in and near poverty with programs adhering to high standards similar to intervention models resulting in the best outcomes for children (Rigby, Ryan, and Brooks-Gunn, 2007).

Community-Based Child Care

Research suggests that participation in formal child care may enhance cognitive development among children living in poverty through the learning environment (Caughy, Daughtry, DiPietro, & Stobino, 1994; Connell & Prinz, 2002; Magnuson, Meyers, Ruhm, & Waldfogel, 2004; Winsler et al., 2008). For example, in the Three-City Study there was a positive relationship between hours in formal child care and math skills among children 2-4 years old (Votruba-Drzal, Coley, Chase-Landsdale, 2004). That is, the number of hours in child care was modestly related to children's quantitative skills. Additionally, the child care programs that were of higher quality were related to better social development with fewer instances of internalizing and externalizing behaviors. Reading skills were boosted for children in higher quality care and who also had more stimulating home environments. Children coming from homes with little stimulation and who were in low quality care exhibited the highest rates of externalizing behaviors. These findings emphasize the increased additive risk of low quality home and low quality child care environments. Considering that the average global quality score across the sample was "minimal", based on ECERS-R and FDCRS scores, the potential opportunity for superior child care environments to positively influence the lives of low-income children is promising. That is, children living in and near poverty who may not have stimulating home environments may have experiences in child care that support academic readiness and social development. In fact, high quality child care may even buffer some negative effects associated with poverty on children's development (Brooks-Gunn, Klebanov, & Liaw, 1995). Utilizing nationally representative data from the Early Childhood Longitudinal Study, Magnuson, Meyers, Ruhm, and Waldfogel (2004) also found children attending center-based child care the year prior to kindergarten scored higher in math and reading through first grade. The effects were greatest for children from impoverished backgrounds. Winsler and colleagues (2008) found center care attendance - accessed through the use of subsidy - to improve academic and social outcomes for low-income children. More specifically, children accessing center care made gains in cognitive and social development.

Children experiencing higher quality child care are cognitively and socially more advanced (Helburn, 1995; Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000; NICHD, 2002). Conversely, children in lower quality programs, which are sometimes unsafe, experience care resulting in compromised outcomes. The NICHD Early Child Care Research Network reported better cognitive and language ability among children in higher quality child care. These positive effects prevailed into elementary school with respect to language and cognitive development, math ability, and behavioral and social development (Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, Kagan, & Yazejian, 2001). The strongest effects associated with high quality child care were among children at risk (i.e. low maternal education) yet, the more advantaged children were in the highest quality care.

Despite the research that concludes child care quality is related to children's outcomes (Burchinal, Peisner-Feinberg, Bryant, & Clifford, 2000; Helburn, 1995; NICHD, 2002), there is evidence that children in and near poverty are more likely to be in programs that are of lower quality compared to children from families with higher incomes. For example, Phillips, Voran, Kisker, Howes, & Whitebook (1994) found that children from upper class families experienced the highest quality child care compared to low and middle class children. Based on ITERS and ECERS scores, children with low and middle incomes were in classrooms below the “good” level of quality unlike their higher income peers. Although a curvilinear relationship among income and global quality was depicted (based on ITERS and ECERS scores), this study reported that children of lower class were most likely to be in programs that had insensitive and detached emotional environments (based on the Arnett Scale).

Additionally, in a study of child care use in Georgia, African American children were less likely to be in “good” quality care compared to European American children (Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995). One plausible explanation for this finding is cultural bias in measurement. However, with the intersection of race and class, other inequities are likely at play. Furthermore, path analyses indicated differential patterns of child care quality used by African American and European American families based on social class. That is, work demands mediated the relationship between social class and child care quality among African American families, whereas, work demands did not mediate this relationship for European American families. Differentiation by race and class in the quality of child care utilized points to the complex social dynamics involved in creating equitable access to high quality child care.

In a study of family child care homes and relative care in California, Texas, and North Carolina, family income was related to the quality of adult-child interactions and the quality of the learning environment in child care settings (Kontos, 1997). In this study

75% of very low-income, 43% of low-income, and 13% of moderate-income children were in care that was of inadequate quality. Furthermore, the sample of very low-income children primarily included African American and Latino children, again highlighting the intersection of race and class and how that impacts our youngest citizens' experiences in child care.

Public education is scrutinized for inequitable access to high quality public schools based on race and class (Ladson-Billings, 1995). There is evidence that the child care sector is following in the same path (Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995; Kontos, 1997) and perpetuated by current policies (Cassidy, Lower, Kintner, and Hestenes, 2009). Cassidy and colleagues found compromised structural supports that resulted in lower processual quality in child care classrooms with African American teachers. These classrooms also had a greater percentage of African American children compared to classrooms with European American teachers. Specifically, classrooms with African American teachers included fewer teachers in the classroom and those teachers had less education compared to the classrooms with European American teachers. In addition, the classrooms with African American teachers had 24% more children receiving subsidy and thus were likely to be from low-income families and requiring extra support, despite the inequitable structural resources available to the classrooms.

Market Constraints in a Multi-Tiered System

It is evident that the current child care system is a multi-tiered system, a system of child care that represents a wide-range of quality and is disproportionally accessible to families. Based on results from the Cost Quality and Child Outcomes study and the Family Child Care Home Study (Helburn & Howes, 1996), cost of child care and process quality is correlated. Further, relying on parent perceptions of quality to drive the child care system is problematic. That is, research indicates that parents and early childhood professionals rate child care quality differently. Helburn and Howes contend that “parents are not well-informed consumers and do not adequately judge child care quality” (p. 70). Cryer and Burchinal (1997) reported that parents falsely inflate scores during natural observations of their child care program when rating characteristics that they valued in a child care setting. In contrast, when parents were provided with a full range of quality options through the use of hypothetical vignettes, Shlay, Tran, Weinraub, & Harmon (2005) found low-income African American parents to prefer characteristics of higher quality settings (i.e. care-giving environment, teacher behavior, accreditation, etc.) and attributed more financial value to these characteristics compared to characteristics of lower quality settings. This finding suggests if the supply of higher quality choices were accessible and affordable to families, they are likely to be chosen over lower quality options. However, when the supply of high quality care is dependent on parent fees, higher quality options become simply not affordable and therefore the demand trumps what supply offers in terms of quality.

In order to improve access to high quality child care direct methods to improve supply are necessary beyond consumer education (Kisker & Ross, 1997). That is, currently there are market constraints (Shlay, Tran, Weinraub, & Harmon, 2005) that prevent parents from securing their ideal child care choice. For example, Li-Grining and Coley (2006) examined child care experiences of low-income families in Boston, Chicago, and San Antonio. The sample included 238 children in a variety of care settings including Head Start (14%), center care (29%), licensed family child care (6%), relative care in home (25%), relative care out of home (19%), and non-relative care out of home (7%). Of the programs, Head Start was financially the best option and the only program that offered “good” quality care. Among families not receiving a subsidy (50% of the sample), cost of care was not significantly different across types of care utilized. On average parents reported spending $40.57 per week or 24% of their income. Approximately 66% of mothers that indicated they preferred center care reported actually using center care. Although differences in cost were not found across types of care, discrepancies between preferred child care and actual child care arrangements suggest other supply constraints may also be in play.

From an economic perspective, demand for child care (e.g. as a result of PRWORA) may result in more availability but, such demand does not ensure access to high quality choices. At the federal level, the Child Care Development Block Grant now authorized as Child Care and Development Fund administered by the Child Care Bureau allocates funds to be used for child care subsidies to “enable low-income [working] families to access quality child care, which in turn makes it possible for parents to leave welfare and to achieve self-sufficiency” (U.S. Department of Health and Human Services Administration for Children and Families, 2008). This strategy is based on the idea that child care vouchers increase the purchasing power of low-income families, resulting in higher quality child care in low-income communities (Fuller, Kagan, Caspary, & Gauthier, 2002). While there is evidence that these subsidies do indeed alleviate some of the financial burden associated with child care costs (Kisker & Ross, 1997), improve the odds that children will be in regulated care (Huston, 2004), and are desperately needed by low wage workers (as testified by long waiting lists; Polakow, 2007); research presents a more complicated picture of patterns of supply and use of child care options.

There is mixed evidence regarding the nature of child care supply among communities of various socioeconomic strata. Some research suggests a curvilinear relationship to child care supply, with the most supply in poor and affluent locations compared to middle-income neighborhoods. For example, based on the national 1990 census data, the proportion of preschool teachers per 1,000 children was highest in poor and affluent zip codes (Fuller & Strath, 2001). In contrast, Queralt and Witte (1998) found supply of part day and full day child care centers to be significantly lower in poor neighborhoods in Massachusetts compared to their higher income counterparts. There is evidence that child care supply may be influenced by the selection patterns of parents based on ethnicity and language. For example, Hirshberg, Huang, and Fuller (2005) found ethnicity and language to be related to child care type, indicating that some families may prefer extended kin over more formal child care options. However, this cannot be fully assumed without sufficient evidence that there is adequate supply. That is, “parents have difficulty making informed and appropriate child care choices when the supply of good care is restricted” (Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995, p. 119). In fact, a study of five cities across three states found the quality of child care used by low-income families was best predicted by the city compared to other maternal variables (e.g. race, education, PPVT score, age, hours spent reading to child, hours and time of day worked), suggesting that selection factors may be influenced and limited by structural barriers in communities (Fuller, Kagan, Loeb, & Chang, 2004). Additionally, there is evidence based on national census data that center care is the least likely to be accessible in nonmetropolitan poor communities (Gordon & Chase-Lansdale, 2001). Although the availability of child care is important to working families, the quality of child care arrangements utilized by low-income families provides greatest understanding into children’s experiences.

Affordability, Subsidy and Quality

While there is evidence that high quality child care may benefit children of low socio-economic status, there are often financial barriers to accessing such programs as a result of a child care system influenced by supply and demand as well as affordability. A report from the National Women's Law Center (2008) indicated that families in poverty spend a greater percentage of their yearly income on child care compared to their more advantaged counterparts. For example, on average families in poverty spend 29% of their income on child care in comparison to 14% among families between 100-200% of the poverty threshold, and 6% among families with an income above the 200% threshold. The report also indicated that the "federal funding for child care assistance has been virtually flat-funded for seven years" and that "only one in seven children eligible under federal law receives child care assistance" (p. 1). Low-income families who do not receive financial support in the form of subsidy face adversity in paying for child care. There is evidence that these children are often in the care of relatives, neighbors, fictive kin, or other unregulated arrangements (Li-Grining & Coley, 2006).

One reason for the complexity of improving child care quality across community contexts may be the uncoordinated goals among current initiatives and funding. For example, as previously discussed, child care subsidy funds are intended to defray child care costs for families in poverty. Although this policy creates more purchasing power among families in poverty, subsidies may be used in regulated and unregulated care arrangements with variable quality. For example, among low-income African American families, the receipt of subsidy was associated with more center-based care and families without child care subsidies relied more on informal care by utilizing assistance from extended kin (Weinraub, Shlay, Harmon, & Tran, 2005). Although the type of child care used was related to subsidy, on average both the formal and informal care arrangements were below “good” quality and were not significantly different from one another. As a result, it seems subsidy use may work to increase supply, but there is little evidence that subsidies alone are able to leverage improved quality.

There is some evidence that children receiving subsidy experience lower quality care. For example, Jones-Branch, Torquati, Raikes, & Edwards (2004) found programs with children receiving subsidies provide significantly lower quality care based on ECERS-R scores (M = 3.3 versus 4.2, respectively). More specifically, language-reasoning (M = 3.0 versus 4.8), activities (M = 2.2 versus 3.2), and interactions (M = 3.9 versus 5.2) were negatively related to the inclusion of children receiving subsides. That is, the learning environments of children receiving subsidy were of lower quality compared to the learning environments of child care programs not serving children receiving subsidy. This correlation is a reminder of the multiple risk factors that intersect for children experiencing poverty. Additionally, in a multivariate analysis, subsidy density was negatively related to global quality and teacher salary. That is, the greater number of children receiving child care subsidy in a classroom, the greater the likelihood that teachers had significantly less education and lower classroom quality. This finding was also replicated by Cassidy, Lower, Kintner, and Hestenes (2009). While subsidy may assist families in accessing formal child care, the programs that seem most accessible to these families - with the greatest density of children receiving subsidy - seem to be of lower quality. Subsidy may be improving the likelihood that children are in licensed care but, there still seems to be discrepancies in the quality of the licensed care accessed compared to their more affluent peers.

In contrast, there is some evidence that suggests a positive association between child care subsidy receipt and child care quality (Fuller, Raudenbush, Wei, & Holloway, 1993). Rigby, Ryan and Brooks-Gunn (2007) found that across 14 states more generous subsidy rates were associated with higher quality child care among non-profit centers and increased the likelihood that children were in center-based care rather than with family or kith and kin care. There is evidence that subsidy increases purchasing power; however, whether or not subsidy can act to ensure children are in high quality programs is debatable and likely depends on other state and federal policies. These results emphasize the important role that subsidies can play in alleviating the cost of child care and increasing purchasing power among poor families. However, it is premature to rely on subsidy policies to ensure that children in poverty are in the high quality arrangements that can promote their optimal social and cognitive development.

Child Care Policy and Enhancement Efforts

National and state policies have promoted child care initiatives with the intent of improving quality. For example, federally, the Child Care and Development Fund (CCDF) administered by the Child Care Bureau of the U.S. Department of Health and Human Services Administration for Children and Families distributes funds to states to aid low-income working families with child care costs and to fund quality enhancement initiatives (Child Care Bureau, 2007). In 2006, 4.8 billion dollars were distributed to States, Tribes, and Territories impacting 1.8 million children. In 2009, this increased to 7 billion dollars including 2 billion dollars from the American Recovery and Investment Act (Child Care Bureau, 2009). Seventy percent of the funds were mandated to be granted to families receiving, transitioning from, or at risk of qualifying for Temporary Assistance for Needy Families (TANF). Subsidy funds granted to families are in the form of vouchers that may be used in a variety of child care settings (e.g. centers, homes, kin) based on parent choice. Additionally, at least 4% of the funds must be used by states on initiatives to improve child care quality. For example, North Carolina, like many other states (e.g., Tennessee, Pennsylvania, Illinois) allocated these funds to implement a rated license with the intention of increasing child care quality across the state. States receiving CCDF funds are mandated to develop a plan to ensure equal access to child care programs to families utilizing subsidies compared to families not eligible. In 2009, 10 million dollars were allocated for research and evaluation (Child Care Bureau, 2009).

Although further evaluative mechanisms are needed to ensure access to high quality child care, there is strong support that state regulatory policies are related to child care quality (Fuller, Raudenbush, Wei, & Holloway, 1993; Phillips, Howes, & Whitebook, 1992; Rigby, Ryan, & Brooks-Gunn, 2007). However, this relationship is complex. For example, in states with more stringent regulations and higher quality child care, children were less likely to be in formal care (Rigby, Ryan, & Brooks-Gunn). That is, stricter regulations, which may increase quality, may also reduce supply, requiring families to resort to more informal arrangements that may be of lower quality. An alternative explanation is that more stringent state regulations result in licensed child care that is too expensive for low-income families and subsequently forces families to choose unlicensed child care of questionable quality. Additionally, a study of child care centers across three California counties found that counties with higher levels of subsidy dollars had higher structural quality promoted by state quality standards (Fuller, Holloway, Bozzi, Burr, Cohen, & Suzuki, 2003). However, in counties where family demand for child care was above supply, the structural quality was compromised resulting in worse teacher-child ratios. In this example, because of the demand, there was more room in the supply of the mixed market for lower quality child care to sustain itself. Interestingly family demand and subsequently lower structural quality was most prevalent in working-class communities with high Latino populations also at risk for poverty.

In an effort to improve quality, some states have responded by implementing Quality Rating Systems. The National Child Care Information Center (2007) defines a Quality Rating System (QRS) as “a systemic approach to assess, improve, and communicate the level of quality in early care and education programs”. However, additional research is needed to determine if such efforts actually promote equitable access to higher quality child care across community contexts (Adams, Tout, & Zaslow, 2007) or further exploit the disparity between programs serving children in poverty compared to their more affluent peers. More recently, QRS are referred to as Quality Rating and Improvement Systems, emphasizing the need for improvement efforts to be a part of this regulatory approach. Additionally, some states have tiered subsidy reimbursement rates for child care programs with varying levels of quality (i.e. programs meeting higher standards receive higher rates). However, Cassidy, Lower, Kintner, & Hestenes (2009) reveal how this practice may in fact perpetuate inequitable resources for programs serving children in poverty. That is, in this particular study, child care subsidy rates were tied to star rating in the state’s QRIS. Classrooms with African American teachers had 24% more children receiving subsidy than classrooms with European American teachers. Classrooms with African American teachers also faced contextual barriers (e.g. lower teacher education, larger class sizes) resulting in lower global quality scores. Consequently, the classrooms with African American teachers and children - with 24% more children on subsidy, lower global quality scores, and fewer “stars” - received lower subsidy rates despite their need for additional resources.

Despite market constraints, efforts to increase supply through county funding and quality enhancement efforts seem to be effective. That is, the use of county level funds for child care quality enhancement seems to increase supply of higher quality child care. For example, a study examining the effects of Smart Start in North Carolina on 180 child care programs within 12 counties (using hierarchical linear modeling) found the proportion of funding allocated by Smart Start used on child care activities was positively related to county child care quality scores (Bryant, Maxwell, & Burchinal, 1999). In fact, the proportion of funding used by Smart Start on child care efforts better predicted quality than the extent to which Smart Start partnerships were allocated full or partial funding, although full funding still yielded significantly better results. Additionally, the extent to which child care programs participated in quality improvement activities, the higher their global quality was rated.

North Carolina Context

In North Carolina, 25% of children under 3 and 22% of children 3 to 5 are living in poverty, representative of the national rate of 22%. Expanding the statistics to include children living in families that are 200% above the poverty level, 45% of children under 3 and 47% of children 3 to 5 are living in these low-income households, representative of the national rate of 46% (National Center for Children in Poverty, 2010a; 2010b). With the PRWORA increasing the demand for child care among low-income families, examining the impact of QRIS policies in communities of different socioeconomic contexts is critical to ensuring equitable access to high quality child care that supports optimal development among children in poverty.

Access to high quality child care is important for all families across communities; it enables parents to work and it enhances children’s development and school readiness

(Trail, Wohl, & Estess, 2004). In North Carolina, 99% of children younger than six living 200% above the poverty level and 82% of young children living below this threshold have at least one working parent (National Center for Children in Poverty, 2010a). Child care is a needed resource among working parents across all income levels. However, it is difficult to balance the demand for child care and equitable access to high quality settings, especially in low-income communities. Although the North Carolina Quality Rating and Improvement System (QRIS) informs the child care market, there is no evidence that there is equitable access to the highest quality programs. On the contrary, there is evidence that children of color and children living in poverty are most likely to experience low quality child care (Helburn, 1995; Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995; Cassidy, Lower, Kintner, & Hestenes, 2009).

In the current study, the concentration of children from low-income families within programs was based on the state and federal funds received by programs to reduce or alleviate the cost of the program to families. Subsidy funds from the North Caorlina Division of Child Development and funds from Early Head Start, Head Start, and More-at-Four (state pre-K) were included. Some programs, like Head Start and More-at-Four focus on serving children from low-income families and classrooms are often made up of predominately children living in poverty and of color. In contrast, some programs may be more heterogeneous in terms of families of low socioeconomic backgrounds. In the current study, the amount of funds received to cover or subsidize the cost of care for children in relation to the program capacity provided a proxy for the concentration of children from low-income families attending the programs and the degree to which programs received state and federal funding.

The North Carolina Office of School Readiness oversees the implementation of Early Head Start, Head Start, and the state pre-Kindergarten program (More-at-Four) in child care programs. Both Head Start and More-at-Four programs are considered program-based models targeted for children from low-income households to promote school readiness and decrease the achievement gap. Head Start (and Early Head Start) is a federally funded family focused program designed to promote social and cognitive development by “meeting emotional, social, health, nutritional, and psychological needs of children and their families” (North Carolina Office of School Readiness, 2010a). More-at-Four is a state funded Pre-K program based on North Carolina’s early learning standards that promote school readiness by engaging children in active learning around approaches to learning, emotional and social development, health and physical development, language development and communication, and cognitive development (North Carolina Office of School Readiness, 2010b). Both programs utilize research-based curriculums, and have enhanced standards for teacher education and training, class size, and staff-child ratios.

In an effort to improve access to high quality child care for all children, North Carolina legislation allocates funds to the North Carolina Partnership for Children to distribute among all the 100 counties through 78 Smart Start offices across the state. The appropriation for 2007 – 2008 was $205.5 million dollars (North Carolina Partnership for Children, 2008). According to the North Carolina Partnership for Children, “Smart Start funds are used to improve the quality of child care, make child care more affordable and accessible, provide access to health services and offer family support”. Based on past expenditures, the majority of funds are used to grant child care subsidies to families in need and to enhance child care quality. Furthermore, the North

Carolina Partnership for Children is a nationally recognized model being replicated in other states. While there is evidence that Smart Start funds have improved child care quality (Bryant, Maxwell, & Burchinal, 1999) and made such programs more affordable to families through subsidies, the current study proposes to examine the extent to which these funds may change the way in which socioeconomic contexts of communities and child care quality are related.

In the current study, the county child care funding context was defined by the funds allocated to the 78 Smart Start county offices utilized for child care quality enhancement initiatives in the 100 North Carolina counties. Smart Start offices that cover more than one county do so due to the population density of the area. When counties are referenced, it is based on the boundaries of the 78 Smart Start offices.

CHAPTER IV

RESEARCH QUESTIONS AND HYPOTHESES

RQ1. To what extent does child care quality vary across community contexts of varying macroscopicity, such as zip codes and counties?

- H1a. Child care quality will vary more across counties than across zip codes.

RQ2. What is the relationship between program level characteristics (program type, capacity, extended care) and child care quality?

- H2a. Child care centers will be higher in quality compared to child care homes.
- H2b. Capacity will be negatively related to child care quality.
- H2c. Extended care will be negatively related to child care quality.

RQ3. What is the relationship between the concentration of state and federal funding (More-at-Four, Head Start, Division of Child Development subsidy) and child care quality?

- H3a. More-at-Four funding will be positively related to child care quality.
- H3b. Head Start funding will be positively related to child care quality.
- H3c. Division of Child Development subsidy will be negatively related to child care quality.

RQ4. What is the relationship between the socioeconomic context of communities and child care quality?

- H4a. Concentrated disadvantage (percent below the poverty line, percent receiving public assistance, percent unemployed, percent female-headed families with children, and percent black) will be negatively related to child care quality.

- H4b. Concentrated immigration (percent Latino, percent foreign born) will be negatively related to child care quality.
- H4c. Residential stability (percent of residents five years old and older who resided in the same house five years earlier, percent of own-occupied homes) will be positively related to child care quality.
- H4d. Concentrated affluence (percent of families with incomes higher than $75,000, percent of adults with a college education, percent civilian labor force employed in professional or managerial occupations) will be positively related to child care quality.
- H4e. Concentration of White population will be positively related to child care quality.

RQ5. To what extent does county level Smart Start funding influence the relationship between the socioeconomic context of communities and child care quality?

- H5a. Smart Start quality enhancement funding will be positively related to quality.
- H5b. The allocation of county level Smart Start funding for quality enhancement will have a moderating effect in the two-level model examining the relationship between child care quality and community socioeconomic context.

RQ6. Under what conditions do child care programs more likely participate in the voluntary environment rating scale assessments?

- H6a. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in zip codes with lower concentrated disadvantage.

- H6b. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in zip codes with lower concentrated immigration.
- H6c. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in zip codes with higher residential stability.
- H6d. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in zip codes with higher concentrated affluence.
- H6e. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in zip codes with a greater percentage of White population.
- H6f. Child care programs that participate in the voluntary environment rating scale assessment are more likely to be in counties that have more funds allocated for quality enhancement.

CHAPTER V

METHODOLOGY

Research Design

The purpose of the study was to examine: (a) the variation in child care quality across communities of various sizes (zip codes versus counties), (b) the relationship between state and federal funding and child care quality, (c) the relationship between child care quality and the socioeconomic context of communities, (d) the extent county level Smart Start funding influences the relationship between the socioeconomic context of communities and child care quality, and (d) the socioeconomic contexts of child care programs participating and not participating in the statewide QRIS voluntary assessment process.

The study utilized a cross-sectional design and multiple data sources including regulatory data from the North Carolina Division of Child Development, observation data from the North Carolina Rated License Assessment Project, survey data from the United States Census Bureau, and administrative data from the North Carolina State Head Start Collaboration Office, North Carolina Office of School Readiness, and the North Carolina Partnership for Children.

The data sources utilized unique procedures – survey, regulatory, observation, and administrative. Each data source resulted from a unique method of data collection and multiple informants. Including all licensed child care programs in the state of North Carolina that serve children birth through 5-years ensured a low risk of selection effects and a large sample size to have adequate power for hierarchical linear modeling. As such, this strong research design yielded valid generalizable data useful for policy recommendations.

Measures

Child Care Quality

Licensing points. The total licensing points earned (out of 15) from the Division of Child Development as of September 25, 2008 was used as a measure of child care quality. The Division of Child Development assigns a star rating to all licensed child care programs. For example, 1-3 points earned in the rated license equates to 1 star, 4-6 points equates to 2 stars, 7-9 points equates to 3 stars, 10-12 points equates to 4 stars, and 13-15 points equates to 5 stars. The star rating is figured from a total number of points out of 15 based on education standards and program standards. Out of the15 points, programs can earn up to 7 points in education standards and 7 points in program standards with an additional "quality point" that may be achieved through enhanced teacher education requirements, approved curriculum adoption, or other options. Points are earned towards the education standards based on teacher and administrative education levels and experience. Points are earned toward the program standards based on operating and personnel policies, number of activity areas in classrooms, square footage per classroom, staff child ratios, and the results from a voluntary Environment Rating Scale assessment. All points attributed to the education standards and program standards, with the exception of the Environment Rating Scale assessment, measure structural quality. Therefore, measurement of quality for programs not participating in the Environment Rating Scale assessment is based on structural quality. The purpose of using the total licensing points earned versus the star rating is to allow for greater variation among programs.

Environment Rating Scales. To achieve the highest star ratings (4 or 5 stars), programs must volunteer for an Environment Rating Scale (ERS) assessment. Scores from the assessment impact the total licensing points earned towards the programs standards component of the rated license. The Environment Rating Scales (Infant Toddler Environment Rating Scale – Revised, Harms, Cryer, & Clifford, 2003; Early Childhood Environment Rating Scale – Revised, Harms, Clifford, & Cryer, 2005; and the Family Child Care Home Environment Rating Scale, Harms & Clifford, 1989) are widely used measures of global quality. The Environment Rating Scales were designed as observational measures that typically require three to five hours of observation and a teacher interview. Based on the observation, items are scored from 1 (inadequate) to 7 (excellent). Items are averaged to determine a global quality score. The ERS contain high levels of face and content validity by addressing important characteristics and practices that describe the level of quality in early care and education and contain acceptable levels of internal consistency (ITERS-R α = .93; ECERS-R α = .92; FDCRS subscale α's range from .70 - .93) . In addition to research, they are used as a part of regulatory enhancement programs in 15 states including North Carolina. The North Carolina Rated License Assessment Project is the organization responsible for all assessments in North Carolina. Assessors maintain an inter-rater reliability of at least 85% within one point. The use of well trained reliable assessors protects against inaccurate results attributed to the way observers score observations.

Program Characteristics

Program Type (center or family child care home), licensed capacity, and extended care (licensed for second and/or third shift care) were included as program level characteristics. To normalize the distribution of licensed capacity the natural log was computed for analyses. Additionally, interactions between program type and licensed capacity and program type and extended care were tested.

Funding received from More-at-Four, Head Start, and the Division of Child Development (DCD) were used as proxies to determine the concentration of children from low-income families attending the programs that accessed state or federal funding. Three separate variables were computed – one for Head Start funds, one for More-at-Four funds, and one for DCD funds. The More-at-Four and Head Start funds were from the 2007-2008 school year and the DCD funds were from the 2008 fiscal year. Program level DCD and More-at-Four funds were merged with the licensing data based on the unique program facility identification numbers. Head Start funding including Early Head Start was received at the level of the funding agency. To include these funds approximations were computed for each program who received funds from the respective agencies. For example, programs were allocated funds proportionally based on the number of programs funded within each of the agencies and the licensing capacity of each of the programs. To adjust for the positively skewed distributions of the data, 1 plus the natural log of More-at-Four, Head Start, and DCD funding divided by licensed capacity was computed for analyses. Correlations among the program level variables are reported in Table 1.

Community Socioeconomic Context

Census data. The Decennial Census 2000 Summary File 3 (SF3) data set was used for the current study. SF3 includes variables measuring socioeconomics at low level geographies such as zip codes (U.S. Census Bureau, 2007). Approximately 1 in 6 households are included in the sample and weighted to the population. Based on Sampson, Morenoff, and Earls (1999), the following scales were used to examine socioeconomic differences between communities at the zip code level: (1) concentrated disadvantage; (2) concentrated immigration; (3) residential stability; and (4) concentrated affluence. More specifically, the variables constituting concentrated disadvantage include: percent population below the poverty line, percent households receiving public assistance, percent individuals 16 and over in labor force unemployed, percent female-headed families with children, and percent Black or African American. The variables constituting concentrated immigration include: percent Latino and percent foreign born. The variables constituting residential stability include: percent of residents five years old and older who resided in the same house five years earlier and the percent of owner-occupied homes. The variables constituting concentrated affluence include: percent of families with incomes $75,000 or higher, percent of adults with a college education, and percent of civilian labor force employed in professional or managerial occupations. The aforementioned scales were utilized instead of variables as single measures in the model because many of the variables were highly correlated (see Table 2). To address this issue of multicollinearity, Burchinal, Roberts, Hooper, and Zeisel (2000) suggest using factor scores to reduce the number of predictors that are highly correlated. The factor scores were more modestly correlated (see Table 3). Because of the history of segregation in North Carolina, race (percent White) was also added as a single variable.

County Funding Context

Smart Start Funding. County Smart Start funds, used for child care quality enhancement efforts, measured the county funding context. Funding allocations by county Smart Start offices were obtained through the North Carolina Partnership for Children. There are a total of 78 Smart Start offices covering the 100 North Carolina counties. For purposes of the current study, county boundaries were based on the coverage of the 78 Smart Start offices. Funds used by each Smart Start agency were coded with a “purpose service code”. Because Smart Start agencies provide a variety of services to support children and families in communities, these codes were used to specifically identify funds that were intended to improve the quality of early care and education. Funds specifically used for the following reasons were summed: quality enhancement (upgrades and maintenance), child care resource and referral services, professional development, child care support services, professional development supplements, provider training, learning materials and teaching aids, health benefits for child care providers, increase child care availability, Head Start expansion (i.e. early a.m. and p.m. services), child care cost supports, and supplement for quality. To adjust for positively skewed distributions of the data, the natural log of Smart Start quality enhancement funds was computed for analyses.

Sample

The population studied included nearly all licensed child care (family child care homes and centers) in North Carolina. The licensing data was received from the North Carolina Division of Child Development on September 25, 2008. At that time there were 8903 programs in the dataset. The licensing data included the zip codes of the program locations which allowed the data to be merged with the census data at the zip code level. Two hundred fifty-four programs did not have census information that corresponded with their zip code therefore they were removed from the data set. Additionally, public school PreK and Afterschool programs (n = 1076) were removed from the data. Furthermore, 613 programs were exempt from quality rating requirements (n = 364 religious exemption; n = 221 temporary license; n = 28 provisional license) and therefore were removed from the data set. An additional 78 programs were dropped from the dataset because they had not yet converted to the two-component licensing system. The final sample size that resulted was 6882 programs nested within 619 zip codes. Of these, 3725 were family child care homes and 3157 were child care centers.

Programs with 1 to 5 stars were represented in the data including 1495 one star programs (n = 1136 homes, n = 359 centers), 1209 two star programs (n = 815 homes, 394 centers), 1505 three star programs (n = 634 homes, n = 871 centers), 1592 four star programs (n = 672 homes, n = 920 centers), and 1081 five star programs (n = 468 homes, 613 centers). Of the 6882 programs, licensing points averaged 7.14 (SD = 4.677) with a range of 0 to 15 points.

Licensing data from the Division of Child Development was merged with subsidy, Head Start, and More-at-Four data based on the unique facility identification number assigned by the Division of Child Development for the purpose of licensing. Furthermore, 5360 (78%) programs received DCD subsidy funding, 282 (4%) received Head Start funding, and 439 (6%) received More-at-Four funding. There were 47 programs that received funds from all three sources, 39 programs that received Head Start and DCD funds, 277 programs that received More-at-Four and DCD funds, 104 programs that received Head Start and More-at-Four funds, 5003 programs that just received DCD funds, 92 programs that only received Head Start funds, 17 programs that only received More-at-Four funds, and 1309 that received no funds from any of the three sources.

The vast majority of child care programs interested in earning higher star ratings (i.e. 3, 4, or 5 stars) request an Environment Rating Scale (ERS) assessment to be conducted. These assessments are conducted by the North Carolina Rated License Assessment Project and scores are stored in the DCD licensing database. From the current sample (n = 6882), 2964 programs (n = 1061 homes, 1903 centers) participated in the voluntary ERS assessment. Of these programs, 1 had one star (center), 115 had two stars (n = 35 homes, n = 80 centers), 489 had 3 stars (n = 135 homes, n = 354 centers), 1278 had four stars (n = 423 homes, n = 855 centers), and 1081 had five stars (n = 468 homes, n = 613 centers). Furthermore, the sub-sample programs had an average of 11.16 licensing points (SD = 2.504) with a range of 3 to 15 points. The mean ERS score was 5.13 (SD = .60) with a range of 1 to 6.83. Because the assessment process is a voluntary part of the rated license, these data were hypothesized to disproportionally represent higher quality programs in the state. Identifying the kinds of programs participating in the voluntary assessment of the licensing process enabled an examination of selection effects of the current policy by comparing the socioeconomic contexts of programs participating and not participating in the assessment.

At the zip code level, the average concentrated disadvantage was 13% (SD = .07) with a range of 2% to 41% for the full- and sub-sample. The average concentrated immigration was 5% for the full-sample and 6% for the sub-sample (SD = .04) with a range of 0 to 45%. The average residential stability was 60% for the full-sample and 59% for the sub-sample (SD = .10) with a range of 6% to 91%. The average concentrated affluence was 22% (SD = .10) for the full-sample (23% (SD = .11) for the sub-sample) with a range of 0% for the full-sample (4% for the sub-sample) to 65%.

The internal consistency (Cronbach's alpha) of the community socioeconomic context measures was examined. The concentrated disadvantage scale yielded an alpha of .69, concentrated immigration scale yielded an alpha of .90, the residential stability scale yielded an alpha of .68, and the concentrated affluence scale yielded an alpha of .95. Based on the these results, the concentrated immigration scale and the concentrated affluence scale have a lower bound estimates of reliability that is sufficiently high to have confidence in the scales whereas the lower bound estimate of reliability for the concentrated disadvantage and the residential stability scales suggest greater caution in interpretation of these effects.

The concentration of White population was not included because it was highly correlated (-.92, $p \leq .00$ for the full- and sub-samples) negatively with concentrated disadvantage. Due to multicollinearity, the variance inflation factor for White was 7.69 suggesting it was not needed in the model as long as concentrated disadvantage was included. Table 2 includes the correlations among the variables used in the scales measuring the socioeconomic context of communities and table 3 includes the correlations among the four scales.

Because zip codes can share more than one county, data reduction was required so that zip codes did not overlap counties. Programs with zip codes that were in more than one county were individually examined. Based on the majority of a zip code nested in a single county, a dominant county was chosen. The programs with a shared zip code but a county that deviated from the dominant county were deleted from the data set. This reduced the sample by 155 programs. Therefore, in the 3-level full sample model, the sample size included 6727 programs nested within the 78 Smart Start county or "partnership" offices. On average, Smart Start allocated $1,400,439 (SD = $1,856,728) for child care quality enhancement initiatives at the level of the Smart Start county (partnership) with a range of $85,030 to $11,103,050. Because the quality enhancement dollars were negatively skewed, the natural log of this variable was used to normalize the curve, resulting in a mean of 13.64 (SD = .998) and a range of 11.35 to 16.22.

CHAPTER VI

ANALYTIC STRATEGY

Preliminary analyses were conducted using SPSS16. The internal consistency (Cronbach's alpha) of the community socioeconomic context measures was examined. Where necessary, variable and scale distributions were examined to confirm normality. Highly non-normal distributions were transformed and zero-order correlations were conducted. Hypotheses were tested using HLM6, software developed for examining data that are hierarchical in structure. Using HLM6 to analyze nested data protected statistical conclusion validity, by properly accounting for non-independence of programs nested within zip codes and counties. Overall, three levels of nesting were included in analyses with child care programs at level 1 nested within zip codes (level 2) nested within counties (level 3).

Unconditional Models

Initial testing began with unconditional 2-level models based on Raudenbush and Bryk (2002).

<u>Level 1 Model</u>

$y_{ij} = \beta_{0i} + r_{ij}$

where:

y_{ij} = total licensing points (or ERS score) of the j^{th} program within the i^{th} zip code (or county).

β_{0i} = level 1 intercept term for programs within the i^{th} zip code (or county).

r_{ij} = level 1residual of the j^{th} program within the i^{th} zip code, or the deviation of the estimated quality (licensing points or ERS score) of the j^{th} program within the i^{th} zip code from its predicted value based on the level 1 regression model.

<u>Level 2 Model</u>

$\beta_{0i} = \gamma_{00} + u_{0i}$

where:
β_{0i} = level 1 intercept term for programs within the i^{th} zip code (or county).
γ_{00} = level 2 intercept term.
u_{0i} = level 2 residual. It reflects the degree to which there is substantial zip code to zip code (or county to county) variation.

Additional assumptions of the unconditional HLM model includes:
$r_{ij} \sim N(0,\sigma^2)$, or level 1 residuals are normally distributed with a mean of 0 and homogeneous variance of σ^2.
$u_{0i} \sim N(0,\tau_{00})$, or level 2 residuals are normally distributed with a mean of 0 and variance of τ_{00}.
$Cov(r_{ij}, u_{0i}) = 0$, or level 1 residuals and level 2 residuals are uncorrelated.

Unconditional models allow for the unambiguous partitioning of total variability into components between and within programs, zip codes, and/or counties. No predictor variables are included. Unconditional models are of primary interest because they allow for estimation of intraclass correlations (ICCs), or the fraction of variability attributable to the heterogeneity of zip codes and/or counties relative to the total variability observed among programs, zip codes, and/or counties. Unconditional models were also used to decide, based on higher ICCs, whether the most appropriate two-level models were programs nested within zip codes rather than programs nested within counties.

Conditional 2-Level Models

Conditional (means as outcomes) 2-level models were built based on Raudenbush and Bryk (2002). Conditional 2-level models include a set of predictors at level 1 and/or level 2 while taking into account dependencies associated with the hierarchical data structure (e.g. child care programs nested within zip codes). For example, in predicting child care quality, characteristics of the program (level 1) may be included (e.g. a binary variable indicating whether the program is a family child care home or center); while at level 2, characteristics of the community in which the program is nested may also be included (e.g. concentrated disadvantage).

The first step in building conditional models begins by identifying an effective level 1 model. The effective level 1 model includes all level 1 (program level) predictors and necessary random effects. A level 1 effective model is identified by reducing a full model that includes all level 1 variables and theoretically driven random effects. For example, a random effect may be included if it is plausible that the magnitude of the relationship between the predictor (e.g. program type) and the outcome variable (e.g. child care quality) varies across groups (e.g. zip codes). All level 1 full models in the current study included random effects for the intercept (u_0), program type (u_1), licensed capacity (u_4), and DCD subsidy funding (u_8).

Level 1 Model

$y_{ij} = \beta_{0i} + \beta_{1i}(program\ type_{ij}) + \beta_{2i}(extended\ care_{ij}) + \beta_{3i}(program\ type_{ij} * extended\ care_{ij}) + \beta_{4i}(licensed\ capacity_{ij}) + \beta_{5i}(program\ type_{ij} * licensed\ capacity_{ij}) + \beta_{6i}(Head\ Start\ funding_{ij}) + \beta_{7i}(More\text{-}at\text{-}Four\ funding_{ij}) + \beta_{8i}(DCD\ subsidy\ funding_{ij}) + r_{ij}$

where:

y_{ij} = total licensing points (or ERS score) of the j^{th} program within the i^{th} zip code.

β_{0i} = level 1 intercept term for programs within the i^{th} zip code. It also refers to the estimated quality of a hypothetical reference program (within each zip code) that is a home provider, without extended care, a licensed capacity of 0, and no Head Start, More-at-Four, or DCD subsidy funding.

β_{xi} = level 1 regression coefficient relating the x^{th} program characteristic to licensing points (or ERS score) within the i^{th} zip code.

r_{ij} = level 1 residual of the j^{th} program within the i^{th} zip code, or the deviation of the estimated quality (licensing points or ERS score) for the j^{th} program within the i^{th} zip code from its predicted value based on the level 1 regression model.

It is assumed that $r_{ij} \sim N(0,\sigma^2)$, or level 1 residuals are normally distributed with a mean of 0 and homogeneous variance of σ^2.

Overall, the level 1 model describes the prediction of licensing points (or ERS score) of individual programs (nested within particular zip codes) from program level predictors.

Level 2 Model

$\beta_{0i} = \gamma_{00} + u_{0i}$

$\beta_{1i} = \gamma_{10} + u_{1i}$

$\beta_{2i} = \gamma_{20}$

$\beta_{3i} = \gamma_{30}$

$\beta_{4i} = \gamma_{40} + u_{4i}$

$\beta_{5i} = \gamma_{50}$

$\beta_{6i} = \gamma_{60}$
$\beta_{7i} = \gamma_{70}$
$\beta_{8i} = \gamma_{80} + u_{8i}$

where:
β_{xi} = level 1 regression coefficient relating the x^{th} program characteristic (or intercept) to licensing points (or ERS score) within the i^{th} zip code.
γ_{x0} = level 2 intercept for predicting the x^{th} program characteristic. It also represents the main effect of the x^{th} program characteristic in a mixed model formulation of the hierarchical linear model.
u_{xi} = level 2 residual associated with the x^{th} program characteristic. It reflects the degree to which there is substantial zip code to zip code variation in the relationship between the x^{th} level 1 program characteristic and program quality (licensing points or ERS score).

Overall, level 2 models without additional level 2 predictors capture the fixed effects of level 1 terms, as well as heterogeneity between zip codes in level 1 parameters for designated terms.

Additional assumptions of the standard HLM model includes:
$r_{ij} \sim N(0,\sigma^2)$, or level 1 residuals are normally distributed with a mean of 0 and homogeneous variance of σ^2.
$u_{xi} \sim N(0,\tau_{xx})$, or level 2 residuals are normally distributed with a mean of 0 and variance of τ_{xx}.
$Cov(u_{xi}, u_{zi}) = \tau_{xz}$, or the covariances between pairs of level 2 residuals = τ_{xz}.
$Cov(r_{ij}, u_{xi}) = 0$, or level 1 residuals and level 2 residuals are uncorrelated.

Since the heterogeneity of level 1 (program) effects across zip codes is maximal before level 2 (community) predictors are added to the model, model comparisons based on likelihood ratio tests of deviance statistics were used to reduce the number of random effects in the level 1 full model to an empirically determined, minimally necessary set. Also, since one of the assumptions of HLM is homogeneity of level 1 variances [i.e. $r_{ij} \sim N(0,\sigma^2)$] across groups (e.g. zip codes), each full level 1 model was tested for homogeneity of level 1 variance. If heterogeneity across groups was detected, level 1 variables were entered as predictors of the variance heterogeneity in order to account for it (Raudenbush & Bryk, 2002, pp.263-265; Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004, pp. 52-53). In all cases where level 1 variance heterogeneity was observed, program type accounted for it.

The level 1 effective model was the foundation for adding level 2 (zip code) predictor variables including: concentrated disadvantage, concentrated immigration, residential stability, and concentrated affluence. For level 1 coefficients with random effects, the level 2 variables were added to help "explain" the heterogeneity among programs (nested within zip codes) implied by the random effect. For level 1 coefficients without random effects, predictors were included in order to test theoretically grounded cross-level interactions implied by the model. For example, if a random effect was included for program type and DCD subsidy funding, level 2 interactions were included in order to help explain the variance components. If a random effect was not needed for a level 1 predictor (e.g. extended care, Head Start funding, More-at-Four funding), yet a theoretically plausible reason suggested a possible interaction with level 1 variables, they were included as noted in the example below.

Level 1 Model

$y_{ij} = \beta_{0i} + \beta_{1i}(\text{program type}_{ij}) + \beta_{2i}(\text{extended care}_{ij}) + \beta_{3i}(\text{program type}_{ij} * \text{extended care}_{ij}) + \beta_{4i}(\text{licensed capacity}_{ij}) + \beta_{5i}(\text{program type}_{ij} * \text{licensed capacity}_{ij}) + \beta_{6i}(\text{Head Start funding}_{ij}) + \beta_{7i}(\text{More-at-Four funding}_{ij}) + \beta_{8i}(\text{DCD subsidy funding}_{ij}) + r_{ij}$

All level 1 terms are defined as in the previous model.

Level 2 Model

$\beta_{0i} = \gamma_{00} + \gamma_{01}(\text{disadvantage}_i) + \gamma_{02}(\text{immigration}_i) + \gamma_{03}(\text{residential stability}_i) + \gamma_{04}(\text{affluence}_i) + u_{0i}$
$\beta_{1i} = \gamma_{10} + \gamma_{11}(\text{disadvantage}_i) + \gamma_{12}(\text{immigration}_i) + \gamma_{13}(\text{residential stability}_i) + \gamma_{14}(\text{affluence}_i) + u_{1i}$
$\beta_{2i} = \gamma_{20} + \gamma_{21}(\text{disadvantage}_i) + \gamma_{22}(\text{immigration}_i) + \gamma_{23}(\text{residential stability}_i) + \gamma_{24}(\text{affluence}_i)$
$\beta_{3i} = \gamma_{30}$
$\beta_{4i} = \gamma_{40}$
$\beta_{5i} = \gamma_{50}$
$\beta_{6i} = \gamma_{60} + \gamma_{61}(\text{disadvantage}_i) + \gamma_{62}(\text{immigration}_i) + \gamma_{63}(\text{residential stability}_i) + \gamma_{64}(\text{affluence}_i)$
$\beta_{7i} = \gamma_{70} + \gamma_{71}(\text{disadvantage}_i) + \gamma_{72}(\text{immigration}_i) + \gamma_{73}(\text{residential stability}_i) + \gamma_{74}(\text{affluence}_i)$
$\beta_{8i} = \gamma_{80} + \gamma_{81}(\text{disadvantage}_i) + \gamma_{82}(\text{immigration}_i) + \gamma_{83}(\text{residential stability}_i) + \gamma_{84}(\text{affluence}_i) + u_{8i}$

where:

β_{xi} = level 1 regression coefficient relating the x^{th} program characteristic to licensing points (or ERS score) within the i^{th} zip code.

γ_{00} = level 2 intercept for predicting the i^{th} zip code's intercept value. In a mixed model formulation of the hierarchical linear model, it also represents the average zip code intercept, or overall intercept value.

γ_{0z} = the level 2 regression coefficient for predicting the i^{th} zip code's intercept value from the z^{th} zip code characteristic. In a mixed model formulation, it represents the main effect of the z^{th} zip code characteristic.
γ_{x0} = level 2 intercept for predicting the coefficient of the x^{th} program characteristic. It also represents the main effect of the x^{th} program characteristic in a mixed model formulation of the hierarchical linear model.
γ_{xz} = the level 2 regression coefficient for predicting the coefficient of the x^{th} program characteristic from the z^{th} zip code characteristic. In a mixed model formulation, it represents the cross-level interaction between the x^{th} program characteristic and the z^{th} zip code characteristic.
u_{xi} = conditional level 2 residual associated with the x^{th} program characteristic. It reflects the degree to which there remains substantial zip code to zip code variation in the relationship between the x^{th} level 1 program characteristic and program quality (licensing points or ERS score) after taking all level 1 and level 2 terms, main effects, and interactions included in the model into account.

Additional assumptions of a two-level model that includes level 2 covariates are the same as described above for the unconditional growth model.

Overall, level 2 models with additional level 2 predictors capture the fixed effects of level 1 and 2 terms and interactions between level 1 and 2 terms as well as heterogeneity between zip codes in level 1 parameters for designated terms.

After fitting the full level 2 model, the model was reduced through a series of stages using model comparisons to determine the minimal necessary set of predictors for each level 1 coefficient. All model comparisons were guided by Wald tests, but finalized through likelihood ratio tests referenced against the full level 2 model (Raudenbush & Bryk, p.56-65). Nonsignificant interactions were reduced followed by main effect terms that were not significant. Reduction of the full level 2 model implied by the minimal set of predictors resulted in the effective level 2 model.

Moderating 3-Level Models

A conditional (means as outcomes) 3-level model was used based on Raudenbush and Bryk (2002) to determine the moderating effect of county level Smart Start funds on 2-level quality models. That is, the 3-level model allowed for changes in the 2-level model when taking the clustering of zip codes into Smart Start county regions, as well as the Smart Start quality enhancement funds into account. Unless otherwise noted, the 2-level effective model (described below) was used as the foundation for adding the third level terms. (See the full 2-level model for definitions of terms.)

Level 1 Model

$y_{ij} = \beta_{0i} + \beta_{1i}(program\ type_{ij}) + \beta_{2i}(extended\ care_{ij}) + \beta_{3i}(program\ type_{ij} * extended\ care_{ij}) + \beta_{4i}(licensed\ capacity_{ij}) + \beta_{5i}(program\ type_{ij} * licensed\ capacity_{ij}) + \beta_{6i}(Head\ Start\ funding_{ij}) + \beta_{7i}(More\text{-}at\text{-}Four\ funding_{ij}) + \beta_{8i}(DCD\ subsidy\ funding_{ij}) + r_{ij}$

Level 2 Model

$\beta_{0i} = \gamma_{00} + \gamma_{01}(disadvantage_i) + \gamma_{02}(residential\ stability_i) + \gamma_{03}(affluence_i) + u_{0i}$
$\beta_{1i} = \gamma_{10} + \gamma_{11}(disadvantage_i) + u_{1i}$
$\beta_{2i} = \gamma_{20}$
$\beta_{3i} = \gamma_{30}$
$\beta_{4i} = \gamma_{40}$
$\beta_{5i} = \gamma_{50}$
$\beta_{6i} = \gamma_{60} + \gamma_{61}(affluence_i)$
$\beta_{7i} = \gamma_{70} + \gamma_{71}(disadvantage_i)$
$\beta_{8i} = \gamma_{80} + \gamma_{81}(affluence_i) + u_{8i}$

A 3-level full model was created by adding county level random effects to level 2 coefficients, as well as Smart Start quality enhancement funds as predictors of the level 2 model terms. As suggested by model nonconvergence, the data only supported inclusion of level 3 random effects for selected level 2 terms.

Level 1 Model

$y_{ijk} = \beta_{0ik} + \beta_{1ik}(program\ type_{ijk}) + \beta_{2ik}(extended\ care_{ijk}) + \beta_{3ik}(program\ type_{ijk} * extended\ care_{ijk}) + \beta_{4ik}(licensed\ capacity_{ijk}) + \beta_{5ik}(program\ type_{ijk} * licensed\ capacity_{ijk}) + \beta_{6ik}(Head\ Start\ funding_{ijk}) + \beta_{7ik}(More\text{-}at\text{-}Four\ funding_{ijk}) + \beta_{8ik}(DCD\ subsidy\ funding_{ijk}) + r_{ijk}$

where:

y_{ijk} = total licensing points (or ERS score) of the j^{th} program within the i^{th} zip code within the k^{th} county.

β_{0ik} = level 1 intercept term for programs within the i^{th} zip code within the k^{th} county. It also refers to the estimated quality of a hypothetical reference program within the i^{th} zip code in the k^{th} county – that is a home provider, without extended care, a licensed capacity of 0, and no Head Start, More at Four, or DCD subsidy funding.

β_{xik} = level 1 regression coefficient relating the x^{th} program characteristic (or intercept) to licensing points (or ERS score) within the i^{th} zip code within the k^{th} county.

r_{ijk} = level 1 residual of the j^{th} program within the i^{th} zip code within the k^{th} county, or the deviation of the estimated quality (licensing points or ERS score) for the j^{th} program within the i^{th} zip code within the k^{th} county from its predicted value based on the level 1 regression model.

Overall, the level 1 model describes the prediction of licensing points (or ERS score) of individual programs (nested within particular zip codes within particular counties) from program level predictors.

<u>Level 2 Model</u>

$\beta_{0ik} = \gamma_{00k} + \gamma_{01k}(disadvantage_{ik}) + \gamma_{02k}(residential\ stability_{ik}) + \gamma_{03k}(affluence_{ik}) + u_{0ik}$
$\beta_{1ik} = \gamma_{10k} + \gamma_{11k}(disadvantage_{ik}) + u_{1ik}$
$\beta_{2ik} = \gamma_{20k}$
$\beta_{3ik} = \gamma_{30k}$
$\beta_{4ik} = \gamma_{40k}$
$\beta_{5ik} = \gamma_{50k}$
$\beta_{6ik} = \gamma_{60k} + \gamma_{61k}(affluence_{ik})$
$\beta_{7ik} = \gamma_{70k} + \gamma_{71k}(disadvantage_{ik})$
$\beta_{8ik} = \gamma_{80k} + \gamma_{81k}(affluence_{ik}) + u_{8ik}$

where:
β_{xik} = level 1 regression coefficient relating the xth program characteristic (or intercept) to licensing points (or ERS score) within the ith zip code within the kth county.
γ_{00k} = level 2 intercept for predicting the ith zip code's intercept value within the kth county.
γ_{0zk} = the level 2 regression coefficient for predicting the the ith zip code's intercept value (within the kth county) from the zth zip code characteristic.
γ_{x0k} = level 2 intercept for predicting the coefficient of the xth program characteristic within the ith zip code and kth county.
γ_{xzk} = the level 2 regression coefficient for predicting the coefficient of the xth program characteristic from the zth zip code characteristic in the kth county.
u_{xik} = conditional level 2 residual associated with the xth program characteristic for the ith zip code nested within the zth county. It reflects the degree to which there remains substantial zip code to zip code variation (within counties) in the relationship between the xth level 1 program characteristic and program quality (licensing points or ERS score) after taking all level 1, level 2, and level 3 terms included in the model into account.

As in the 2-level models, it is assumed that:
$u_{xik} \sim N(0,\tau_{xx})$, or level 2 residuals are normally distributed with a mean of 0 and homogeneous variance of τ_{xx}.
$Cov(u_{xik}, u_{zik}) = \tau_{xz}$, or the covariance between pairs of level 2 residuals = τ_{xz}.
$Cov(\sigma_{iik}, u_{xik}) = 0$, or level 1 and level 2 residuals are uncorrelated.

Overall, the level 2 model within a three-level hierarchical linear model captures the fixed effects of program and zip code level predictors of licensing points (or ERS scores) within counties. For each county, it also captures the heterogeneity remaining between constituent zip codes in values of their level 1 parameters for designated terms after taking all predictors in the model into account.

<u>Level 3 Model</u>

$\gamma_{00k} = \pi_{000} + \pi_{001}(quality\ enhancement_k) + \delta_{00k}$
$\gamma_{01k} = \pi_{010} + \pi_{011}(quality\ enhancement_k) + \delta_{01k}$
$\gamma_{02k} = \pi_{020} + \pi_{021}(quality\ enhancement_k) + \delta_{02k}$

$\gamma_{03k} = \pi_{030} + \pi_{031}(quality\ enhancement_k) + \delta_{03k}$
$\gamma_{10k} = \pi_{100} + \pi_{101}(quality\ enhancement_k) + \delta_{10k}$
$\gamma_{11k} = \pi_{110} + \pi_{111}(quality\ enhancement_k) + \delta_{11k}$
$\gamma_{20k} = \pi_{200}$
$\gamma_{30k} = \pi_{300}$
$\gamma_{40k} = \pi_{400}$
$\gamma_{50k} = \pi_{500}$
$\gamma_{60k} = \pi_{600} + \pi_{601}(quality\ enhancement_k)$
$\gamma_{61k} = \pi_{610} + \pi_{611}(quality\ enhancement_k)$
$\gamma_{70k} = \pi_{700} + \pi_{701}(quality\ enhancement_k)$
$\gamma_{71k} = \pi_{710} + \pi_{711}(quality\ enhancement_k)$
$\gamma_{80k} = \pi_{800} + \pi_{801}(quality\ enhancement_k) + \delta_{80k}$
$\gamma_{81k} = \pi_{810} + \pi_{811}(quality\ enhancement_k) + \delta_{81k}$

where:
γ_{00k} = level 2 intercept for predicting the ith zip code's intercept value within the kth county.
π_{000} = level 3 intercept for predicting zip code-level intercept values.
π_{001} = level 3 regression coefficient for predicting zip code-level intercept values from county quality improvement funds.
γ_{0zk} = level 2 regression coefficient for predicting the ith zip code's intercept value (within the kth county) from the zth zip code characteristic.
π_{0z0} = level 3 intercept for predicting zip code-level parameter values on γ_{0zk} .
π_{0z1} = level 3 regression coefficient for predicting zip code-level parameter values on γ_{0zk} from county quality improvement funds.
γ_{xzk} = level 2 regression coefficient (or intercept) for predicting the coefficient of the xth program characteristic within the ith zip code and kth county.
π_{xz0} = level 3 intercept for predicting zip code-level parameter values on γ_{xzk} .
π_{xz1} = level 3 regression coefficient for predicting zip code-level parameter values on γ_{xzk} from county quality improvement funds.
δ_{xzk} = level 3 residual associated with the prediction of a level 2 term (γ_{00k}, γ_{0zk}, γ_{xzk}) for the ith zip code within the kth county. It reflects the degree to which counties still vary in values of the level 2 term, even after program, zip code, and county characteristics have been taken into account.

It is assumed in 3-level models, that the level 1, level 2, and level 3 covariance structures are homogenous within level and that the residual terms are uncorrelated between levels.

After determining the fullest level 3 moderation model supported by the data, the model was reduced through a series of stages using model comparisons to determine the minimal necessary set of predictors for each level 1 and level 2 coefficient. As in the model reduction process described above for the full 2 level model, all model comparisons were guided by Wald tests, but finalized through likelihood ratio tests referenced against the full level 3 moderation model described above.

Hierarchical Generalized Linear Model

In order to better understand which programs requested environment rating observations to be conducted, a dummy variable was created to indicate participation (1) or nonparticipation (0) in the ERS assessment process. Because the dependent variable was dichotomous, a Bernoulli hierarchical generalized linear model (HGLM) utilizing Laplace approximation was used based on Raudenbush & Bryk (2002). The main distinction of the HGLM model is that the dependent variable is dichotomous rather than continuous as in the previous models. That is, the HGLM method models the log-odds of participating or not participating in the ERS observational assessment. Modeling procedures began with an unconditional HGLM model followed by an unconditional 1-level model that included level 1 predictor variables, and a level 2 random effect on the intercept. As in the conditional models, theoretically grounded random effects (program type, capacity and DCD subsidy funding) were also included in the unconditional 1-level model. Except for the level 1 residual, the terms included in the level 1 model are the same as in previous examples, so their descriptions will not be reiterated here. In Bernoulli HGLMs, the level 1 variance component is determined by probability of the event occurring (i.e. participating in the ERS assessment); thus, unless over- or underdispersion is present, Bernoulli HGLMs generally do not contain Level 1 residuals. The possibility of over- (under-) dispersion was considered, but the data did not support it.

<u>Level 1Model</u>

$Prob(ERS\ assessment = 1) = \varphi_{ij}$

$\eta_{ij} = \log(\varphi_{ij}/1 - \varphi_{ij}) = \beta_{0i} + \beta_{1i}(program\ type_{ij}) + \beta_{2i}(extended\ care_{ij}) + \beta_{3i}(program\ type_{ij} * extended\ care_{ij}) + \beta_{4i}(licensed\ capacity_{ij}) + \beta_{5i}(program\ type_{ij} * licensed\ capacity_{ij}) + \beta_{6i}(Head\ Start\ funding_{ij}) + \beta_{7i}(More\text{-}at\text{-}Four\ funding_{ij}) + \beta_{8i}(DCD\ subsidy\ funding_{ij})$

<u>Level 2 Model</u>

$\beta_{0i} = \gamma_{00} + u_{0i}$

$\beta_{1i} = \gamma_{10} + u_{1i}$
$\beta_{2i} = \gamma_{20}$
$\beta_{3i} = \gamma_{30}$
$\beta_{4i} = \gamma_{40} + u_{4i}$
$\beta_{5i} = \gamma_{50}$
$\beta_{6i} = \gamma_{60}$
$\beta_{7i} = \gamma_{70}$
$\beta_{8i} = \gamma_{80} + u_{8i}$

Additional assumptions of the HGLM model includes:
$\mu_{xi} \sim N(0, \tau_{xx})$, or level 2 residuals are normally distributed with a mean of 0 and homogeneous variance of τ_{xx}.
$Cov(\mu_{xi}, \mu_{zi}) = \tau_{xz}$, or the covariance between pairs of level 2 residuals = τ_{xz}.

This model was reduced based on the same procedure used with the conditional models, eliminating non-significant random effects tested against the full level 1 model with likelihood ratio tests based on deviance statistics. Level 2 predictors were added to the level-1 effective model to create a full 2-level model as in the example below (refer to the previous full 2-level HLM model for a more extended description of each term).

Level 1Model
Prob(ERS assessment =1)= φ
$\eta_{ij} = log(\varphi_{ij}/1-\varphi_{ij}) = \beta_{0i} + \beta_{1i}(program\ type_{ij}) + \beta_{2i}(extended\ care_{ij}) + \beta_{3i}(program\ type_{ij} * extended\ care_{ij}) + \beta_{4i}(licensed\ capacity_{ij}) + \beta_{5i}(program\ type_{ij} * licensed\ capacity_{ij}) + \beta_{6i}(Head\ Start\ funding_{ij}) + \beta_{7i}(More\text{-}at\text{-}Four\ funding_{ij}) + \beta_{8i}(DCD\ subsidy\ funding_{ij})$

Level 2 Model
$\beta_{0i} = \gamma_{00} + \gamma_{01}(disadvantage_i) + \gamma_{02}(immigration_i) + \gamma_{03}(residential\ stability_i) + \gamma_{04}(affluence_i) + u_{0i}$
$\beta_{1i} = \gamma_{10} + \gamma_{11}(disadvantage_i) + \gamma_{12}(immigration_i) + \gamma_{13}(residential\ stability_i) + \gamma_{14}(affluence_i) + u_{1i}$
$\beta_{2i} = \gamma_{20} + \gamma_{21}(disadvantage_i) + \gamma_{22}(immigration_i) + \gamma_{23}(residential\ stability_i) + \gamma_{24}(affluence_i)$
$\beta_{3i} = \gamma_{30}$
$\beta_{4i} = \gamma_{40}$
$\beta_{5i} = \gamma_{50}$
$\beta_{6i} = \gamma_{60} + \gamma_{61}(disadvantage_i) + \gamma_{62}(immigration_i) + \gamma_{63}(residential\ stability_i) + \gamma_{6}\ (affluence_i)$
$\beta_{7i} = \gamma_{70} + \gamma_{71}(disadvantage_i) + \gamma_{72}(immigration_i) + \gamma_{73}(residential\ stability_i) + \gamma_{74}(affluence_i)$
$\beta_{8i} = \gamma_{80} + \gamma_{81}(disadvantage_i) + \gamma_{82}(immigration_i) + \gamma_{83}(residential\ stability_i) + \gamma_{84}(affluence_i)$

Additional assumptions are the same as for the unconditional level 1 HGLM described above.

The full 2-level model was reduced using the same procedures previously described for the 2-level conditional models. Using the 2-level effective model as the foundation model for adding Smart Start quality enhancement funds at the third level as a possible moderator of the 2-level effects. The 3-level model was reduced to identify an effective model using the same procedures previously described for 3-level models of program quality.

CHAPTER VII

RESULTS

First, results from 2- and 3-level models with the full sample (n = 6882) and licensing points as the outcome variable are reported. Second, results from an HGLM model describing predictors associated with participation in the voluntary ERS observational assessment are reported. The sub-sample, that voluntarily participated in the ERS observational assessment (n = 2964), is further analyzed with a 3-level model (with licensing points as the outcome variable) compared to the full sample. Finally, results from 2- and 3-level models from the sub-sample and ERS scores as the outcome variable are reported.

Full Sample

Unconditional

The two-level model with licensing points as the outcome variable at level 1 and programs nested within zip codes ($\sigma^2 = 20.61$, $\tau_{00} = 1.28$) accounted for more variance (6%) compared to when programs were nested within Smart Start county boundaries ($\sigma^2 = 20.89$, $\tau_{00} = 0.84$; 4%). Furthermore, there is more homogeneity at the zip code level indicating that the quality of programs can better be predicted when they are closer in proximity (e.g. within the same zip code compared to within the same county). These results support the theoretical argument for examining child care quality within the geographic level of zip codes in 2-level conditional models. Additionally, there is substantial variability in child care quality between zip codes and counties. That is, quality varies by zip code and by county.

Conditional 2-Level Model

Modeling procedures began by identifying an effective level 1 model. Heterogeneity was predicted by center type and, as reported in table 4, the best fitting or most parsimonious level 1 model resulted by retaining random effects for the intercept (u_{0i}), program type (u_{1i}), and DCD subsidy funding (u_{8i}) while dropping the random effect for licensed capacity (u_{4i}). In the level 1 effective model, the level 1 covariates (program type, extended care, capacity, the interaction of program type with extended care, the interaction of program type with capacity, Head Start funding, More-at-Four funding, and DCD subsidy funding) helped to explain 22% of the variance (pseudo R^2 = 0.22). The level 1 effective model was the foundation for adding level 2 (zip code level) predictor variables in a full model including: concentrated disadvantage, concentrated immigration, residential stability, and concentrated affluence. In the reduced model concentrated immigration was not a main effect nor was it involved in an interaction therefore it was eliminated from the model in the final effective 2-level model.

Program Level

As depicted in Figure 1, the interaction of program type and extended care (γ_{30} = -1.37, $p \leq .00$) was a level 1 main effect where family child care homes offering second and/or third shift care received a boost in predicted licensing points while centers offering extended care received a decrement in predicted licensing points. It was hypothesized (H2c) that extended care would be negatively related to child care quality. This hypothesis was partially supported in the case of center care but, not supported with family child care homes.

At level 1, the interaction between licensed capacity and program type (γ_{50} = -3.41, $p \leq .00$) indicated that family child care homes with higher capacities received an increment in predicted licensing points whereas centers with higher capacities received a decrement in predicted licensing points (see Figure 2). It was hypothesized (H2b) that capacity would be negatively related to quality. This hypothesis was partially supported with centers with higher capacities gaining fewer predicted licensing points; however, larger family child care homes earned more predicted points.

Community Level

At level 2, residential stability was a main effect and negatively related to predicted licensing points (γ_{02} = -3.12, $p \leq .00$). In contrast with the hypothesis (H4c), communities with higher rates of residential stability had lower predicted licensing points.

Program and Community Level Interactions

Furthermore, level 1 and 2 interactions included program type with concentrated affluence (γ_{11} = -3.46, $p \leq .015$), Head Start funding with concentrated affluence (γ_{61} = -1.05, $p \leq .00$), More-at-Four funding with concentrated disadvantage (γ_{71} = -1.19, $p \leq .00$), and DCD subsidy funding with concentrated affluence (γ_{81} = -0.69, $p \leq .00$). As hypothesized (H4d and H2a), both centers and family child homes improved in predicted licensing points as communities were more affluent with centers consistently earning more predicted licensing points compared to family child care homes (see Figure 3). The interaction between concentrated affluence and Head Start funds indicated that as Head Start funds increased, predicted licensing points improved across levels of concentrated affluence (supporting hypothesis H3b) with the greatest boost in communities of lower concentrated affluence (see Figure 4). That is, Head Start funds had the greatest impact in communities with less concentrated affluence. As hypothesized (H3a), More-at-Four funds were also related to higher predicted licensing points in programs. However, the relationship was greatest in communities with less concentrated disadvantage (see

Figure 5). That is, the boost in quality received from More-at-Four dollars had less of an impact in communities of higher concentrated disadvantage. It was hypothesized (H3c) that DCD subsidy funds would be negatively related to child care quality. This hypothesis was not supported. Results suggest a positive relationship between DCD subsidy funds and predicted licensing points. More specifically, in the interaction between DCD subsidy funds and concentrated affluence, DCD funds equalize the relationship between concentrated affluence and predicted licensing points. That is, at the highest level of DCD subsidy funds, programs across all levels of concentrated affluence receive the same boost in predicted licensing points (see Figure 6). However, when DCD subsidy funds are low, programs in communities with higher levels of concentrated affluence receive a greater boost in predicted licensing points compared to programs in communities with lower levels of concentrated affluence.

Conditional 3-Level Model

The foundation of the full-sample 3-level model was the effective full-sample 2-level model (see Table 5). The only random effect that was needed at level 3 was the intercept. Additionally, at level 2 in the 3-level model, the random effect for DCD subsidy funding was no longer needed. The full 3-level model, accounting for Smart Start quality enhancement funds, is noted in Table 5. Furthermore, as hypothesized (H5b), in the final effective 3-level model there were significant changes in the results compared to the 2-level model.

Distinctions between the 2- and 3- Level Models

Smart Start quality enhancement funds interacted with residential stability (γ_{021} = -1.59, $p \leq 0.01$) and concentrated affluence (γ_{030} = -1.80, $p \leq 0.00$) in the 3-level model. In the interaction with residential stability, as depicted in Figure 7, Smart Start quality enhancement funds are positively related to predicted licensing points (hypothesis H5a) and yield the greatest impact in communities with less residential stability. Additionally, Smart Start quality enhancement funds interacted with concentrated affluence. As illustrated in Figure 8, Smart Start quality enhancement funds were positively related to predicted licensing points (hypothesis H5a) across all levels of concentrated affluence yielding the most points in communities with the highest levels of concentrated affluence; however, the funds had the greatest impact (i.e. the steepest slope) in communities with the lowest concentrated affluence.

In the 3-level model there was still an interaction between Head Start funds and concentrated affluence (γ_{610} = -1.12, $p \leq 0.01$); however, when accounting for Smart Start quality enhancement funds, the relationship changed. That is, Head Start funds continued to improve predicted licensing points but, the greatest boost was in communities of higher concentrated affluence (see Figure 9).

In the 3-level model, Smart Start quality enhancement funds interacted with DCD subsidy funds to affect predicted licensing points (γ_{801} = 0.04, $p \leq 0.057$). In this interaction DCD subsidy funds and Smart Start quality enhancement funds worked together to yield the greatest boost in quality, with programs receiving the most DCD subsidy funds and Smart Start quality enhancement funds yielding the highest predicted licensing points, and programs receiving the least funds from DCD and Smart Start yielding the lowest predicted licensing points (see Figure 10).

As in the 2-level model, DCD subsidy funds interacted with concentrated affluence in the 3-level model (γ_{810} = -0.86, $p \leq 0.00$); however, when accounting for Smart Start quality enhancement funds, the relationship with licensing points changed. In the 3-level model, concentrated affluence was positively related to quality with programs in the most affluent communities yielding the greatest boost in predicted licensing points; however as subsidy funds increased the boost became smaller (with the exception of programs in communities with 0% affluence in which they maintained the same level of quality across subsidy levels, see Figure 11). That is, as DCD subsidy funds increased the boost in predicted licensing points associated with concentrated affluence decreased with the greatest drop in communities of highest concentrated affluence.

Similar Program Level Results

Consistent with the level 2 model, there was an interaction between program type and extended care ($\gamma_{300} = -1.42$, $p \leq 0.00$), and an interaction between licensed capacity and program type ($\gamma_{500} = -3.30$, $p \leq 0.00$). As in the 2-level model, centers offering extended care received a decrement in predicted licensing points whereas family child care homes offering extended care received a boost in predicted licensing points (see Figure 12). Additionally, as represented in figure 13, family child care homes with higher capacities received an increment in predicted licensing points and centers with higher capacities received a small decrement in predicted licensing points.

Similar Program and Community Level Interactions

In an interaction between concentrated affluence and program type ($\gamma_{110} = 3.14$, $p \leq 0.05$), predicted licensing points increased as concentrated affluence increased with centers receiving the greatest boost compared to family child care homes (see Figure 14). In an interaction between concentrated disadvantage and More-at-Four funds ($\gamma_{710} = -1.10$, $p \leq 0.02$), More-at-Four funds were positively related to predicted licensing points and the greatest boost was among programs nested in communities with less concentrated disadvantage (see Figure 15).

Hierarchical Generalized Linear Models

As previously described, the program standards component of the rated license includes a voluntary observational ERS assessment. Per research question 6, it was of interest to understand program and community level characteristics that may predict participation.

Program Level

In the effective HGLM 2-level model (see Table 6) there was an interaction between program type and extended care ($\gamma_{30} = -0.43$, $p \leq 0.00$; odds ratio = 0.65) and program type and capacity ($\gamma_{50} = -0.67$, $p \leq 0.03$; odds ratio = 0.51) in predicting the log-odds of participation in the ERS observational assessment. As depicted in Figure 16, centers were more likely to participate in the ERS assessment compared to family child care homes. Furthermore, centers without extended care were slightly less likely to participate compared to centers with extended care. In contrast, family child care homes with extended care were slightly more likely to participate than family child care homes without extended care. Both family child care homes and centers with higher capacity were more likely to participate in the ERS assessment, with the greatest impact among family child care homes (see Figure 17). Additionally, programs receiving More-at-Four funds were 1.4 times more likely to participate in an assessment compared to programs that did not receive More-at-Four funds ($\gamma_{70} = 0.33$, $p \leq 0.00$).

Community Level

Concentrated disadvantage ($\gamma_{031} = -2.64$, p ≤ 0.01) and residential stability ($\gamma_{03} = -1.87$, $p \leq 0.01$) were main effects in predicting the log-odds of participation in the ERS observational assessment. Programs in communities with less concentrated disadvantage were 0.07 times more likely to participate in an ERS assessment and programs with less residential stability were 0.15 times more likely to participate in an ERS assessment.

Program and Community Level

Head Start funds interacted with concentrated immigration (γ_{61} = -1.58, $p \leq 0.02$; odds ratio = 0.21) and DCD subsidy funds interacted with concentrated affluence (γ_{82} = -0.37, $p \leq 0.00$; odds ratio = 0.69) in predicting the log-odds of participation in an ERS observational assessment. As illustrated in Figure 18 Head Starts funds were positively related to participation; however, as concentrated immigration increased, the likelihood of participation decreased. The 2-way interaction between DCD subsidy funds and concentrated affluence suggested that, as both concentrated affluence and DCD subsidy funding increased, the likelihood of participation in the ERS assessment also increased. Furthermore, as depicted in Figure 19, DCD subsidy funding narrowed the gap in the relationship between concentrated affluence and participation. DCD subsidy funds also marginally interacted with concentrated immigration (γ_{81} = 0.51, $p \leq 0.07$; odds ratio = 1.67). The marginal interaction between DCD subsidy funding and concentrated immigration suggested that programs with DCD subsidy funding increased the likelihood of participation (see Figure 20); however as concentrated immigration increased programs with no or low levels (25^{th} percentile) of DCD subsidy funding were less likely to participate in an assessment. In contrast, when programs with moderate (50^{th} percentile) to high (75^{th} percentile) levels of DCD subsidy programs were in communities of higher concentrated immigration they were slightly more likely to participate in the assessment.

HGLM 3-Level Model

The effective 2-level HGLM model was the foundation for adding Smart Start quality enhancement funds at the third level (see Table 7). Smart Start quality enhancements funds were not found to be significant as a main effect or interaction. In the reduced model the main effect of Smart Start quality enhancement funds remained non-significant. Therefore, Smart Start quality enhancement funds did not help to predict the likelihood of participation in the ERS observational assessment.

Sub-Sample of Programs Participating in Voluntary Assessment

Unconditional

A 2-level unconditional model was tested with the sub-sample using licensing points and ERS scores as the outcome variables at level 1. With the outcome variable licensing points, programs nested within zip codes ($\sigma^2 = 5.99$, $\tau_{00} = 0.29$) accounted for the same amount of variance (5%) compared to nesting programs within counties ($\sigma^2 = 6.02$, $\tau_{00} = 0.35$; 5%). With the ERS score as the outcome variable, programs nested within zip codes ($\sigma^2 = 0.33$, $\tau_{00} = 0.03$) accounted for the same amount of variance (8%) compared to when programs were nested within counties ($\sigma^2 = 0.33$, $\tau_{00} = 0.03$; 8%). Furthermore, total points and program ERS scores for the sub-sample varied between zip codes and between counties. To be consistent with the full sample, programs were nested within the socioeconomic contexts of zip codes and county level Smart Start quality enhancement funding for the 2- and 3-level conditional models, respectively.

Sub-Sample Conditional 3-Level with Licensing Points

Analyses with the sub-sample began by building a 3-level model comparable to the full sample by using licensing points as the outcome variable. The level 1 effective model included random effects for the intercept (u_0) and for licensed capacity (u_4; see table 7). The full level 2 (see Table 4) and the full level 3 (see Table 5) models for the full-sample were duplicated for a full 3-level model for the sub-sample. The 3-level effective model of the full-sample was also duplicated with the sub-sample and tested against the 3-level full model created for the subsample (as previously described) with Wald tests and likelihood ratio tests on deviance statistics. Model comparisons confirmed that the 3-level model for the sub-sample could be reduced (see Table 8) to the full-sample effective model. However, the sub-sample significance tests suggested that further reduction was needed. The highest order interactions (quality enhancement funds with concentrated affluence, G031; quality enhancement funds with DCD funds, G801) that were not significant were first dropped from the model individually followed by lower order interactions (concentrated affluence with Head Start funds, G610; concentrated disadvantage with More-at-Four funds, G710; and concentrated affluence with DCD funds, G810).

Program Level

In the subsample, there was a similar interaction between program type and extended care ($\gamma_{300} = -0.63$, $p \leq 0.03$) that was found with the full sample. Overall, centers received more predicted licensing points compared to family child care homes (supporting H2a). However, when centers offered extended care their advantage dropped slightly compared to centers that did not offer extended care (see Figure 21). In contrast, when family child care homes offered extend care they received slightly higher predicted licensing points compared to family child care homes that did not offer extended care (partially supporting H2c). There was also an interaction between program type and licensed capacity ($\gamma_{500} = -1.77$, $p \leq 0.00$) which was similar to the full sample results (partially supporting H2b). That is, centers with larger capacities received a decrement in predicted licensing points while family child care homes with larger capacities received an increment in predicted licensing points (see Figure 22). Furthermore, Head Start (γ_{600} = 0.07, $p \leq 0.00$) and More-at-Four (γ_{700} = 0.22, $p \leq 0.00$) funds were positively related to predicted licensing points (supporting H3a and H3b); while DCD subsidy funds (γ_{800} = -0.10, $p \leq 0.00$) were negatively related to predicted licensing points (supporting H3c). Unlike the full sample results, Head Start, More-at-Four, and DCD funds were main effects. They did not interact with contextual variables in the subsample.

Community Level

Concentrated disadvantage was negatively related to predicted licensing points in the subsample (γ_{010} = -2.58, p ≤ 0.01). This was a unique main effect for the subsample and supported hypothesis H4a.

Program and Community Level

As in the full sample, program type and concentrated affluence interacted in the subsample (γ_{110} = 1.80, $p \leq 0.05$); however, the interaction yielded different results. In the subsample, centers received higher predicted licensing points compared to family child care homes (supporting H2a). Furthermore, centers in more affluent areas received a small boost in predicted licensing points compared to centers in less affluent areas while family child care homes received a very slight decrement in predicted licensing points when in higher affluent areas (see Figure 23). Compared to Figure 14 (for the full sample), the increase in predicted licensing points attributed to concentrated affluence for centers was less in the subsample than the full sample.

Zip Code and County Level Interaction

As in the full sample, residential stability interacted with Smart Start quality enhancement funds ($\gamma_{021} = -1.07$, $p \leq 0.03$). In both the full and subsample, when Smart Start quality enhancement funds were at their minimum, more predicted licensing points were attributed to higher levels of residential stability (supporting H4c). In the subsample, as residential stability increased to the 25^{th} percentile (53%), quality enhancement funds continued to provide a boost in predicted licensing points, although a smaller boost compared to lower levels of residential stability (see Figure 24). In contrast, as residential stability increased to the 50^{th} percentile of the sample (61%), Smart Start funds had even less of an effect. Distinct from the effect in the full sample (see Figure 7), the effect in the subsample dropped below the boost attributed to less residential stability alone (based on the minimum value of Smart Start quality enhancement funds in Figure 24). That is, as residential stability increased, Smart Start quality enhancement funds had less of an effect in improving predicted licensing points.

Conditional 2-Level Model with ERS Scores

The same process that was conducted with the full-sample was followed with the sub-sample using the ERS scores as the outcome variable. The test of homogeneity of the level 1 variance in the model was not significant therefore, homogeneity could be assumed. The most parsimonious level 1 model resulted by retaining random effects for the intercept (u_0) and program type (u_1) which became the level 1 effective model (see table 5). The level 1 effective model was the foundation for adding the level 2 (zip code) main effects and interactions. Furthermore, the level 1 interaction between program type and extended care was not needed in the 2-level model and therefore was eliminated from the model to create the effective 2-level model (see table 9).

Program Level

At the program level, there was an interaction between licensed capacity and program type ($\gamma_{40} = -0.29$, $p \leq .01$). As in the model with licensing points hypothesis H2a and H2b were partially supported (see Figure 25). Family child care homes with higher capacities received higher predicted ERS scores compared to family child care homes with lower capacities. In contrast, centers with higher capacities received lower predicted ERS scores compared to centers with lower capacities. Furthermore, as hypothesized (H3a and H3c), More-at-Four funds were positively related to predicted ERS scores ($\gamma_{60} = 0.03$, $p \leq .00$) and DCD subsidy funds were negatively related to predicted ERS scores ($\gamma_{70} = -0.03$, $p \leq .00$).

Program and Community Level Interactions

Level 1 and 2 interactions included program type with concentrated immigration ($\gamma_{11} = 1.39$, $p \leq .02$), and extended care with concentrated disadvantage ($\gamma_{21} = 0.80$, $p \leq .04$). It was hypothesized that concentrated immigration would be negatively related to quality (H4b). This hypothesis was partially supported (see Figure 26). Family child care homes in communities with higher levels of concentrated immigration experienced a decrement in predicted ERS scores. In contrast, centers in communities with higher levels of concentrated immigration received a boost in predicted ERS scores. Overall, extended care was related to lower predicted ERS scores (as hypothesized in H2c). However, as the level of concentrated disadvantage increased to the 75^{th} percentile (17%) in communities, the negative effect of extended care was equalized (see Figure 27). That is, programs with and without extended care in the most disadvantaged communities received similarly low scores on predicted ERS scores whereas in communities with less concentrated disadvantaged programs not offering extended care received a smaller decrement in predicted ERS scores.

Head Start funds interacted with all four community level predictors of concentrated disadvantage ($\gamma_{51} = -0.21$, $p \leq .01$), concentrated immigration ($\gamma_{52} = -0.31$, $p \leq .01$), residential stability ($\gamma_{53} = -0.22$, $p \leq .00$), and concentrated affluence ($\gamma_{54} = -0.15$, $p \leq .01$). Among all four interactions, as Head Start funds increased, predicted ERS scores increased (supporting hypothesis H3b); however, predicted ERS scores differentially increased depending on the context of the communities in which they were nested. For example, programs receiving Head Start funds received a greater increment in predicted ERS scores when they were in communities with less concentrated disadvantage (see Figure 28). That is, in communities with higher levels of concentrated disadvantage Head Start funds had less of an impact on predicted ERS scores. Similarly, the impact of Head Start funds was not as large in communities with higher levels of concentrated immigration (see Figure 29). Head Start funds had the most impact on predicted ERS scores in communities where there was less residential stability (see Figure 30). Programs receiving Head Start funds received a greater boost on predicted ERS scores when they were in communities of lower concentrated affluence (see Figure 31).

Sub-Sample 3-Level with ERS Scores

A 3-level model, accounting for Smart Start quality enhancement funds, was also tested with the sub-sample and the ERS scores as the outcome variable. The 2-level effective model (see Table 9) was used as the foundation for the 3-level model. As described in chapter 6 (analytic strategy), at level 3 (county level), a full model was created by adding appropriate random effects and Smart Start quality enhancement funds as a main effect and as a possible interaction with level 1 and 2 variables. However, the data were not strong enough to support all of the random effects. Therefore, the random effects were reduced to the intercept and program type based on the results of the 2-level effective model. This model became the reduced full model (see Table 10). From here, model reduction adhered to the original protocol, dropping non-significant 3-way interactions individually followed by non-significant 2-way interactions (involving Smart Start quality enhancement funds) to achieve a final 3-level effective model. Furthermore, as hypothesized (H5b), Smart Start quality enhancement funds had a moderating effect on the 2-level effective model.

Distinctions between the 2- and 3- Level Models

In the 3-level model, Smart Start quality enhancement funds interacted with program type and concentrated immigration in a 3-way interaction ($\gamma_{111} = -1.05$, $p \leq .01$). For both family child care homes and centers Smart Start quality enhancement funds were associated with lower predicted ERS scores (see Figures 32a and 32b). That is, the higher the county level quality enhancement funds, the lower the predicted ERS scores. However, as concentrated immigration increased, the decrement became smaller for family child care homes (see Figure 32a). In contrast, the decrement remained relatively consistent for centers across levels of concentrated immigration except for programs in counties receiving the lowest amount of quality enhancement funds (see Figure 32b). In these counties, the decrement was slightly less as concentrated immigration increased.

Quality enhancement funds were also involved in a 3-way interaction with extended care and concentrated disadvantage ($\gamma_{111} = -0.67$, $p \leq .04$). For programs not offering extended care, programs in zip codes with the highest level of concentrated disadvantage and within counties receiving the lowest amounts of Smart Start quality enhancement funds yielded the greatest effect (see Figure 33a). In contrast, programs that offered extended care seemed to perform more similarly across levels of concentrated disadvantage (see Figure 33b). With the exception of programs in counties receiving the fewest quality enhancement funds, programs offering extended care demonstrated relatively similar predicted ERS scores across levels of concentrated disadvantage and quality enhancement funds.

Similar Program Level Results

The interaction between program type and licensed capacity demonstrated a similar pattern in both the 2- and 3-level models with centers receiving a decrement in predicted ERS scores as capacity increased and family child care homes receiving an increment in predicted ERS scores as capacity increased (see Figure 34). However, the relationship with predicted ERS scores is only marginally significant in the 3-level model ($\gamma_{400} = -0.21$, $p \leq .06$).

In the 3-level model More-at-Four funds maintained a significant positive relationship with predicted ERS scores ($\gamma_{600} = 0.03$, $p \leq .00$) and DCD subsidy funds maintained a significant negative relationship with predicted ERS scores ($\gamma_{700} = -0.03$, $p \leq .00$).

Similar Program and Community Interactions

In the 3-level model Head Start funds interacted with all four community level characteristics (concentrated disadvantage, $\gamma_{510} = -0.13$, $p \leq .09$; concentrated immigration, $\gamma_{520} = -0.24$, $p \leq .03$; residential stability, $\gamma_{530} = -0.18$, $p \leq .01$; and concentrated affluence, $\gamma_{540} = -0.15$, $p \leq .01$). In the interaction between Head Start funds and concentrated disadvantage, predicted ERS scores dropped as concentrated disadvantage increased. This drop was smallest for the programs receiving the most Head Start funds (see Figure 35). While the pattern in the 3-level model was similar to that in the 2-level model, it was only marginally significant in the 3-level model. In the interaction between Head Start funds and concentrated immigration an increment in predicted ERS scores associated with Head Start funds decreased as concentrated immigration increased (see Figure 36). A similar pattern is again depicted in the interaction between Head Start funds and residential stability (see Figure 37). As residential stability increased, the increment in predicted quality associated with Head Start funds was compromised. Finally, in the interaction between Head Start funds and concentrated affluence, the boost in predicted quality associated with Head Start funds was greatest in communities with the least concentrated affluence (see Figure 38).

CHAPTER VIII

DISCUSSION

The purpose of the current study was to examine how socioeconomics of community contexts shape access to high quality child care in North Carolina. By combining multiple state-wide data sources, program and community level characteristics were combined to better understand predictors of child care quality. Including nearly all licensed child care programs in the sample increased the validity and generalizability of the results. Furthermore, more homogeneity was found at the zip code level indicating that the quality of programs can better be predicted when they are closer in proximity (e.g. within the same zip code compared to within the same county). Funding sources at the program and community levels, as well as the socioeconomic status of the communities in which programs resided, proved to matter in predicting child care quality. Results support the bioecological theory (Bronfenbrenner & Evans 2000) that human processes are situated within micro and macro-level contexts that interact dynamically.

The current study demonstrates that there are inequities within the system where the highest quality child care is differentially accessible based on program level characteristics, community socioeconomics, and interactions among the program and community variables. Because of the dynamic nature of the models it is overly simplistic to separate effects. However, for purposes of organization, the following discussion is divided into five main sections. The first section focuses on the community context, followed by a focus on program level characteristics, and finally a section that discusses program level and community level funding. Interactions are included in the sections where they seemed most logical. Therefore, some program characteristics are discussed in tandem with effects about the community context in the section focusing on community context and vice versa. Next, selection effects of the programs participating in the ERS component of the rated license are discussed. Study limitations and future research suggestions are discussed followed by policy recommendations.

Community Context

In an interaction with program type, concentrated affluence was positively related to predicted quality as defined by licensing points in both the 2- and 3-level models for the full sample. Both family child care homes and centers were of higher quality in communities with greater concentrated affluence. Communities with higher levels of concentrated affluence include the greatest percentage of families earning $75,000 or higher, that are college educated, and employed in professional or managerial occupations. In communities where these characteristics were less prevalent – especially in communities where residents have lower incomes, are less educated, and engage in low-wage work – child care programs were of lower predicted quality.

These results clearly indicate a positive correlation between zip code level concentrated affluence and predicted child care quality. One explanation for this result is that families that are college educated and earn higher incomes may seek out and create more demand for higher quality programs. Programs in more affluent areas may also be able to charge higher fees and therefore provide higher quality care that is more expensive to implement. It also may be easier to recruit and hire more educated teachers in these communities. Likely it is a combination of factors that are at play. Peyton, Jacobs, O'Brien, & Roy (2001) found families of higher incomes to be more likely to choose child care based on quality (of the teachers, environment, and program) rather than practicality (fees, hours, location, and availability). Furthermore, the children of parents that chose child care based on quality were more likely to be in higher quality programs and be more satisfied with the care their children were receiving compared to the children whose parents, who were more likely to have lower incomes, chose their child care based on practicality. In the current study, in community contexts of higher concentrated affluence, programs were able to meet the higher licensing standards in order to obtain greater licensing points a proxy for higher quality early learning experiences for the children accessing those programs compared to their counterparts in communities with less concentrated affluence.

In the subsample (the programs that participated in the ERS assessment) 3-level model with licensing points as the outcome, programs received higher predicted licensing points when they were in communities with less concentrated disadvantage. The concentrated disadvantage scale was made up of percent below the poverty line, percent receiving public assistance, percent unemployed, percent female-headed families with children, and percent Black or African American. Additionally, concentrated disadvantage was negatively correlated with percent White or European American. Therefore, the highest quality programs in the subsample (or the programs earning the highest program score on the ERS assessments) were more likely to be located in communities with a higher percentage of White people in addition to a lower percentage of families below the poverty line, receiving public assistance, unemployed, single mothers, and Black or African American. Past research has found that African American children tend to be in lower quality child care compared to their European American peers (Cassidy, Lower, Kintner, & Hestenes, 2009; Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995; Kontos, 1997; LoCasale-Crouch, et al., 2007). Based on the current study, one plausible reason for this is that the highest quality child care is not accessible in the communities in which the majority of African American families reside. Furthermore, in the subsample – with a restricted range of child care quality that represents the higher quality programs in the state – programs in communities of less concentrated disadvantage are fairing best. One could argue that these programs are the best of the best and they are the least likely to be in communities that may need them most.

Based on past research, children from contexts that were less affluent and more disadvantaged are likely to benefit the most from high quality child care (Peisner-Feinberg, Burchinal, Clifford, Culkin, Howes, Kagan, & Yazejian, 2001; Caughy, Daughtry, DiPietro, & Stobino, 1994; Connell & Prinz, 2002; Magnuson, Meyers, Ruhm, & Waldfogel, 2004). That is, the impact of high quality child care on children's developmental outcomes (cognitive and social) is greatest for children with risk factors associated with living in and near poverty. Investing early in children with the most need has been found to have long term positive effects for later academic, social, and economic productivity into adulthood (Cunha & Heckman, 2006; Duncan, Ludwig, & Magnuson, 2007; Heckman, 2010). However, in the current study these were the programs that were least likely to be in communities where families most at risk resided. In the communities with low rates of concentrated affluence and high rates of concentrated disadvantage, the local child care programs were most likely to be of lower predicted quality. Although the current study is not able to confirm that families utilized the child care programs within the zip code in which they lived, families rate location as important (Kim & Fram, 2009) and often choose child care based on location (Peyton, Jacobs, O'Brien, & Roy, 2001).

While it is established that high quality child care is related to positive developmental outcomes especially among children in and near poverty, research has found poor and near poor children to experience lower quality care (Kontos, 1997; Phillips, Voran, Kisker, Howes, & Whitebook, 1994). Furthermore, there is evidence the developmental outcomes of children experiencing the stresses associated with poverty at home and experiencing compromised levels of quality in child care, are cumulatively inhibited (Hooper, Burchinal, Roberts, Zeisel, and Neebe, 1998). Although the current study is not able to confirm the home addresses of the children in the programs, it is likely that families living with less affluence and more disadvantage are least likely to make long commutes in search of higher quality care. Peyton, Jacobs, O'Brien, & Roy (2001) found families with low incomes to be nearly 4 times more likely to choose child care based on practical reasons including location compared to their higher income counterparts. Certainly with the known importance of high quality early care and education for children in poverty, efforts should be made to make high quality programs easily accessible in the communities where children and families in need reside.

Also important to note is that concentrated disadvantage was negatively correlated with the percentage of White population. Therefore, the highest quality programs in the restricted sample (of already higher quality programs compared to the full sample) are most likely to be in communities with a higher concentration of White people and the lowest concentration of Black or African American people. Past research has found African American children to be in lower quality programs (Cassidy, Lower, Kintner, & Hestenes, 2009; Howes, Sakai, Shinn, Phillips, Galinsky, & Whitebook, 1995).

The current study confirms that the highest quality programs are least likely to be in the communities where African American children live.

Another contextual variable that was related to child care quality was residential stability. Counter to our hypothesis, in the full sample 2-level model, lower rates of residential stability were associated with higher licensing points. In the full sample 3-level model residential stability interacted with Smart Start quality enhancement funds where quality enhancement funds yielded the greatest boost in licensing points when in communities of less residential stability. Residential stability was comprised of percent of residents who resided in the same house for at least five years and the percent of owner-occupied homes. Because higher rates of residential stability tend to be associated with more positive community and individual outcomes (Sampson, Morenoff, & Gannon-Rowley, 2002), it was hypothesized that more residential stability would be positively related to child care quality.

However, based on the results of the full sample, it seems that some transiency in communities is positive for child care quality. It may be that families living in the same house for less than five years are younger and have younger children. Additionally, communities with less transiency – higher percentage of residents living in the same house for greater than five years and own their home – may be more likely to be older, have older children, or be retired and not in need of early care and education. This was found in a study of child care supply in Massachusetts where greater residential stability was related to lower proportions of children birth to 5 relative to retirees ages 55-74 (Queralt and Witte, 1998). Additionally, Queralt and Witte suggest in communities where residents are more stable, neighbors may be more willing to care for children in their home. With less than 1% of unregulated care in North Carolina, neighbors operating family child care homes (of lower quality compared to centers) in order to legally care for children in their communities of higher residential stability is a plausible explanation.

In contrast, residential stability did not have the same impact in the subsample with the restricted data, including only programs with the ERS assessment. In the 3-level model, with licensing points as the outcome, residential stability interacted with Smart Start quality enhancement funds. In this interaction more predicted licensing points were related to higher levels of residential stability. Therefore, of the higher quality programs participating in the ERS assessment, residential stability seemed to have a qualitatively different impact. Important to note, in the restricted sample 36% of the programs were family child care homes compared to 54% in the full sample. Furthermore, in the full sample 17% of family child care homes and 22% of centers had 4 or 5 stars. In comparison, in the restricted sample 30% of the family child care homes and 50% of the centers were 4 or 5 star programs. With a greater percentage of the sample representing higher quality programs, there seems to be a unique effect associated with residential stability that characterizes this variable in a different way. In other words, the highest quality programs, where ERS assessments were completed, were located in more stable communities (with a higher rate of residents living in the same house for at least five year and a higher rate of home ownership). This is likely a selection effect, a function of the restricted sample. For example, based on the results from Queralt and Witte (1998), perhaps in the restricted sample, rather than greater stability being related to a lower concentration of young children relative to retirees, perhaps greater residential stability was related to a higher concentration of young children.

Program Type

Child care centers and family child care homes functioned differentially in the North Carolina system. Consistently, child care centers outperformed family child care homes in both predicted licensing points and ERS scores. Furthermore, program type interacted with other program level and contextual variables (as previously described) suggesting centers and family child care homes uniquely operate within the QRIS system and their community contexts. This contention is supported by recent research that thoroughly examined the structure and learning environments of child care centers and family child care homes and concluded that they offer very different experiences for children (Dowsett, Huston, Imes, & Geenetian, 2008).

In the current study, family child care homes were generally lower in predicted quality and in the subsample performed lower on the ERS assessment. However, family child care homes that had higher capacities (overall range = 3 to 8) and offered extended care performed better than family child care homes with lower capacities and traditional hours. It may be that family child care homes with higher capacities are focusing more on the learning environment and implementing methods that align more with formal child care. Family child care homes with lower capacities may be licensed, meeting the minimal health and safety requirements of the state but, providing more informal care. With less than 1% of unregulated care in North Carolina, the family child care homes with the lowest capacities may be regulated but, providing a more informal service to the communities in which they serve. In contrast centers that had higher capacities (overall range = 5 to 500) and offered extended care were related to lower predicted quality compared to their centers with smaller capacities. One explanation for this result may be related to the work environments of centers and monitoring of quality by directors may be difficult as centers become too large. Another explanation may be that large centers are meeting a demand for care but, in doing so, compromise the level of quality.

Family child care homes that offered extended care also received a boost in predicted quality whereas centers that offered extended care received a decrement in predicted quality. That is, the family child care homes offering second and/or third shift care and meeting higher standards compared to family child care homes operating standard hours. In contrast, centers offering second and/or third shift care and meeting lower standards compared to centers operating standard hours. Dowsett, Huston, Imes, and Geenetian contend, “nuanced observations of different types of care make it clear that one type of care is not necessarily ‘better’ than others for all purposes…’ (p. 90). There is limited research on programs offering extended care and virtually none that constitutes what high quality care looks like during untraditional hours. Furthermore, the current study suggests within group variation or unique processes for family child care homes and centers related to the option of extended care as they relate to predicted quality as defined by licensing points and ERS scores.

Funding

Four percent of the programs in the sample received Head Start funding and 6% of the programs received More-at-Four funding. At the program level, Head Start and More-at-Four funding boosted predicted quality. This is not surprising considering that higher quality requirements are tied to Head Start and More-at-Four funds. Both Head Start and More-at-Four programs are program-based models targeted for children from low-income households to promote school readiness and decrease the achievement gap. Both programs utilize research-based curriculums, and have enhanced standards for teacher education and training, class size, and staff-child ratios.

The current study found Head Start and More-at-Four funding to be related to higher predicted quality and supports continuation and expansion of these initiatives. Because these funds are related to higher quality and the programs are targeted to populations that may otherwise not have access to high quality choices, funding additional programs (beyond the 4% and 6% of programs that received Head Start and More-at-Funds, respectively, in the current study) may help to improve accessibility for families in need. Although the funds do not seem to be consistently equalizing the effects of community level socioeconomics, they are working to close the gap and improve quality. For example, the boosts in predicted quality vary depending on the community context; however the funds were associated with higher predicted quality across contexts. Increasing funds per child in programs already receiving funds may be an effective strategy to further narrow the gap associated with community context.

The interactions between Head Start and More-at-Four with community contextual variables present a more nuanced picture of how these funds are currently operating within unique contexts. In the full sample 2-level model, Head Start funds had the most impact in communities with less concentrated affluence. In other words, programs receiving Head Start funding realized a boost in predicted quality, with larger boosts associated with greater funding levels. The magnitude of the boost, though, decreased as community affluence increased. Thus, the increment in quality from Head Start funding was greatest in the least affluent communities. This result is important because it suggests Head Start funding had the greatest impact in the communities with the greatest need. However, this result changed in the full sample 3-level model when accounting for Smart Start quality enhancement funds. When accounting for county level Smart Start quality enhancement funds, Head Start funds continued to be related to higher predicted quality. However, in this case, the magnitude of the boost in predicted quality was greatest in communities of higher concentrated affluence. In this model, when Smart Start quality enhancement funds were entered into the equation, the effect associated with concentrated affluence was greater. Although programs in both high and low affluent communities receive a boost in predicted quality associated with Head Start funding, the magnitude of the boost is greatest for programs located in more affluent areas. The difference in the results based on the 2- and 3-level model may be a function of the Smart Start funding entered at the county level rather than the program level. That is, programs do not equally benefit from the Smart Start quality enhancement funding therefore understanding the program level effect of this source of funding may alter the 3-level results.

In the subsample, including the programs with the ERS assessment, Head Start funds were related to predicted licensing points as a main effect. That is, when the sample was restricted to the programs that underwent the voluntary ERS assessment, contextual variables did not interact with Head Start funds. Head Start provided the same boost in predicted quality to all programs across contexts. In contrast, when the outcome variable was changed to the program scores on the ERS, Head Start funds interacted with all four zip code level variables: concentrated disadvantage, concentrated immigration, residential stability, and concentrated affluence. Because the ERS scores are a more detailed measure of global classroom quality compared to the licensing points, these interactions differentially predict more proximal experiences children are having in the classroom including processual quality. Although Head Start funds are related to higher predicted ERS scores, the funding is not able to fully equalize the effects associated with the contexts in which the programs operate. That is, predicted ERS scores were related to Head Start dollars differentially depending on the context. For example, the greatest boost in predicted ERS scores associated with Head Start funds was in more privileged contexts that included less concentrated disadvantage, less concentrated immigration, more residential stability, and less concentrated affluence.

Similarly, in the full sample 2-level and 3-level models, More-at-Four funds yielded the greatest boost in predicted quality when programs receiving the funds were in communities with less concentrated disadvantage. That is, even with the More-at-Four funds, programs in communities with concentrated disadvantage were not able to compensate for the negative effect associated with the community context. In the subsample, including only the programs that participated in the ERS assessment, More-at-Four funds were a main effect in predicting licensing points and ERS scores. When the sample was restricted to higher quality programs, More-at-Four funds were directly related to higher predicted quality through licensing points and the ERS scores. This is likely an artifact of the restricted sample representing higher quality programs.

Clearly, program-level funds of Head Start and More-at-Four were positively related to predicted quality; but they did not seem to be sufficient to consistently propel programs beyond decrements associated with concentrated disadvantage or lower levels of concentrated affluence. This is of particular concern since these programs are intended to increase access to high quality early care and education for populations at risk. It is questionable whether or not additional funds would be able to close this gap or if there are processes that create barriers in reaching higher standards such as greater life stressors in the lives of the teachers, children and families in these programs. Important to emphasize, regardless of context, these funds were positively related to higher predicted quality both in licensing points for the full and subsample and ERS scores in the subsample.

Unlike the funds associated with the intervention programs, DCD subsidy funds were not consistently related to higher quality. Subsidy funds are intended to assist low-income families obtain quality child care so that parents can work. In the full sample 2-level model there was a relationship between DCD subsidy funds and higher licensing points with the most DCD funds equalizing the effect of community level concentrated affluence. However, in the full sample 3-level model, DCD subsidy funds were not able to supersede the effect associated with concentrated affluence. In other words, the boost in predicted quality associated with concentrated affluence was compromised with greater subsidy funds. Again, this change in results from the 2 to the 3-level model may be a function of the Smart Start funds accounted for at the county level rather than the program level.

Furthermore, in the full sample 3-level model, DCD subsidy funds worked in tandem with Smart Start quality enhancement funds to yield the greatest impact in quality among programs receiving the greatest DCD subsidy funds and the greatest county level Smart Start quality enhancement funds. This is an example of two funding programs jointly influencing predicted quality as defined by licensing points. For example, the magnitude of the boost associated with the additive effect of DCD subsidy funding and Smart Start quality enhancement funding was greatest for programs located in counties with the most quality enhancement funds and that received the most DCD subsidy funding. Because North Carolina has tiered reimbursement rates associated with the rated license, it is plausible that programs may aim for higher licensing points to receive higher subsidy rates. For example, more stars in the rated license, informed by licensing points, yield higher subsidy payments per subsidized child. Therefore, if programs are interested in being reimbursed at a higher rate for enrolling subsidized children, they may be motivated to undergo the steps to increase their licensing points. Furthermore, the county quality enhancement funds assist programs in meeting the higher standards (e.g. helping to prepare for the ERS assessment, providing grants for equipment, providing training for the teachers, etc.) to achieve more points and subsequently more stars. Results from the current study suggest that one funding source alone was not able to leverage improved quality as effectively as both sources together.

In the subsample, ERS scores were negatively related to DCD subsidy funds. This finding supports past research where subsidy density was negatively related to global quality (Cassidy, Lower, Kintner, & Hestenes, 2009; Jones-Branch, Torquati, Raikes, & Edwards, 2004). In contrast, there is also research that suggests that subsidies are related to higher quality (Fuller, Raudenbush, Wei, & Holloway, 1993; Rigby, Ryan & Brooks-Gunn, 2007). Based on the current study where results changed depending on the model, the sample, and the outcome variable (either licensing points or ERS scores), it is not surprising that there are mixed results in the literature. Rigby, Ryan, and Brooks-Gunn found that states that offered higher subsidy rates had higher quality in non-profit centers, suggesting differential policies may impact the magnitude at which subsidies can leverage quality. In a study of 17 states, North Carolina had the second greatest percentage of children who received subsidy in regulated care with the greatest percentage of these children in centers (85%) (Burnstein & Layzer, 2007). The subsidy rates in North Carolina vary by county, star rating, age of child, and program type. Generally, five star centers receive the highest rates. Although North Carolina has tiered reimbursement for subsidies, the funds are not connected to a set of standards like intervention programs such as Head Start and More-at-Four. Historically, subsidy funds are designed to cover the cost of a slot in a child care program so that parents are able to work. In North Carolina subsidy rates are based on 75% of the market rate so, one may argue that subsidy funds are not designed to cover the full cost of providing high quality care for low-income children which also sends a message that low-income children are not deserving of the full cost of high quality child care. Competing goals associated with subsidy funds may compromise the potential impact of subsidy to leverage quality improvement. That is, if subsidy funds are designed to only cover the cost of 75% of a child care slot in a program, they may not be sufficient to finance efforts to improve quality (e.g. reduce ratios, hire more educated teachers, improve the physical environment, etc.).

Adams and Rohacek (2002) recommend that policy around subsidy also include child development goals. While this is a commendable recommendation, currently there is not adequate funding to meet the waiting list with the existing funding structures (Burnstein & Layzer, 2007; National Women's Law Center, 2008) Therefore, there must be a balance between serving more families and ensuring high quality. The interaction between Smart Start quality enhancement funds and DCD subsidy funds suggests funding sources may be able to work together to accomplish the goal of assisting parental work as well as optimizing children's learning experiences. This requires coordination among policy, funding, and organizations.

Like the other funding sources, in the full sample, Smart Start quality enhancement funds were positively related to predicted quality (licensing points) but, did so differentially based on the community contexts in which they were directed. In the full sample, communities with less residential stability and the highest concentrated affluence benefited most from the quality enhancement funds. Although quality enhancement funds were related to higher predicted licensing points, they were not able to equalize the effects of residential stability or concentrated affluence in the full sample. That is, communities with less residential stability and higher concentrated affluence demonstrated the greatest boost in predicted licensing points associated with quality enhancement funds. Bryant, Maxwell, & Burchinal (1999) also found a positive relationship between Smart Start funding and child care quality based on ERS scores. In contrast, in the current study with the restricted sample, and ERS scores as the outcome, this was not found. This result may be a function of the restricted sample – the voluntary nature of having an ERS assessment conducted – since predicted licensing points in the full sample, and full range of quality in North Carolina, were related to higher quality enhancement funds.

Selection Effects of the Sub-Sample

Because the ERS assessment is a voluntary component of the rated license, it was important to determine if the voluntary nature resulted in selection effects in the sample. Results suggested that programs do not equally participate in the ERS observational assessment and that both program and community level characteristics influence the likelihood of participation. With a binary outcome, HGLM models the odds that a program will undergo the voluntary ERS assessment based on the predictors (Raundenbush & Bryk, 2002). Centers are more likely to participate in the assessment process compared to family child care homes with slight differentiation among centers and family child care homes based on extended care. These results also align with the trends associated with predicted quality in the conditional models. More specifically, centers without extended care are the most likely to participate with family child care homes without extended care the least likely to participate. Higher relative capacities in centers and homes also were related to the likelihood of participation. It is not surprising that centers are more likely to participate in the assessment since they tend to be more business oriented and are considered more formal in their practices. Centers also receive higher subsidy rates compared to family child care homes, even with the same number of stars (e.g. in the same county infant care in a five star center is $694 per slot and in a five star family child care home is $478; North Carolina Division of Child Development, 2007a; 2007b). However, it seems that as family child care homes increase their capacity (with the highest licensed capacity of 8 children), they too may be adhering to more formal practices and thus more likely than other family child care homes to participate in the assessment. Since less than 1% of programs are unregulated in North Carolina, family child care homes that provide care for small capacities of children may also be offering the least formal environment for children with little interest in participating in higher licensing standards.

Furthermore, as in the conditional models predicting quality, residential stability was negatively related to the likelihood of participation. Based on the conditional models, this would be expected since the higher quality programs in the full sample seem to be in communities where there is more family transiency. As mentioned earlier this may be related to the density of children in the early years (Queralt & White, 1998) thus creating demand and competition among programs to meet higher licensing standards and earn more stars.

More-at-Four funds were directly related to the likelihood of participation in the assessment process. This is not surprising considering the observational assessment is a requirement of the More-at-Four program. Furthermore, other program level funding sources – Head Start and DCD – were involved in interactions with community level characteristics in predicting the likelihood of participation. Head Start funds were related to participation; however in areas where there were greater percentages of concentrated immigration, programs were less likely to participate. This may be a result of less formal care options in these communities. Alternatively, the demand for enhanced standards may be less if communities are made up of recently immigrated residents that do not have as much information about the North Carolina child care system. DCD funds marginally interacted with concentrated immigration where programs with less DCD subsidy funds and in communities of higher concentrated immigration were less likely to participate but, as DCD funds increased they were more likely to participate. If parents are accessing child care subsidies they may be more aware of the child care system creating a higher demand for enhanced licensing standards or in other words more stars. Alternatively, programs accepting DCD subsidy funds may be enhancing their standards in order to receive a higher rate of subsidy. Furthermore, programs in the most affluent communities and receiving the highest levels of DCD subsidy funding were the most likely to participate in the assessment process. Again, these programs may be securing higher subsidy rates by electing to participate in the assessment process to increase their stars. Additionally, in more affluent communities there may be more demand and ability to pay for higher quality child care.

Conclusion

The North Carolina rated license is designed to inform consumers as well as to promote quality improvement among programs. Quality for the full sample was based on total licensing points. Minimal standards (or one star programs) were meeting basic health and safety requirements that the state deems important for children. However, in a system where there is room for programs to operate under different standards; that is, moving up in stars through staff education and/or through the learning environment, differentiation in what children experience results. This begs the question, who is privileged by a system that allows children to be cared and educated in programs of differential quality? That is, some programs operate under minimal health and safety requirements while others operate under enhanced standards that include more educated teachers and learning environments related to better developmental outcomes for children. Who benefits most from such a system?

In a system honoring “parent choice”, there must be evidence that there is actually sufficient supply for choices to be made. There is no question that North Carolina is a leader in the nation in child care policy with one of the first rated licenses, legislation that requires basic health and safety in licensed programs, rewards for meeting higher standards such as higher subsidy rates, and coordinated quality enhancement efforts at the county level. Furthermore, North Carolina estimates that less than 1% of programs are unregulated, where health and safety standards cannot be assumed. All children in licensed care experience a minimal level of quality that the state currently legislates as adequate. However, when given the opportunity to place children in programs that only meet basic health and safety requirements compared to programs that are offering enhanced learning environments, it seems logical that providing children with more optimal learning environments is best. But, with access limited and affordability central to consumers, choice also becomes limited.

In an effort to more thoroughly examine the impact of the rated license on supply of high quality child care across community contexts, the current study aimed to: (a) examine the variation in child care quality across communities of various size (zip codes versus counties), (b) examine the relationship between state and federal funding and child care quality, (c) examine the relationship between child care quality and the socioeconomic context of communities, (d) examine the extent county level Smart Start funding influences the relationship between socioeconomic context of communities and child care quality, and (e) examine the socioeconomic contexts of child care programs participating and not participating in the voluntary assessment process.

In short, it was found that child care quality varied across communities and that program quality was most readily predicted by proximity. More-at-Four and Head Start funding were related to higher quality; however they were not able to entirely equalize the effects of community context in order to ensure children in these programs were receiving equitable care and education of their more affluent peers. There were mixed results as to whether DCD subsidy funding was able to leverage quality alone. Despite these mixed results, there was evidence that DCD subsidy worked in tandem with Smart Start funding as well as the rated license system supporting enhanced standards through tiered reimbursement rates. Furthermore, there was evidence from the full sample model that suggested that Smart Start quality enhancement funds were helping to improve child care quality in North Carolina. The community context including concentrated affluence, concentrated disadvantage, and residential stability were related to child care quality. Finally, selection effects associated with the likelihood of participation in the ERS assessment process were found. That is, differential participation in the observational component of the licensing system was related to program level characteristics and community context. In sum, access to high quality child care is not universal and the application of current policy is not equally within reach of all programs. That is, participation in the voluntary ERS assessment is not equally likely among programs and across community contexts. These results are compelling, problematic, and suggest needed attention.

Limitations and Future Research

A major strength of the current study is the use of existing data from multiple sources. However, using existing data also creates limitations due to the nature of data collection and means of connectivity to other data sets. Because Head Start funds were allocated to the funding agency, program level funds had to be estimated based on the number of programs within funding agencies and the capacity of these programs. There is likely some level of error in these estimations. Future research that incorporates exact Head Start funds allocated to programs is recommended. Furthermore, Smart Start quality enhancement funds were allocated at the county level. In future research it would be beneficial to understand the exact funding received by programs from Smart Start and what funds were used for at the program level. The census data provided an estimate of community contexts; however, it is dated and some contexts may have changed since its collection. Replication of this study with new census data is recommended.

The current study included the socioeconomics at the zip code level to better understand the contexts of programs performing best in North Carolina's rated license. Furthermore the child care system is dynamic and the current study is limited by the variables that are included and by default the variables that are missing at the program and community levels. It is recommended that future studies include more program level characteristics. Additionally, following up with programs in a qualitative study to illuminate barriers programs face in meeting enhanced standards would allow for more depth in identifying needs. It would also allow us to better understand the complexities programs face as a result of the context in which they operate and the population they serve. Finally, the current study was based on programs nested within communities. More information about the children that attend programs would add an additional level to the analyses and further address the question of accessibility. It would also be beneficial to examine differences in the results for different age groups. In the current study child care quality was examined at the program level rather than classroom level. Examining differentiation in quality for infants, toddlers, and preschoolers based on program characteristics and community context would provide the possibility of unique effects based on children's ages.

Despite the limitations of the current study, the results yielded evidence that there is more that North Carolina needs to do to ensure all children are receiving equitable care and education during the most malleable years of life.

Policy Recommendations

The current study suggests the child care system does not function independent of the multiple contexts in which programs are nested. It is clear that the application of policies, like the rated license, do not equally impact all communities or programs. The current study supports the importance of aligning policies that support working parents with policies that support the learning environments of their children (Adams and Rohaccek , 2002; Huston, 2004).

When there is evidence that suggests programs of minimal standards are most likely to be found in communities of less affluence and more disadvantage compared to enhanced standards in communities of more affluence and less disadvantage, are we letting our most vulnerable children and their families down? Policy makers must ask themselves if basic health and safety requirements of one star programs are enough for our most vulnerable children and policies must work to move programs beyond minimal standards. That is, policies must first work to help programs enhance their standards, making it possible to help teachers improve their education, for programs to financially be able to reduce ratios, and equip classrooms. Then, the minimal standard may be raised in order to institutionalize the effect. In contrast, if standards are increased without first preparing the programs, we risk increasing the percentage of children in unregulated care. Therefore, policy must support field workers to assist programs in raising and sustaining quality through programs like the rated license, More-at-Four, Head Start, DCD subsidy, and Smart Start so that policy makers can then raise the bar for what is minimally accepted.

While a public campaign educating parents about the rated license and the benefits of high quality care may be worthwhile, it is clear that we cannot rely on parents alone to push quality. Programs in communities of lower socioeconomics need additional support to perform at the same level of programs in more affluent areas in the form of enhanced learning environments and educating staff on child development and early education. Policy makers must be informed of the complex and multifaceted needs of children living in poverty and that the teachers serving these children are in need of additional supports in order to adequately educate and care for these children. Subsidy dollars may be covering the basic fees of the program so that parents can work and children are in a licensed program; but, additional funds are likely needed to ensure environments that promote optimal development among the children with the most needs. This may require lower ratios and smaller group sizes so that there is greater levels of teacher-child interactions. This may also include financing educational opportunities for the teachers themselves to learn how to best work with children with multiple risk factors.

If programs are provided with the resources to offer higher quality care, they may be more likely to equally engage in the voluntary component of the rated license. However, additional steps should also be taken to create opportunities for programs to engage in this part of the license, especially among the programs that are the least likely to participate. Furthermore, programs that are least likely to participate may need incentives to participate in this component of the license as well as assistance in preparing for the assessment so that it is more attainable across contexts. For example, since family child care homes were less likely to participate in the rated license and they were generally of lower quality than centers, it may be worthwhile to target this group of care providers. One way to facilitate this may be to increase subsidy rates for enhanced standards so that they are more comparable to child care centers.

In conclusion, the current study of child care quality across community contexts suggests that there is inequitable access to high quality child care based on race and class. Furthermore, there is evidence that child care programs participate differentially in the rated license system suggesting program and community level barriers may exist in improving quality. While past research suggests children in and near poverty and children of color are the least likely to be in high quality child care settings, the current study found this may be because high quality programs are least likely to be in the communities in which these children reside. If the child care system allows for variation in quality, we must ensure access is not determined by socioeconomics and that all children in child care have experiences that promote their optimal development. Although North Carolina is viewed as a leader in child care policy across the nation, the children and families, especially the most vulnerable, are counting on us not just to do better but, to do right.

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APPENDIX A

Tables

Table 1. Program Level Variable Correlations

	Program Type	Extended Care	Program Type * Extended Care	Licensed Capacity	Licensed Capacity * Program Type	Head Start Funding	More-at-Four Funding	DCD Subsidy Funding	Licensing Points	ERS Program Average
n = 6882										
Program Type	1									
Extended Care	-.455**	1								
Program Type * Extended Care	.395**	.362**	1							
Licensed Capacity	.853**	-.470**	.206**	1						
Licensed Capacity * Program Type	.958**	-.483**	.305**	.963**	1					
Head Start Funding	.220**	-.199**	-.067**	.172**	.202**	1				
More-at-Four Funding	.282**	-.190**	.015	.297**	.302**	.411**	1			
DCD Subsidy Funding	.177**	.246**	.237**	.156**	.169**	-.235**	-.039**	1		
Licensing Points	.253**	-.043**	.061**	.236**	.248**	.200**	.257**	.247**	1	
n = 2964										
ERS Program Average	.059**	-.104**	-.050**	.030	.043*	.058**	.107**	-.136**	.660**	1

** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

Table 2. Variable Correlations of Socioeconomic Context Scales (N = 619)

Scale	Variable	% Below Poverty	% Receiving Public Assistance	% Unemployed	% Female Headed Family with Child(ren)	% Black or African American (not Hispanic)	% Latino or Hispanic	% Foreign Born	% Living in the Same House for 5 Years or More	% Owner Occupied Homes	% of Families with Incomes 75K or Higher	% of Population with at Least a Bachelors Degree	% Employed in a Professional or Managerial Occupation	% White or European American (not Hispanic)
Con. Disadvantage	% Below Poverty	1												
	% Receiving Public Assistance	.530**	1											
	% Unemployed	.518**	..299**	1										
	% Female Headed Family with Child(ren)	..606**	..514**	.412**	1									
	% Black or African American (not Hispanic)	.575**	.594**	.360**	.678**	1								
Con. Immigration	% Latino or Hispanic	.130**	.040	.053	.120**	.074	1							
	% Foreign Born	-0.20	-.097*	-.024	.103*	.024	.865**	1						
Residential Stability	% Living in the Same House for 5 Years or More	.180*	.208**	-.079*	-.139**	.078	-.228**	-.442**	1					
	% Owner Occupied Homes	-.360**	-.199**	-.401**	-.599**	-.333**	-.271**	-.376**	.537**	1				
Con. Affluence	% of Families with Incomes 75K or Higher	-.566**	-.459**	-.274**	-.299**	-.292**	-.094*	.188*	-.440**	075	1			
	% of Population with at Least a Bachelors Degree	-.358**	-.386**	-.041	-.111**	-.222**	-.046	.285**	-.623**	-.277**	.798**	1		
	% Employed in a Professional or Managerial Occupation	-.359**	-.410**	-.096*	-.138**	-.226**	-.088**	.211**	-.547**	-.203**	.793**	.923**	1	
	% White or European American (not Hispanic)	-.611**	-.594**	-.396**	-.701**	-.911**	-.281**	-.230**	-.022	.381**	.290**	.201**	.299**	1

** Significant at the 0.01 level.

* Significant at the 0.05 level.

Table 3. Community Level Socioeconomic Scale Correlations (N = 619)

	Concentrated Disadvantage	Concentrated Immigration	Residential Stability	Concentrated Affluence	% White or European American (not Hispanic)
Concentrated Disadvantage	1				
Concentrated Immigration	.066	1			
Residential Stability	-.239**	-.382**	1		
Concentrated Affluence	-.331**	.076	-.404**	1	
% White or European American (not Hispanic)	-902**	-266**	.220**	.249**	1

** Significant at the 0.01 level.

Table 4. Full Sample 2-Level Modeling (N = 6882)

	Unconditional	Effective 1-Level	Full 2-Level	Reduced 2-Level	Effective 2-Level
Fixed Effects					
Intercept2, γ_{00}	7.13 (0.08)**	-2.32 (0.91)**	-1.74 (2.19)	-2.22 (1.41)	-2.21 (1.36)
Con_Dis, γ_{01}			-1.14 (3.32)	-1.34 (1.54)	-1.35 (1.53)
Con_Imm, γ_{02}			-2.58 (4.49)	0.07 (2.27)	
Res_Sta, γ_{03}			-3.61 (2.25)	-3.11 (1.04)**	-3.12 (0.94)**
Con_Afl, γ_{04}			5.04 (1.94)**	5.35 (1.51)**	5.35 (1.51)**
Program Type, γ_{10}		8.02 (1.01)**	10.11 (2.15)**	8.07 (1.18)**	8.07 (1.18)**
Con_Dis, γ_{11}			-3.83 (2.79)		
Con_Imm, γ_{12}			-3.39 (4.28)		
Res_Sta, γ_{13}			-2.05 (1.96)		
Con_Afl, γ_{14}			2.64 (1.97)	3.46 (1.42)*	3.46 (1.42)*
Extended Care, γ_{20}		0.87 (0.19)**	-0.00 (1.47)	0.83 (0.19)**	0.83 (0.19)**
Con_Dis, γ_{21}			1.09 (2.54)		
Con_Imm, γ_{22}			-2.00 (3.45)		
Res_Sta, γ_{23}			0.80 (1.67)		
Con_Afl, γ_{24}			1.37 (1.51)		
Program Type * Extended Care, γ_{30}		-1.41 (0.26)**	-1.32 (0.27)**	-1.37 (0.26)**	-1.37 (0.26)**
Capacity, γ_{40}		2.95 (0.45)**	3.30 (0.48)**	3.29 (0.48)**	3.29 (0.48)**
Program Type * Capacity, γ_{50}		-3.01 (0.46)**	-3.42 (0.49)**	-3.41 (0.49)**	-3.41 (0.49)**
Head Start Funds, γ_{60}		0.44 (0.03)**	0.35 (0.39)	0.68 (0.08)**	0.68 (0.08)**
Con_Dis, γ_{61}			0.03 (0.63)		
Con_Imm, γ_{62}			-0.24 (0.75)		
Res_Sta, γ_{63}			0.46 (0.43)		
Con_Afl, γ_{64}			-0.77 (0.43)	-1.05 (0.35)**	-1.05 (0.35)**
More-at-Four Funds, γ_{70}		0.47 (.03)**	0.73 (0.36)*	0.63 (0.04)**	0.63 (0.4)**
Con_Dis, γ_{71}			-1.08 (0.62)	-1.19 (0.35)**	-1.19 (0.35)**
Con_Imm, γ_{72}			-0.11 (0.68)		
Res_Sta, γ_{73}			-0.09 (0.40)		
Con_Afl, γ_{74}			-0.28 (0.45)		
DCD Subsidy Funds, γ_{80}		0.36 (0.02)**	0.34 (0.30)	0.54 (0.05)**	0.54 (0.05)**
Con_Dis, γ_{81}			0.21 (0.44)		
Con_Imm, γ_{82}			0.95 (0.51)		
Res_Sta, γ_{83}			0.18 (0.33)		
Con_Afl, γ_{84}			-0.65 (0.27)*	-0.69 (0.19)**	-0.69 (0.19)**
Random Effects (Variance Components)					
Level 1 Variance, r_{ij}	20.61	16.11			
Intercept1, μ_{0j}	1.28**	1.97**	1.37**	1.42**	1.42**
Program Type, μ_{1j}		1.86**	1.23**	1.24**	1.54**
DCD Subsidy Funds, μ_{8j}		0.16**	0.01, ($p \leq 0.059$)	0.11	0.01
Intraclass Correlation	0.06				
Goodness of fit					
Deviance (-2LL)	40618.83	39028.06	38928.11	38938.05	38938.05
Estimated Parameters	3	17	41	25	24
Liklihood Ratio Test				$p \geq 0.50$	$p \geq 0.50$

** Significant at the 0.01 level.

* Significant at the 0.05 level.

Table 5. Full Sample 3-Level Modeling (N = 6727)

	Unconditional	Effective 2-Level	Full 3-Level	Effective 3-Level
Fixed Effects				
Intercept3, Π_{000}	7.11 (0.13)**	-2.21 (1.36)	-20.42 (9.33)*	-19.68 (7.34)**
Quality Enhancement Funds, Π_{001}			1.13 (0.61)	1.09 (0.45)*
Con_Dis, Π_{010}		-1.35 (1.53)	-1.52 (17.42)	-0.24 (1.45)
Quality Enhancement Funds, Π_{011}			0.049 (1.21)	
Res_Sta, Π_{020}		-3.12 (0.94)**	23.33 (9.42)*	21.56 (9.71)*
Quality Enhancement Funds, Π_{021}			-1.73 (0.62)**	-1.59 (0.62)**
Con_Afl, Π_{030}		5.35 (1.51)**	35.18 (17.60)*	34.48 (7.96)**
Quality Enhancement Funds, Π_{031}			-1.76 (1.16)	-1.80 (0.53)**
Program Type, Π_{100}		8.07 (1.18)**	11.42)4.98)*	7.85 (1.39)**
Quality Enhancement Funds, Π_{101}			-0.21 (0.32)	
Con_Afl, Π_{130}		3.46 (1.42)*	-14.20 (19.71)	3.14 (1.60)*
Quality Enhancement Funds, Π_{131}			1.05 (1.31)	
Extended Care, Π_{200}		0.83 (0.19)**	0.81 (0.19)**	0.85 (0.18)**
Program Type * Extended Care, Π_{300}		-1.37 (0.26)**	-1.30 (0.26)**	-1.42 (0.26)**
Capacity, Π_{400}		3.29 (0.48)**	3.26 (0.67)**	3.18 (0.63)**
Program Type * Capacity, Π_{500}		-3.41 (0.49)**	-3.39 (0.69)**	-3.30 (0.65)**
Head Start Funds, Π_{600}		0.68 (0.08)**	-0.09 (0.10)	0.70 (0.07)**
Quality Enhancement Funds, Π_{601}			0.05 (0.07)	
Con_Afl, Π_{630}		-1.05 (0.35)**	2.38 (2.94)	-1.12 (0.32)**
Quality Enhancement Funds, Π_{631}			-0.24 (0.20)	
More-at-Four Funds, Π_{700}		0.63 (0.4)**	1.10 (0.85)	0.62 (0.06)**
Quality Enhancement Funds, Π_{701}			-0.03 (0.06)	
Con_Dis, Π_{710}		-1.19 (0.35)**	-6.04 (5.41)	-1.10 (0.41)**
Quality Enhancement Funds, Π_{711}			0.34 (0.36)	
DCD Subsidy Funds, Π_{800}		0.54 (0.05)**	-0.40 (0.60)	0.01 (0.30)
Quality Enhancement Funds, Π_{801}			0.07 (0.04)	0.04 (0.02)~
Con_Afl, Π_{830}		-0.69 (0.19)**	0.60 (2.16)	-0.86 (0.19)**
Quality Enhancement Funds, Π_{831}			-0.10 (0.14)	
Random Effects (Variance Components)				
Level 1 Variance, r_{ijk}	20.72	16.10	16.10	16.24
Intercept1, μ_{0ik}	0.27**	1.42**	0.46**	0.68**
Program Type, μ_{1ik}		1.54**	0.83**	1.50**
DCD Subsidy Funding, μ_{8ik}		0.01, $p \leq 0.064$	0.001**	
Intercept1/Intercept2, δ_{00k}	0.77**		3.54	0.73**
Intercept1/Con_Dis, δ_{01k}			16.48	
Intercept1/Res_Sta, δ_{02k}			3.59	
Intercept1/Co_Afl, δ_{03k}			12.84	
Program Type/Intercept2, δ_{10k}			3.04	
Program Type/Con_Afl, δ_{13k}			29.10	
DCD Funds/Intercept2, δ_{80k}			0.03	
DCD Funds/Con_Afl, δ_{83k}			0.24	
Level 2 Intraclass Correlation	0.01			
Level 3 Intraclass Correlation	0.04			
Level 2 and 3 Intraclass Correlation	0.05			
Goodness of fit				
Deviance (-2LL)	39637.35	38938.05	38053.66	38085.48
Estimated Parameters	4	24	71	25
Liklihood Ratio Test				$p \geq 0.50$

** Significant at the 0.01 level.

* Significant at the 0.05 level.

~$p \leq 0.057$

Table 6. HGLM 2-Level Modeling (N = 6882)

	Unconditional		Unconditional 1-Level		Full 2-Level		Effective 2-Level	
Fixed Effects	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio
Intercept2, γ_{00}	-0.31 (0.04)**	0.73	-3.44 (0.59)**	0.03	-3.44 (1.40)**	0.03	-3.26 (0.82)**	0.04
Con_Dis, γ_{01}					-1.91 (2.25)	0.15	-2.64 (0.94)**	0.07
Con_Imm, γ_{02}					-2.70 (2.70)	0.07	-3.11 (2.24)	0.04
Res_Sta, γ_{03}					-1.83 (1.49)	0.16	-1.87 (0.68)**	0.15
Con_Afl, γ_{04}					3.99 (0.99)**	54.31	3.65 (0.71)**	38.47
Program Type, γ_{10}			1.56 (0.66)*	4.77	2.96 (1.32)	19.37	2.09 (0.66)**	8.11
Con_Dis, γ_{11}					-1.98 (1.71)	0.14		
Con_Imm, γ_{12}					-2.87 (2.39)	0.06		
Res_Sta, γ_{13}					-0.70 (1.28)	0.50		
Con_Afl, γ_{14}					-0.15 (1.03)	0.87		
Extended Care, γ_{20}			0.30 (0.13)*	1.34	0.23 (1.07)	1.26	0.32 (0.10)**	1.37
Con_Dis, γ_{21}					0.64 (1.65)	1.89		
Con_Imm, γ_{22}					-0.54 (2.75)	0.58		
Res_Sta, γ_{23}					0.42 (1.23)	1.52		
Con_Afl, γ_{24}					-1.00 (0.96)	0.37		
Program Type * Extended Care, γ_{30}			-0.39 (0.16)*	0.68	-0.39 (0.16)*	0.68	-0.43 (0.14)**	0.65
Capacity, γ_{40}			0.70 (0.28)**	2.02	0.90 (0.31)**	2.45	0.90 (0.29)**	2.46
Program Type * Capacity, γ_{50}			-0.43 (0.30)	0.65	-0.68 (0.32)*	0.51	-0.67 (0.30)*	0.51
Head Start Funds, γ_{60}			0.32 (0.03)**	1.37	0.35 (0.65)	1.42	0.42 (0.05)**	1.52
Con_Dis, γ_{61}					0.22 (0.75)	1.25		
Con_Imm, γ_{62}					-1.64 (1.21)	0.19	-1.58 (0.70)*	0.21
Res_Sta, γ_{63}					0.22 (0.73)	1.24		
Con_Afl, γ_{64}					-0.53 (0.70)	0.59		
More-at-Four Funds, γ_{70}			0.33 (0.03)**	1.38	0.72 (0.53)	2.05	0.33 (0.03)**	1.40
Con_Dis, γ_{71}					-0.98 (0.67)	0.37		
Con_Imm, γ_{72}					0.79 (1.13)	2.21		
Res_Sta, γ_{73}					-0.34 (0.57)	0.71		
Con_Afl, γ_{74}					-0.45 (0.66)	0.64		
DCD Subsidy Funds, γ_{80}			0.14 (0.01)**	1.15	0.23 (0.14)	1.26	0.23 (0.03)**	1.26
Con_Dis, γ_{81}					-0.05 (0.29)	0.96		
Con_Imm, γ_{82}					0.62 (0.41)	1.87	0.51 (0.28)~	1.67
Res_Sta, γ_{83}					-0.01 (0.16)	0.99		
Con_Afl, γ_{84}					-0.35 (0.13)**	0.70	-0.37 (0.09)**	0.69
Random Effects (Variance Components)								
Intercept1, μ_{0i}			0.52, $p \geq 0.50$		0.49**		0.51**	
Program Type, μ_{1i}			0.56, $p \geq 0.50$		0.26, $p \geq 0.09$		0.53, $p \geq 0.12$	
Capacity, μ_{4i}			0.02, $p \geq 0.50$					
DCD Subsidy Funds, μ_{8i}			0.01, $p \geq 0.27$					
Goodness of fit								
Deviance (-2LL)	21747.30		20384.18		20282.40		20296.80	
Estimated Parameters	2		10		36		19	
Liklihood Ratio Test							$p \geq 0.50$	

** Significant at the 0.01 level.

* Significant at the 0.05 level.

~ $p \leq 0.07$

Table 7. HGLM 3-Level Modeling (N = 6882)

	Effective 2-Level		Full 3-Level		Reduced 3-Level	
Fixed Effects	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio	Coefficient (SE)	Odds Ratio
Intercept3, Π_{000}	-3.26 (0.82)**	0.04	-4.87 (2.61)~	0.01	-4.16 (2.35)~	0.02
Quality Enhancement Funds, Π_{001}			0.03 (0.16)	1.03	-0.01 (0.14)	0.99
Con_Dis, Π_{010}	-2.64 (0.94)**	0.07	-0.80 (1.58)	0.45	-0.82 (1.51)	0.44
Con_Imm, Π_{020}	-3.11 (2.24)	0.04	-0.52 (3.41)	0.60	-0.52 (3.41)	0.59
Res_Sta, Π_{030}	-1.87 (0.68)**	0.15	-0.81 (1.37)	0.45	-0.81 (1.30)	0.45
Con_Afl, Π_{040}	3.65 (0.71)**	38.47	3.83 (1.00)**	46.11	3.84 (0.99)**	46.39
Program Type, Π_{100}	2.09 (0.66)**	8.11	4.08 (2.52)	59.13	2.07 (1.20)~	7.91
Quality Enhancement Funds, Π_{101}			-0.14 (0.19)	0.87		
Extended Care, Π_{200}	0.32 (0.10)**	1.37	0.31 (0.12)**	1.37	0.31 (0.12)**	1.37
Program Type * Extended Care, Π_{300}	-0.43 (0.14)**	0.65	-0.34 (0.18)~	0.71	-0.35 (0.18)~	0.71
Capacity, Π_{400}	0.90 (0.29)**	2.46	0.93 (0.51)~	2.54	0.90 (0.50)~	2.46
Program Type * Capacity, Π_{500}	-0.67 (0.30)*	0.51	-0.69 (0.53)	0.50	-0.66 (0.52)	0.52
Head Start Funds, Π_{600}	0.42 (0.05)**	1.52	0.41 (0.06)**	1.51	0.41 (0.06)**	1.51
Con_Imm, Π_{620}	-1.58 (0.70)*	0.21	-1.46 (1.14)	0.23	-1.48 (1.13)	0.23
More-at-Four Funds, Π_{700}	0.33 (0.03)**	1.40	0.34 (0.03)**	1.41	0.34 (0.03)**	1.41
DCD Subsidy Funds, Π_{800}	0.23 (0.03)**	1.26	0.24 (0.04)**	1.27	0.24 (0.04)**	1.27
Con_Imm, Π_{820}	0.51 (0.28)~	1.67	0.39 (0.40)	1.48	0.40 (0.40)	1.48
Con_Afl, Π_{840}	-0.37 (0.09)**	0.69	-0.37 (0.13)**	0.69	-0.37 (0.13)**	0.69
Random Effects (Variance Components)						
Intercept1, μ_{0ik}			0.08, $p \leq 0.18$		0.08, $p \leq 0.20$	
Program Type , μ_{1ik}			0.17, $p \leq 0.24$		0.15, $p \leq 0.25$	
Intercept1/Intercept2, δ_{00k}	0.51**		0.38**		0.38**	
Program Type/Intercept2, δ_{10k}	0.53, $p \leq 0.12$		0.27**		0.29**	
Goodness of fit						
Deviance (-2LL)	20296.80		19693.48		19695.06	
Estimated Parameters	19		24		23	
Liklihood Ratio Test	$p \geq 0.50$				$p \geq 0.50$	

** Significant at the 0.01 level.
* Significant at the 0.05 level.
~ Significant at the 0.10 level.

Table 8. Sub Sample 3-Level Modling with Licensing Points as Outcome (N = 2964)

	Unconditional	Reduced 3-Level	Effective 3-Level
Fixed Effects			
Intercept3, Π_{000}	11.16 (0.09)**	-1.92 (6.40)	1.43 (5.38)
Quality Enhancement Funds, Π_{001}		0.81 (0.39)*	0.63 (0.32)~
Con_Dis, Π_{010}		-2.24 (1.10)*	-2.58 (1.01)**
Res_Sta, σ020		16.88 (7.90)*	13.66 (7.63)
Quality Enhancement Funds, Π_{021}		-1.27 (0.51)*	-1.07 (0.49)*
Con_Afl, Π_{030}		12.26 (7.14)	-0.18 (0.95)
Quality Enhancement Funds, Π_{031}		-0.74 (0.44)	
Program Type, Π_{100}		2.95 (0.86)**	3.01 (0.94)**
Con_Afl, Π_{110}		2.14 (0.84)*	1.80 (0.90)*
Extended Care, Π_{200}		0.52 (0.25)*	0.53 (0.24)*
Program Type * Extended Care, Π_{300}		-0.64 (0.30)*	-0.63 (0.29)*
Capacity, Π_{400}		1.45 (0.33)**	1.41 (0.34)**
Program Type * Capacity, Π_{500}		-1.80 (0.34)**	-1.77 (0.35)**
Head Start Funds, Π_{600}		0.12 (0.06)	0.07 (0.02)**
Con_Afl, Π_{610}		-0.18 (0.35)	
More-at-Four Funds, Π_{700}		0.26 (0.03)**	0.22 (0.2)**
Con_Dis, Π_{710}		-0.35 (0.25)	
DCD Subsidy Funds, Π_{800}		-0.31 (0.22)	-0.10 (0.2)**
Quality Enhancement Funds, Π_{801}		0.02 (0.02)	
Con_Afl, Π_{810}		-0.23 (0.15)	
Random Effects (Variance Components)			
Level 1 Variance, r_{ijk}	5.98	5.08	5.10
Intercept1, μ_{0ik}	0.05, $p \leq 0.27$	1.64**	1.51**
Capacity, μ_{4ik}		0.13**	0.13**
Intercept1/Intercept2, δ_{00k}	0.32**	0.34**	0.60**
Level 2 Intraclass Correlation	0.01		
Level 3 Intraclass Correlation	0.05		
Level 2 and 3 Intraclass Correlation	0.06		
Goodness of fit			
Deviance (-2LL)	13799.81	13405.21	13412.25
Estimated Parameters	4	25	20
Liklihood Ratio Test		$p \geq 0.50$	$p \geq 0.50$

** Significant at the 0.01 level.

* Significant at the 0.05 level.

~$p \leq 0.056$

Table 9. Sub Sample 2-Level Modeling with ERS Score as Outcome (N = 2964)

	Unconditional	Effective 1-Level	Full 2-Level	Reduced 2-Level	Effective 2-Level
Fixed Effects					
Intercept2, γ_{00}	5.13 (0.01)**	4.82 (0.24)**	5.95 (0.56)**	5.38 (0.32)**	5.41 (0.32)**
Con_Dis, γ_{01}			-2.92 (0.87)**	-2.13 (0.36)**	-2.10 (0.36)**
Con_Imm, γ_{02}			-0.42 (1.24)	-0.27 (0.58)	-0.25 (0.58)
Res_Sta, γ_{03}			-0.84 (0.55)	-0.58 (0.20)**	-0.57 (0.20)**
Con_Afl, γ_{04}			-0.88 (0.36)*	0.04 (0.15)	0.05 (0.15)
Program Type, γ_{10}		0.71 (0.26)**	0.53 (0.57)	0.70 (0.26)**	0.63 (0.25)**
Con_Dis, γ_{11}			0.58 (0.72)		
Con_Imm, γ_{12}			1.27 (1.04)	1.42 (0.58)*	1.39 (0.59)*
Res_Sta, γ_{13}			-0.17 (0.52)		
Con_Afl, γ_{14}			0.63 (0.39)		
Extended Care, γ_{20}		0.01 (0.06)	-0.19 (0.42)	-0.07 (0.07)	-0.13 (0.06)*
Con_Dis, γ_{21}			1.17 (0.64)	0.85 (0.38)*	0.80 (0.39)*
Con_Imm, γ_{22}			0.39 (0.84)		
Res_Sta, γ_{23}			-0.03 (0.47)		
Con_Afl, γ_{24}			0.31 (0.36)		
Program Type * Extended Care, γ_{30}		-0.08 (0.07)	-0.10 (0.07)	-0.10 (0.07)	
Capacity, γ_{40}		0.22 (0.12)	0.19 (0.12)	0.23 (0.12)*	0.23 (.12)*
Program Type * Capacity, γ_{50}		-0.28 (0.12)*	-0.26 (0.12)*	-0.29 (0.12)**	-0.29 (0.12)**
Head Start Funds, γ_{60}		-0.01 (0.01)**	0.19 (0.07)**	0.20 (0.06)**	0.20 (0.06)**
Con_Dis, γ_{61}			-0.23 (0.10)*	-0.21 (0.08)**	-0.21 (0.8)**
Con_Imm, γ_{62}			-0.28 (0.15)	-0.31 (0.13)**	-0.31 (0.13)**
Res_Sta, γ_{63}			-0.20 (0.08)*	-0.22 (0.07)**	-0.22 (0.07)**
Con_Afl, γ_{64}			-0.16 (0.06)*	-0.15 (0.06)**	0.15 (0.06)**
More-at-Four Funds, γ_{70}		0.03 (0.00)**	-0.00 (0.06)	0.03 (0.004)**	0.03 (0.004)**
Con_Dis, γ_{71}			0.08 (0.10)		
Con_Imm, γ_{72}			-0.01 (0.11)		
Res_Sta, γ_{73}			0.02 (0.07)		
Con_Afl, γ_{74}			0.06 (0.06)		
DCD Subsidy Funds, γ_{80}		-0.03 (0.00)**	-0.09 (0.05)	-0.03 (0.004)**	-0.03 (0.004)**
Con_Dis, γ_{81}			0.04 (0.09)		
Con_Imm, γ_{82}			0.01 (0.11)		
Res_Sta, γ_{83}			0.07 (0.06)		
Con_Afl, γ_{84}			0.06 (0.04)		
Random Effects (Variance Components)					
Level 1 Variance, r_{ij}	0.33	0.31	0.31	0.31	0.31
Intercept1, μ_{0i}	0.03**	0.04**	0.04**	0.04**	0.04**
Program Type slope, μ_{1i}		0.04**	0.04**	0.04**	0.05**
Intraclass Correlation	0.08				
Goodness of fit					
Deviance (-2LL)	5329.63	5203.51	5203.14	5187.43	5188.19
Estimated Parameters	2	13	4	4	4
Liklihood Ratio Test				$p \geq 0.50$	$p \geq 0.50$

** Significant at the 0.01 level.

* Significant at the 0.05 level.

Table 10. Sub Sample 3-Level Modeling with ERS Score as Outcome (N = 2964)

	Reduced Full 3-Level	Effective 3-Level
Fixed Effects		
Intercept3, Π_{000}	8.65 (1.84)**	8.43 (0.62)**
Quality Enhancement Funds, Π_{001}	-0.24 (0.11)*	-0.22 (0.04)**
Con_Dis, Π_{010}	-11.57 (4.31)**	-11.83 (3.63)**
Quality Enhancement Funds, Π_{011}	0.69 (0.29)*	0.71 (0.24)**
Con_Imm, Π_{020}	-13.22 (4.04)**	-12.94 (4.27)**
Quality Enhancement Funds, Π_{021}	0.93 (0.27)**	0.91 (0.28)**
Res_Sta, Π_{030}	-0.80 (1.95)	-0.23 (0.21)
Quality Enhancement Funds, Π_{031}	0.04 (0.12)	
Con_Afl, Π_{040}	0.49 (1.96)	0.28 (0.17)~
Quality Enhancement Funds, Π_{041}	-0.015 (0.13)	
Program Type, Π_{100}	-1.29 (0.81)	-1.37 (0.75)~
Quality Enhancement Funds, Π_{101}	0.12 (0.05)*	0.13 (0.05)**
Con_Imm, Π_{120}	14.51 (6.49)*	15.93 (5.78)**
Quality Enhancement Funds, Π_{121}	-0.96 (0.43)*	-1.05 (0.38)**
Extended Care, Π_{200}	-2.36 (0.77)**	-2.34 (0.76)**
Quality Enhancement Funds, Π_{201}	0.16 (0.05)**	0.15 (0.05)**
Con_Dis, Π_{210}	9.95 (5.23)~	10.37 (4.80)*
Quality Enhancement Funds, Π_{211}	-0.64 (0.35)~	-0.67 (0.33)*
Capacity, Π_{300}	0.16 (0.11)	0.15 (0.11)
Program Type * Capacity, Π_{400}	-0.21 (0.11)~	-0.21 (0.11)~
Head Start Funds, Π_{500}	-0.62 (1.03)	0.17 (0.06)**
Quality Enhancement Funds, Π_{501}	0.06 (0.07)	
Con_Dis, Π_{510}	0.39 (1.05)	-0.13 (0.08)~
Quality Enhancement Funds, Π_{511}	-0.04 (0.07)	
Con_Imm, Π_{520}	1.54 (1.42)	-0.24 (0.11)*
Quality Enhancement Funds, Π_{521}	-0.13 (0.10)	
Res_Sta, Π_{530}	0.60 (1.30)	-0.18 (0.07)**
Quality Enhancement Funds, Π_{531}	-0.06 (0.09)	
Con_Afl, Π_{540}	0.50 (0.60)	-0.15 (0.05)**
Quality Enhancement Funds, Π_{541}	-0.05 (0.04)	
More-at-Four Funds, Π_{600}	0.02 (0.06)	0.03 (0.005)**
Quality Enhancement Funds, Π_{601}	0.02 (0.06)	
DCD Subsidy Funds, Π_{700}	-0.004 (0.04)	-0.03 (0.004)**
Quality Enhancement Funds, Π_{701}	-0.002 (0.003)	
Random Effects (Variance Components)		
Level 1 Variance, r_{ijk}	0.30	0.30
Intercept1, μ_{0ik}	0.01**	0.01**
Program Type, μ_{1ik}	0.02**	0.02**
Intercept1/Intercept2, δ_{00k}	0.03**	0.03**
Program Type/Intercept2, δ_{10k}	0.03**	0.03**
Goodness of fit		
Deviance (-2LL)	5019.752555	5021.706741
Estimated Parameters	41	32
Liklihood Ratio Test		$p \geq 0.50$

** Significant at the 0.01 level.

* Significant at the 0.05 level.

~ Significant at the 0.10 level.

APPENDIX B

Figures

Full Sample Effective 2-Level Model Interactions

Figure 1. Program Type and Extended Care

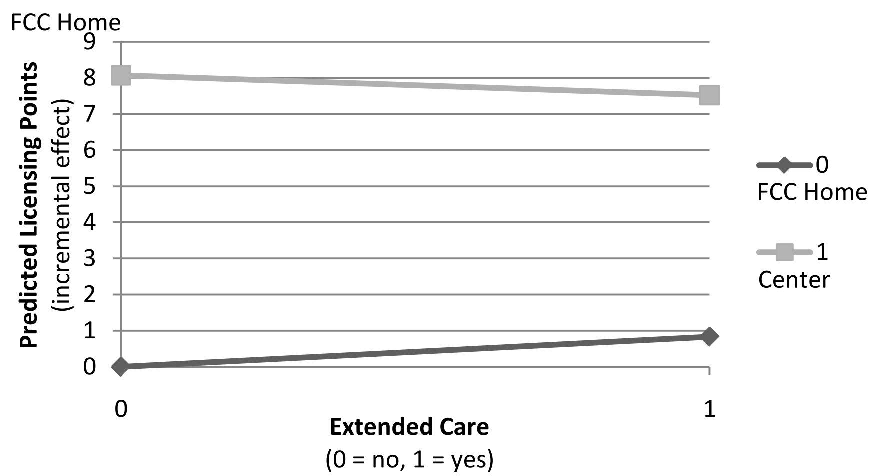


Figure 2. Program Type and Licensed Capacity

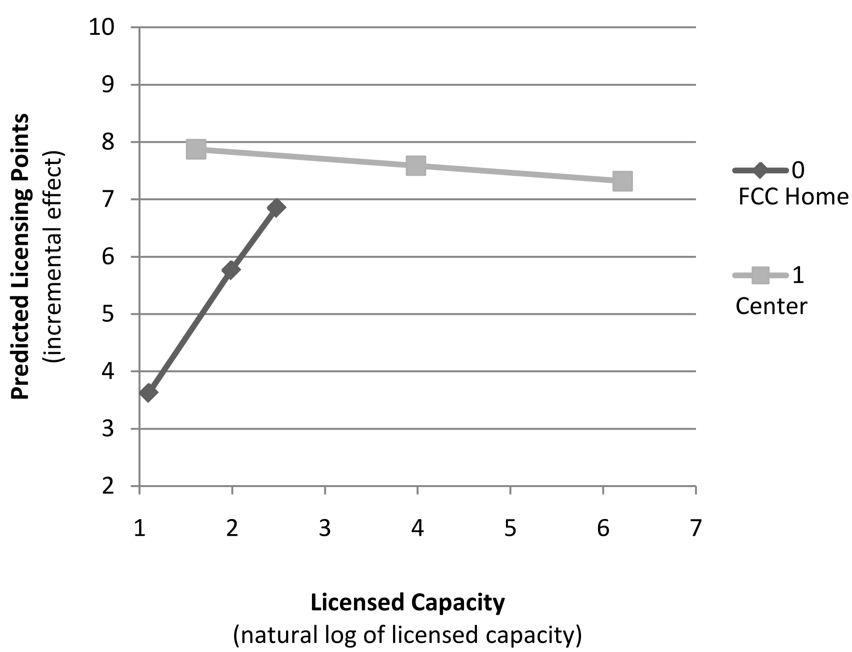


Figure 3. Program Type and Concentrated Affluence

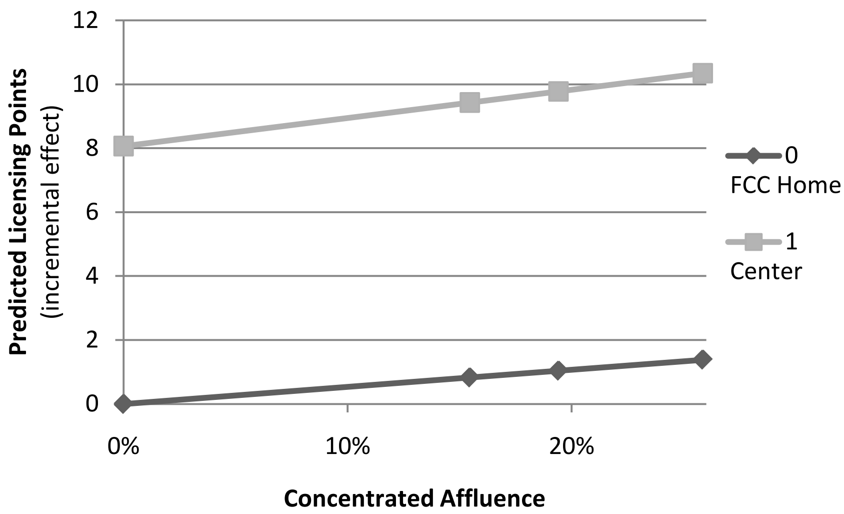


Figure 4. Head Start Funding and Concentrated Affluence

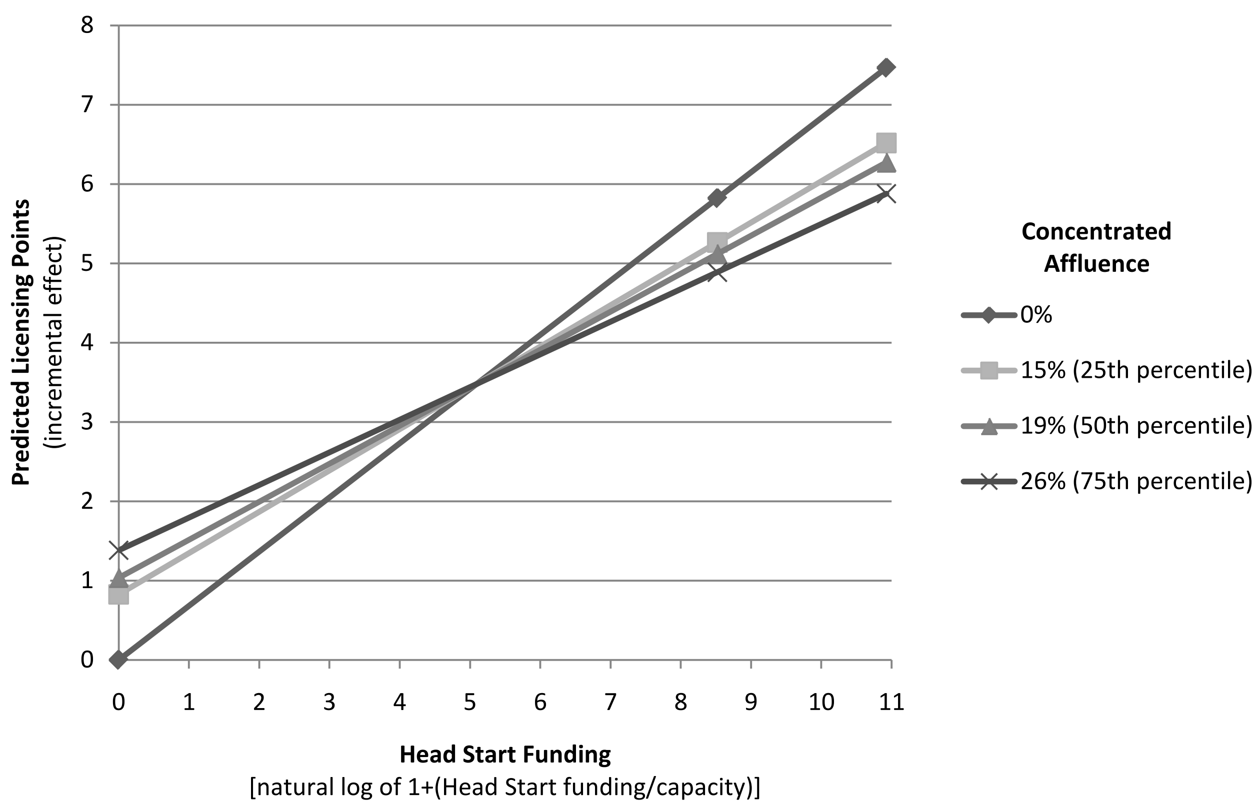


Figure 5. More-at-Four Funding and Concentrated Disadvantage

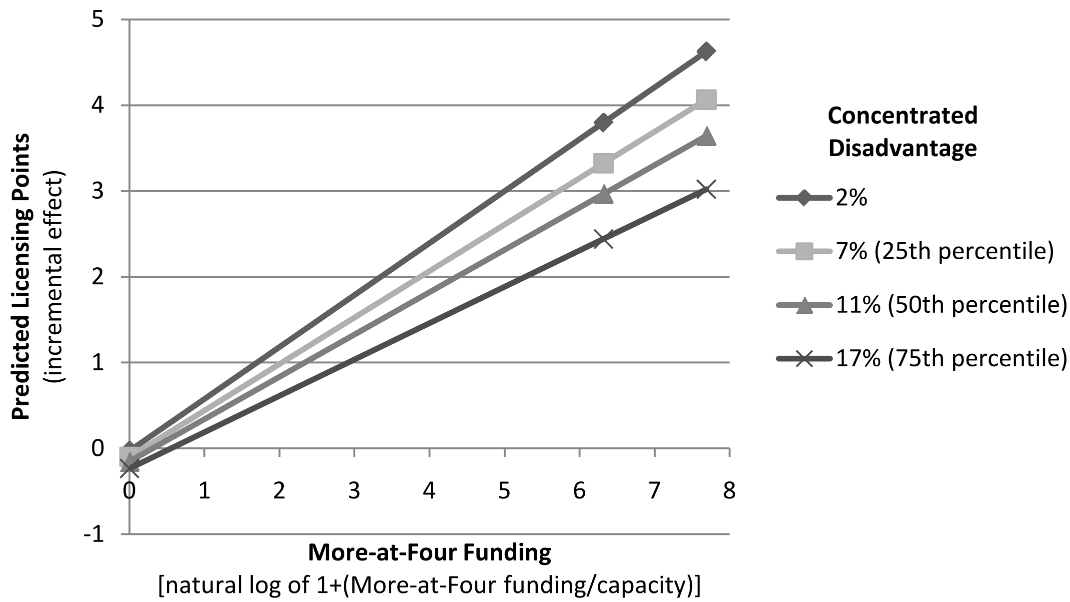
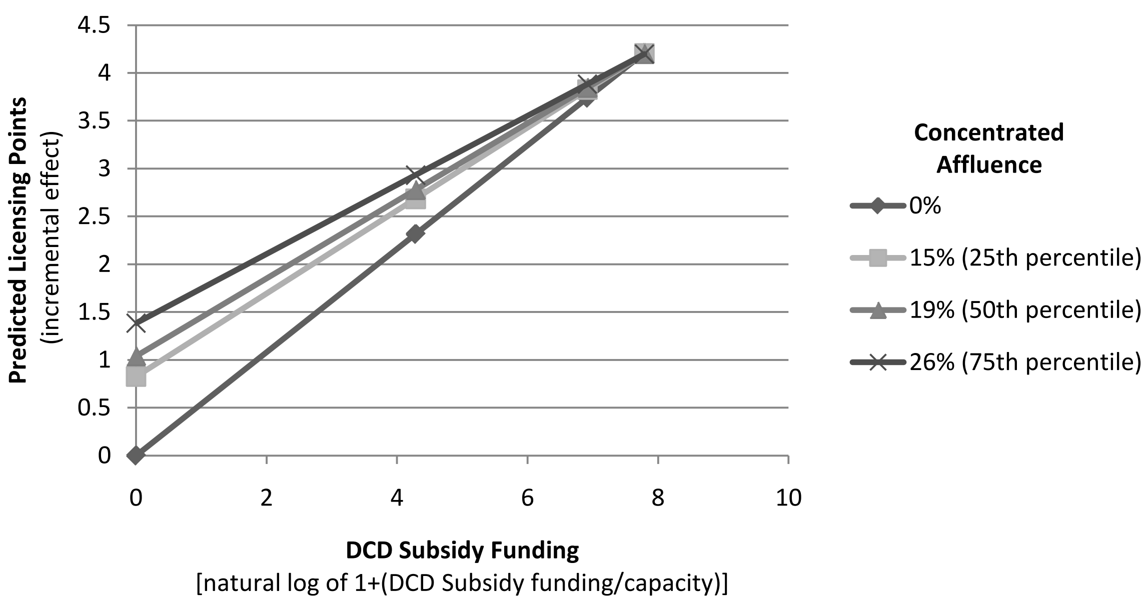


Figure 6. DCD Subsidy Funding and Concentrated Affluence



Full Sample Effective 3-Level Model Interactions

Figure 7. Smart Start Quality Enhancement Funding and Residential Stability

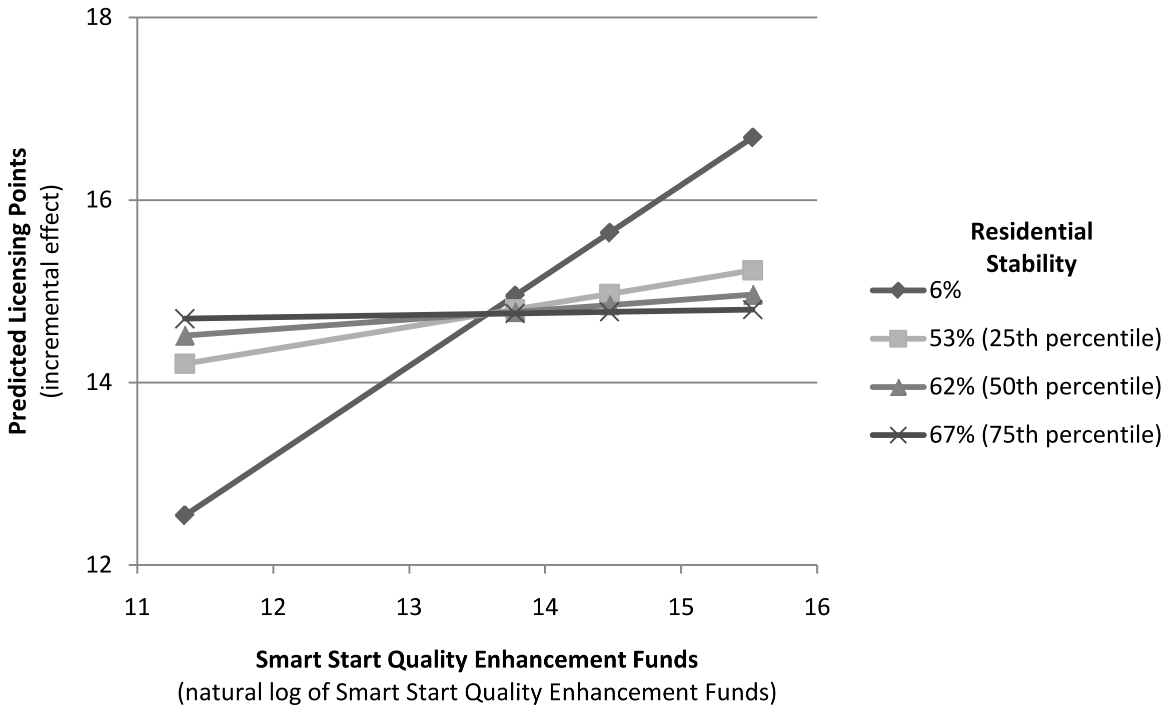


Figure 8. Smart Start Quality Enhancement Funding and Concentrated Affluence

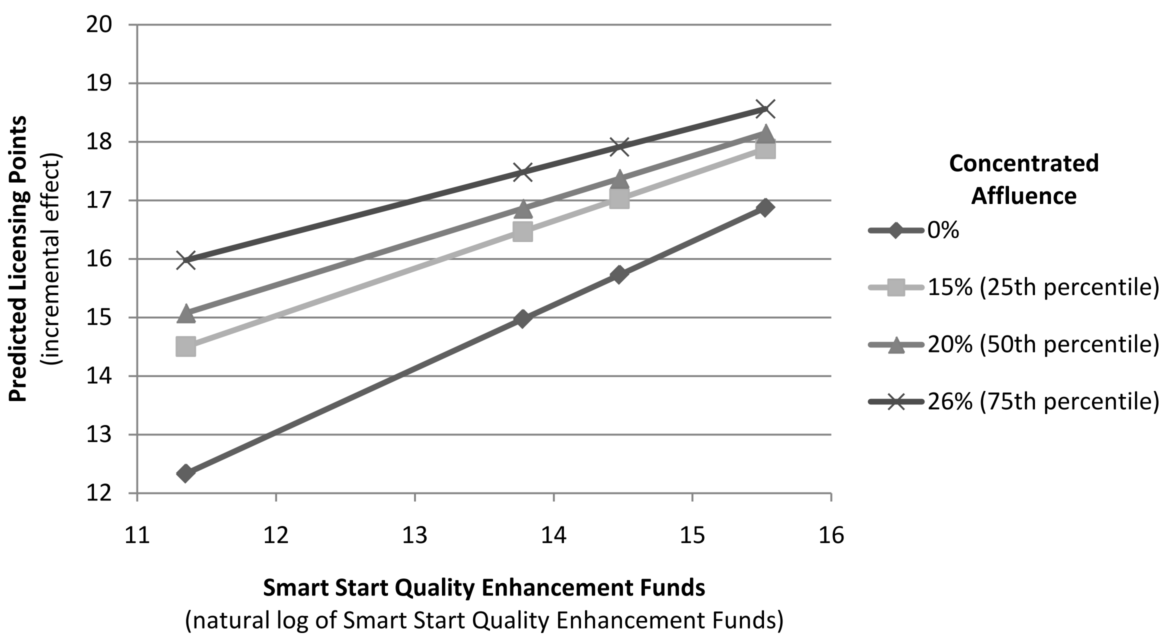


Figure 9. Head Start Funding and Concentrated Affluence

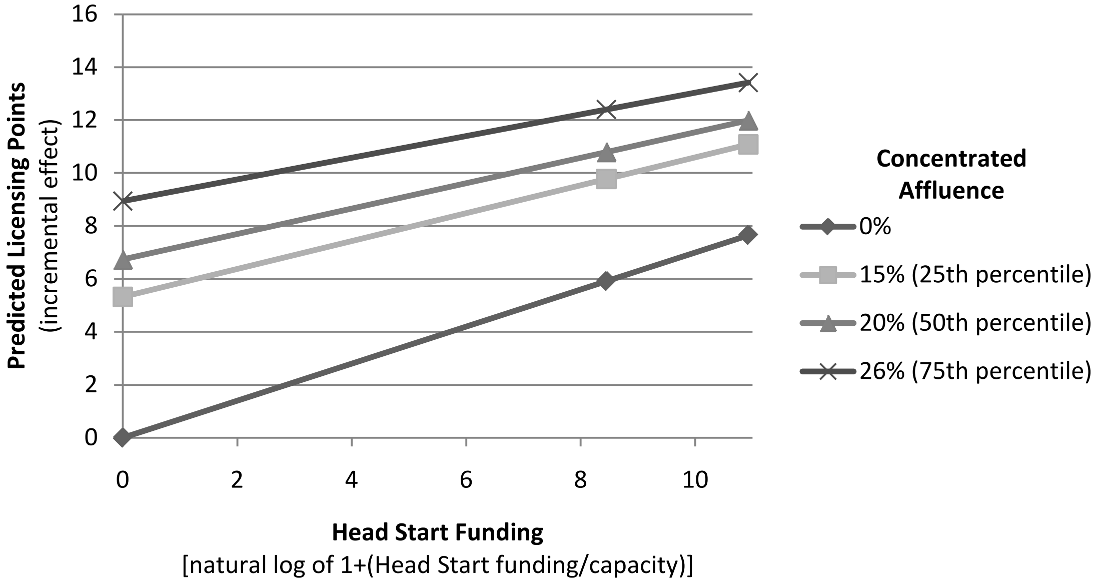


Figure 10. Smart Start Quality Enhancement Funds and DCD Subsidy Funding

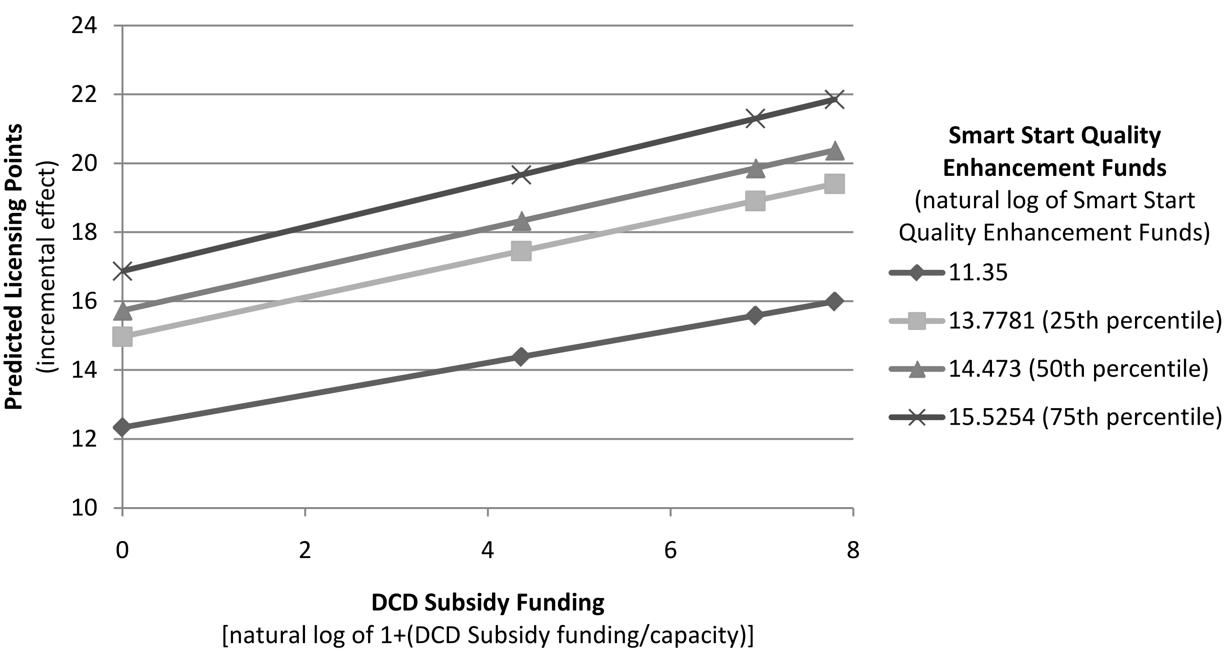


Figure 11. DCD Subsidy Funding and Concentrated Affluence

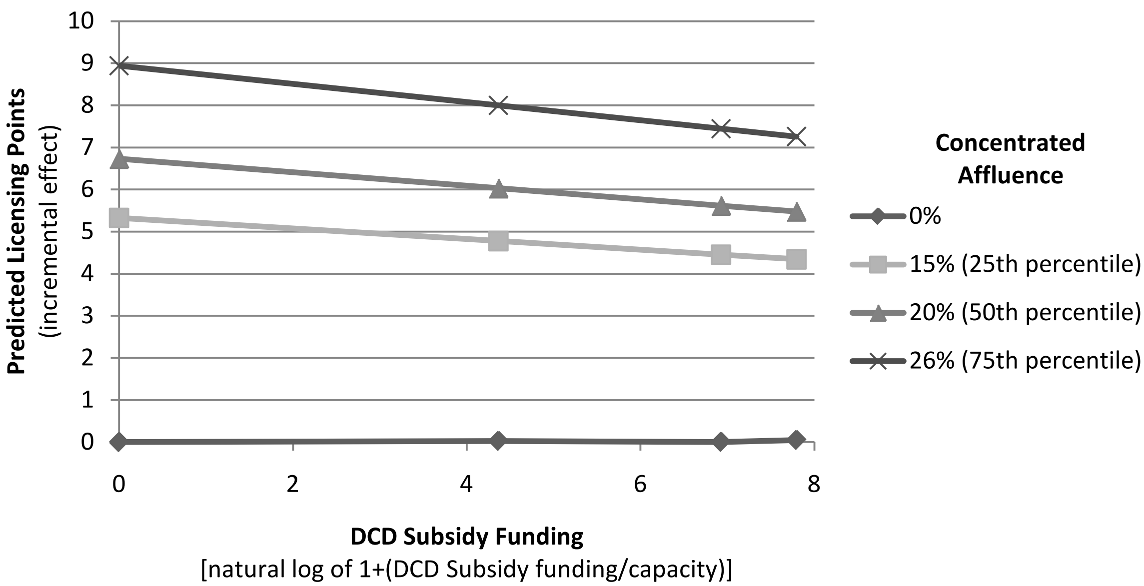


Figure 12. Program Type and Extended Care

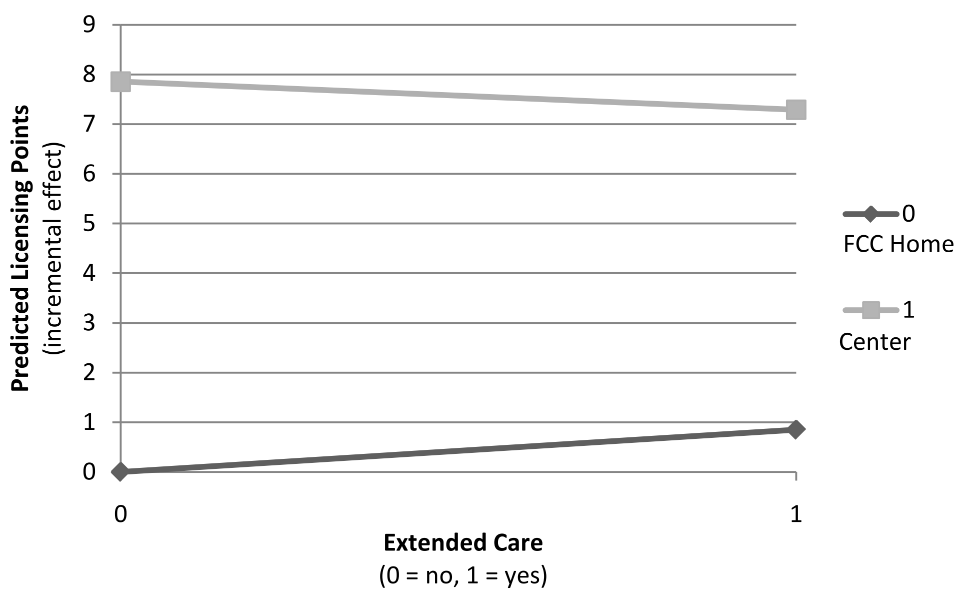


Figure 13. Program Type and Licensed Capacity

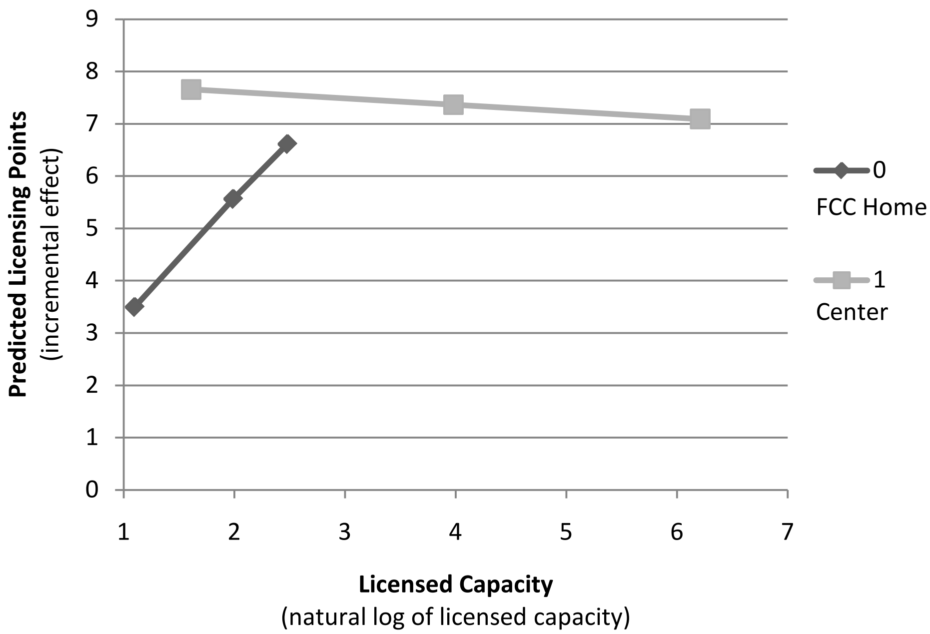


Figure 14. Program Type and Concentrated Affluence

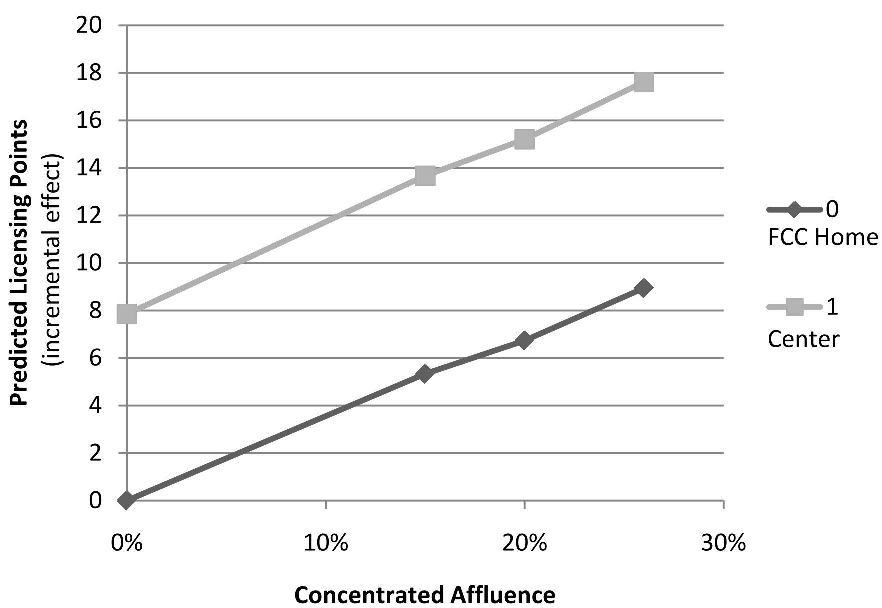
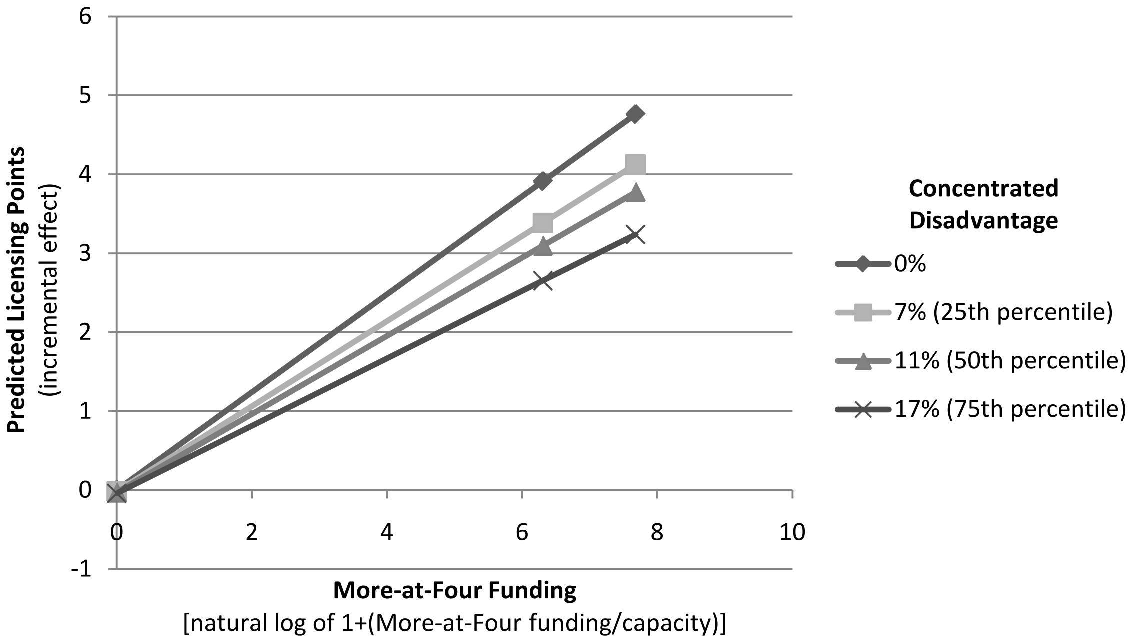


Figure 15. More-at-Four Funding and Concentrated Disadvantage



Hierarchical Generalized Linear Model Interactions

Figure 16. Program Type and Extended Care

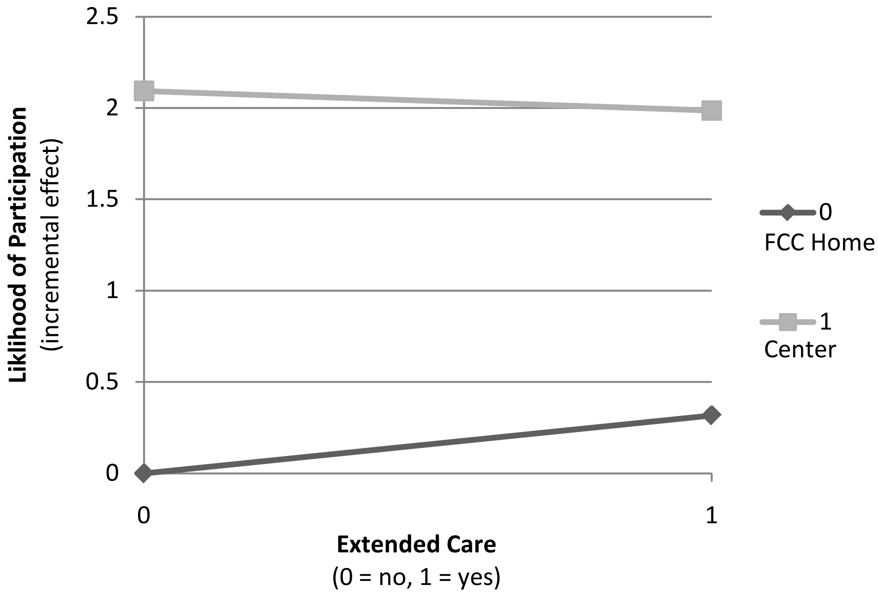


Figure 17. Program Type and Licensed Capacity

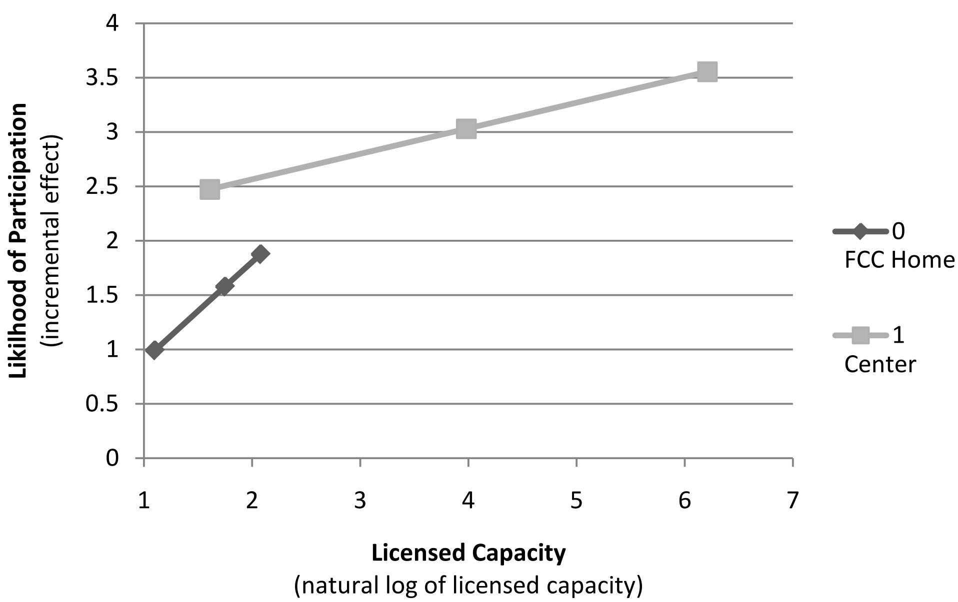


Figure 18. Head Start Funding and Concentrated Immigration

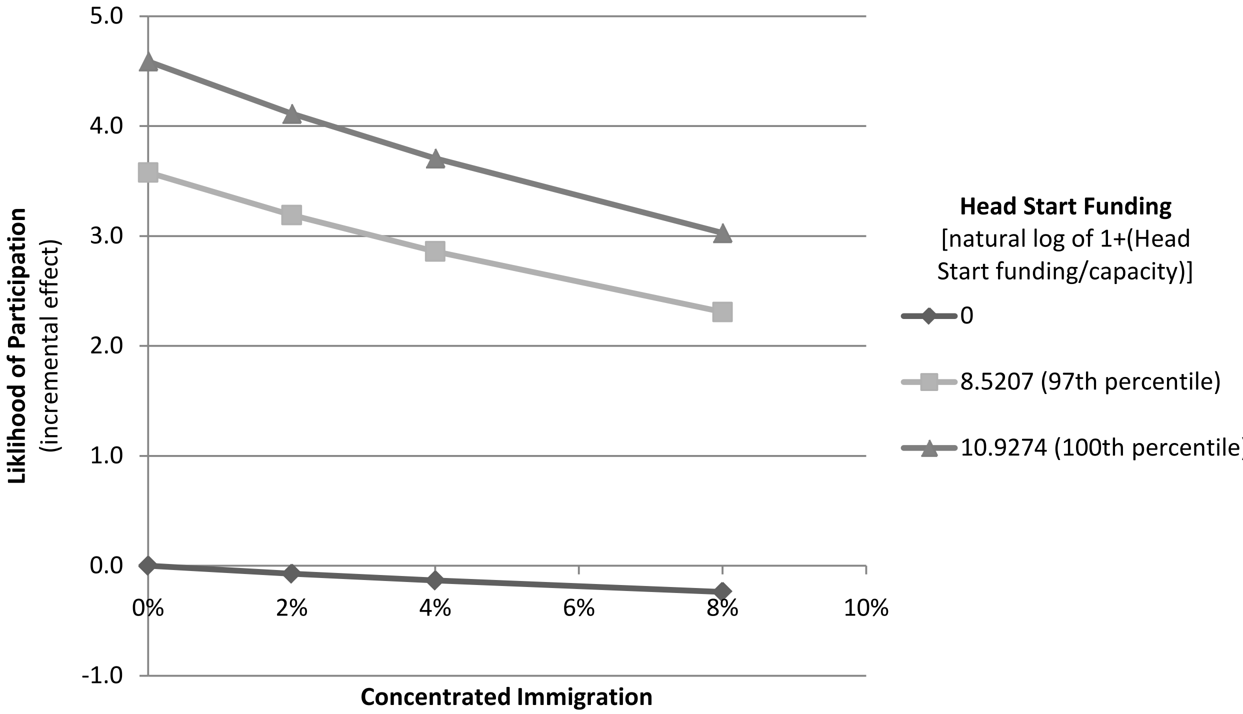


Figure 19. DCD Subsidy Funding and Concentrated Affluence

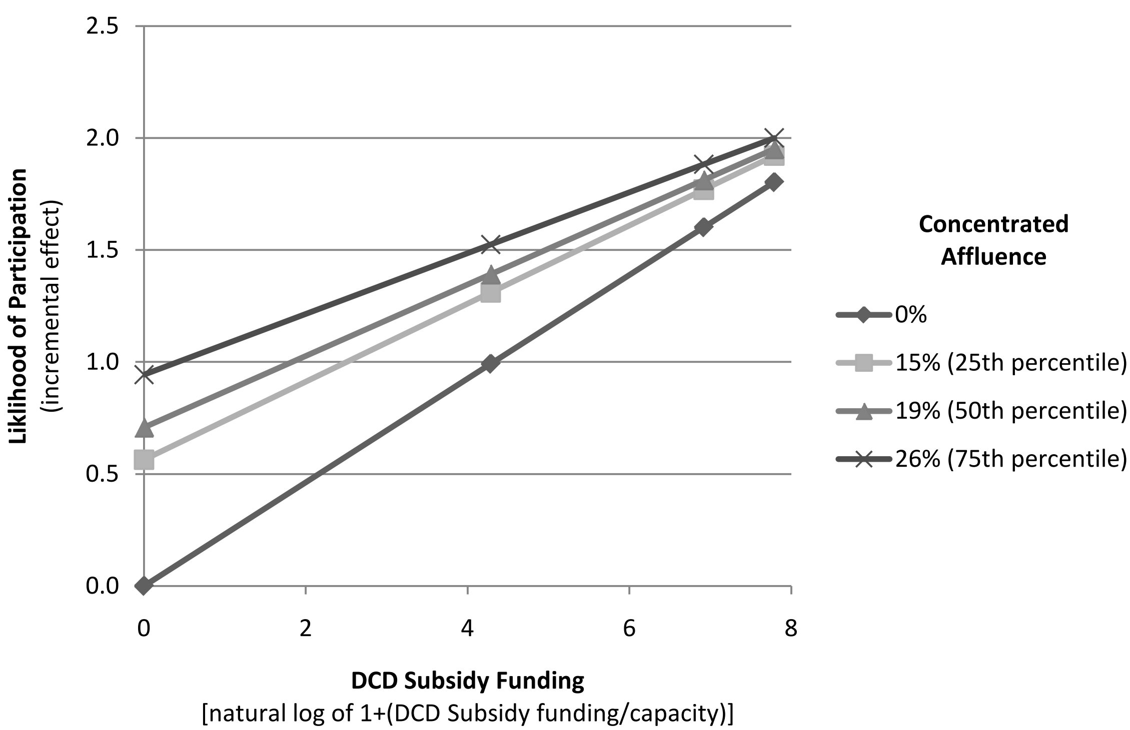
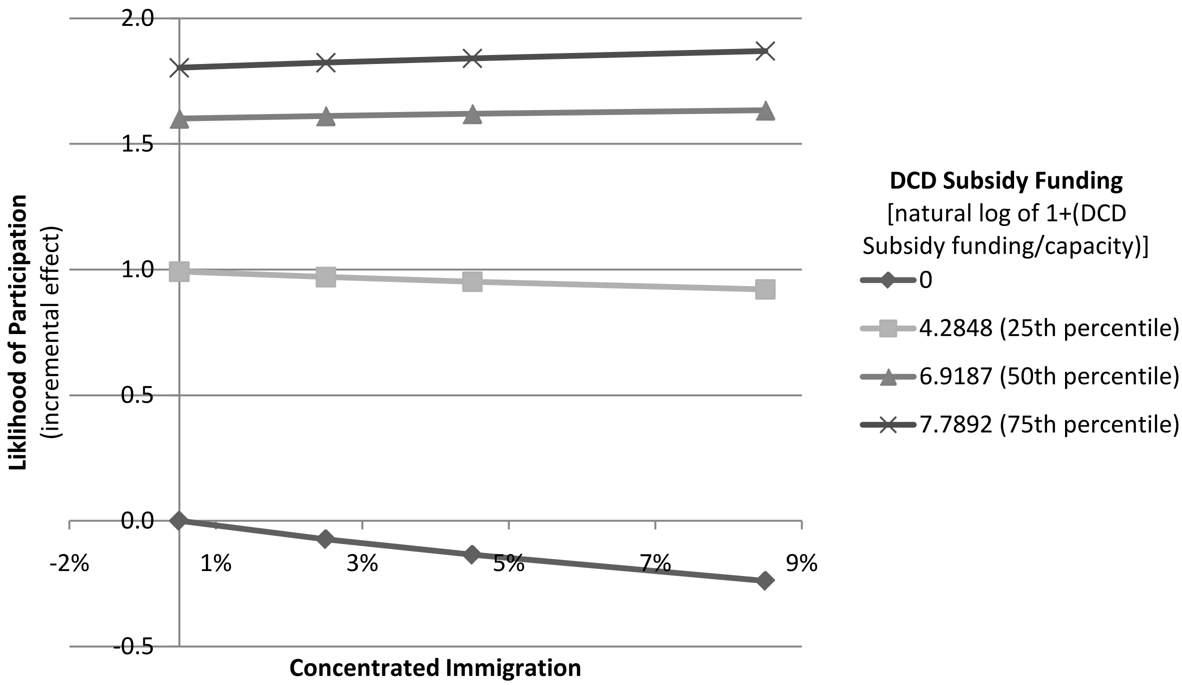


Figure 20. DCD Subsidy Funding and Concentrated Immigration



Subsample Effective 3-Level Interactions with Licensing Points as Outcome

Figure 21. Program Type and Extended Care

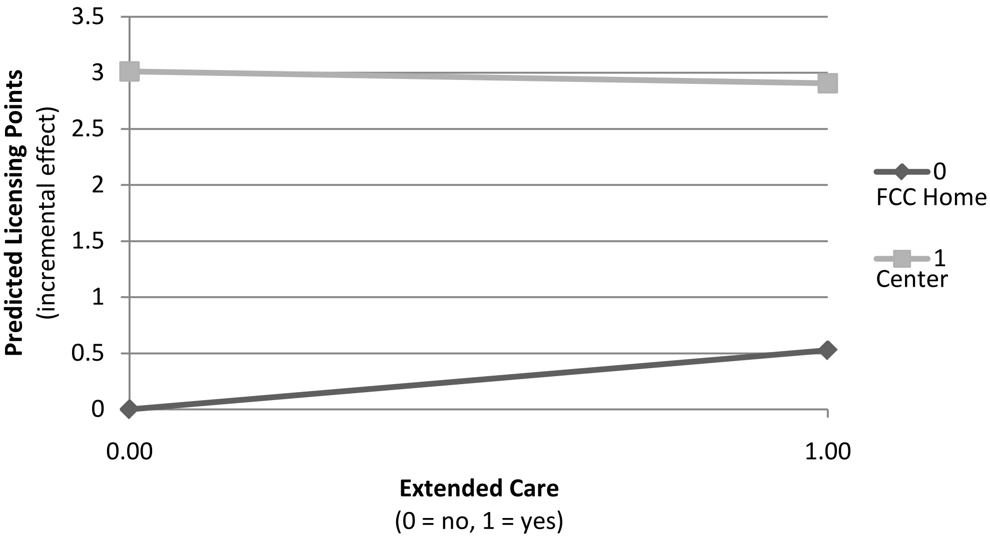


Figure 22. Program Type and Licensed Capacity

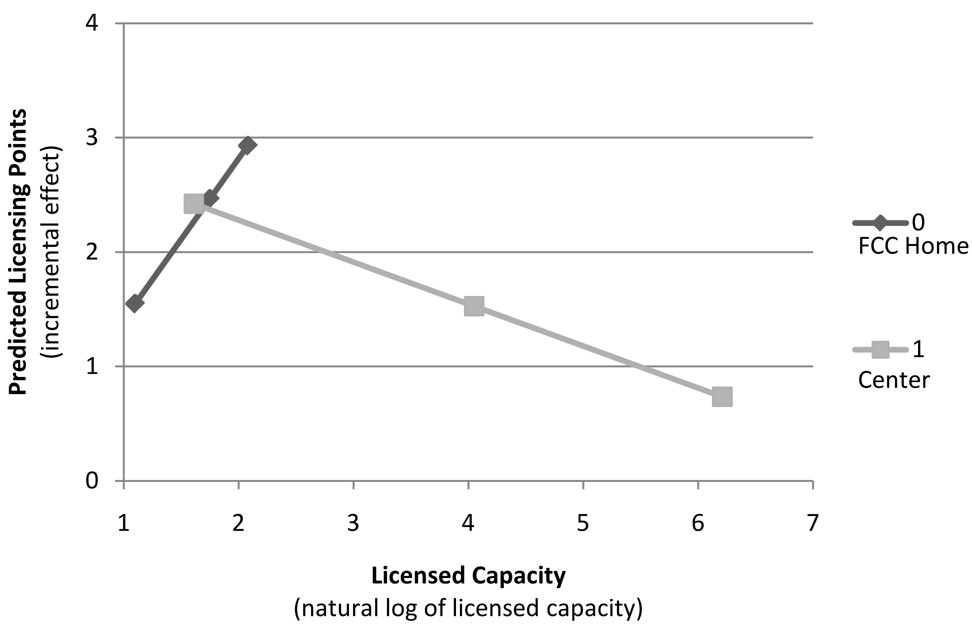


Figure 23. Program Type and Concentrated Affluence

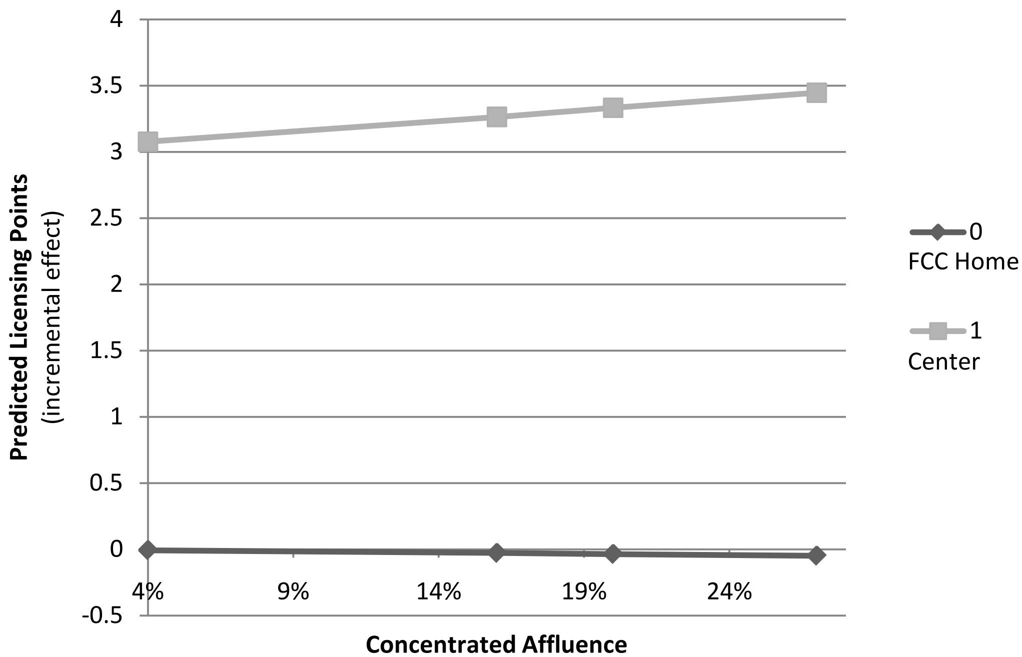
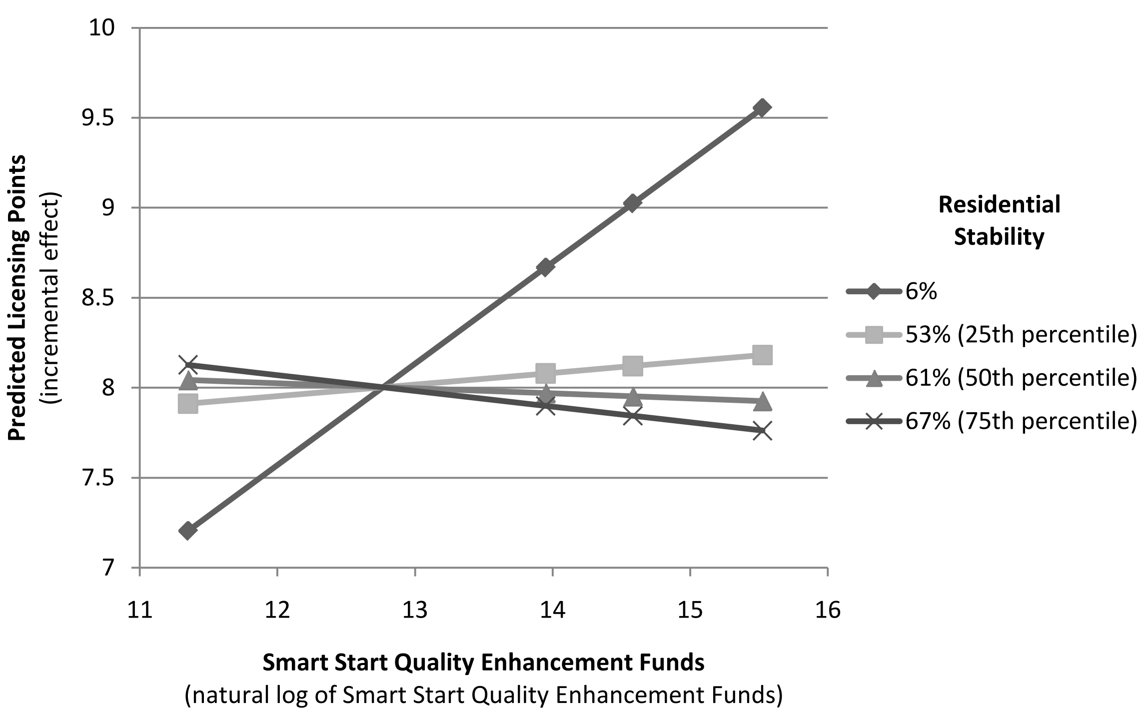


Figure 24. Smart Start Quality Enhancement Funds and Residential Stability



Subsample Effective 2-Level Interactions with ERS Score as Outcome

Figure 25. Program Type and Licensed Capacity

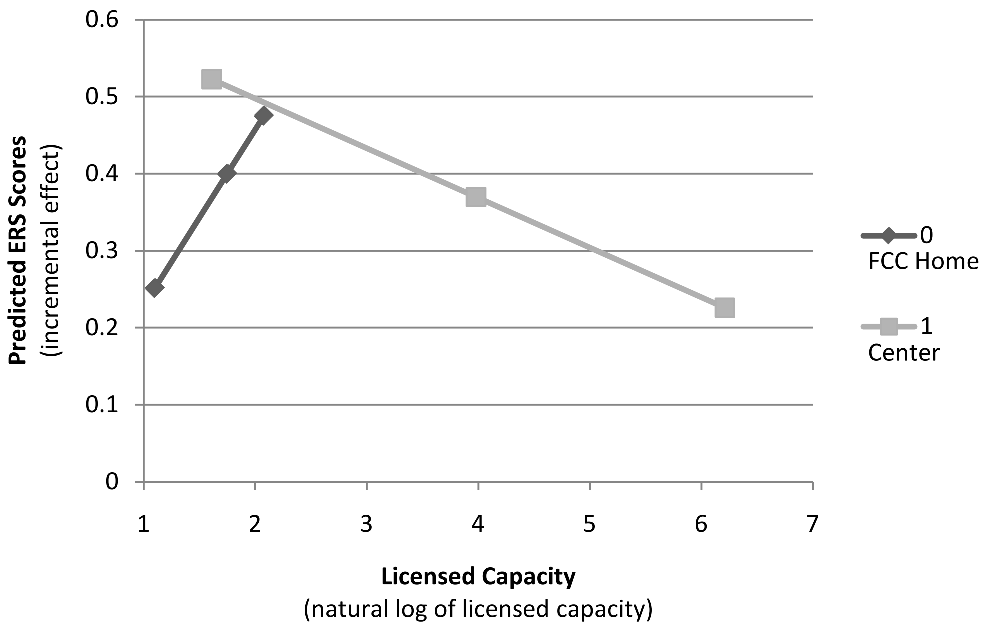


Figure 26. Program Type and Concentrated Immigration

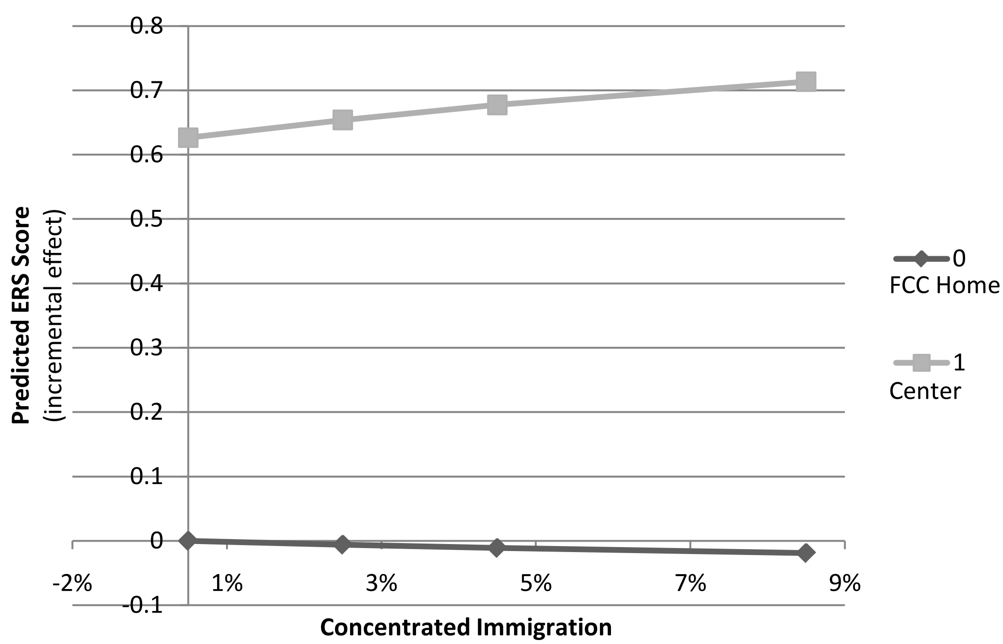


Figure 27. Extended Care and Concentrated Disadvantage

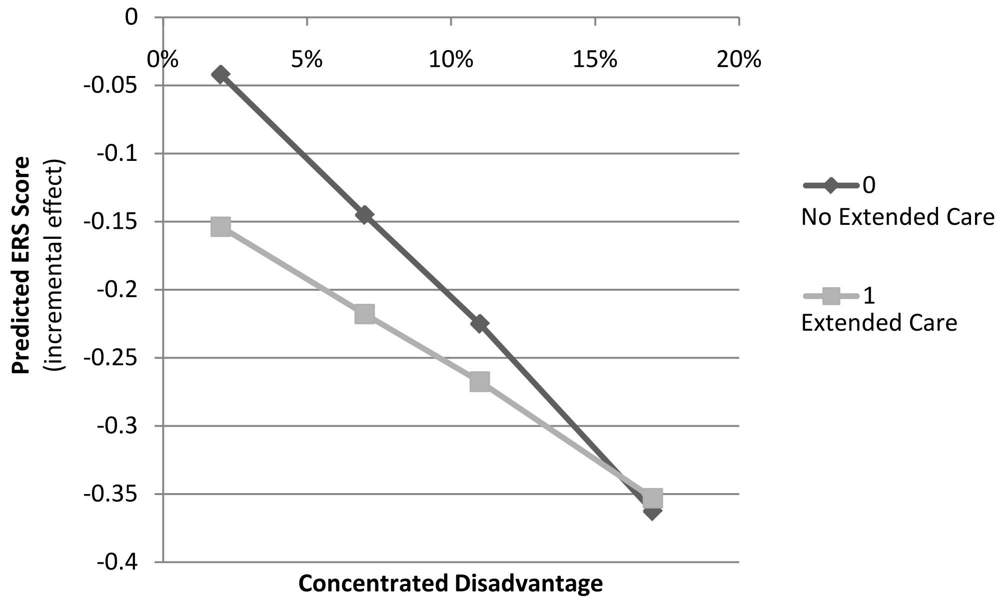


Figure 28. Head Start Funding and Concentrated Disadvantage

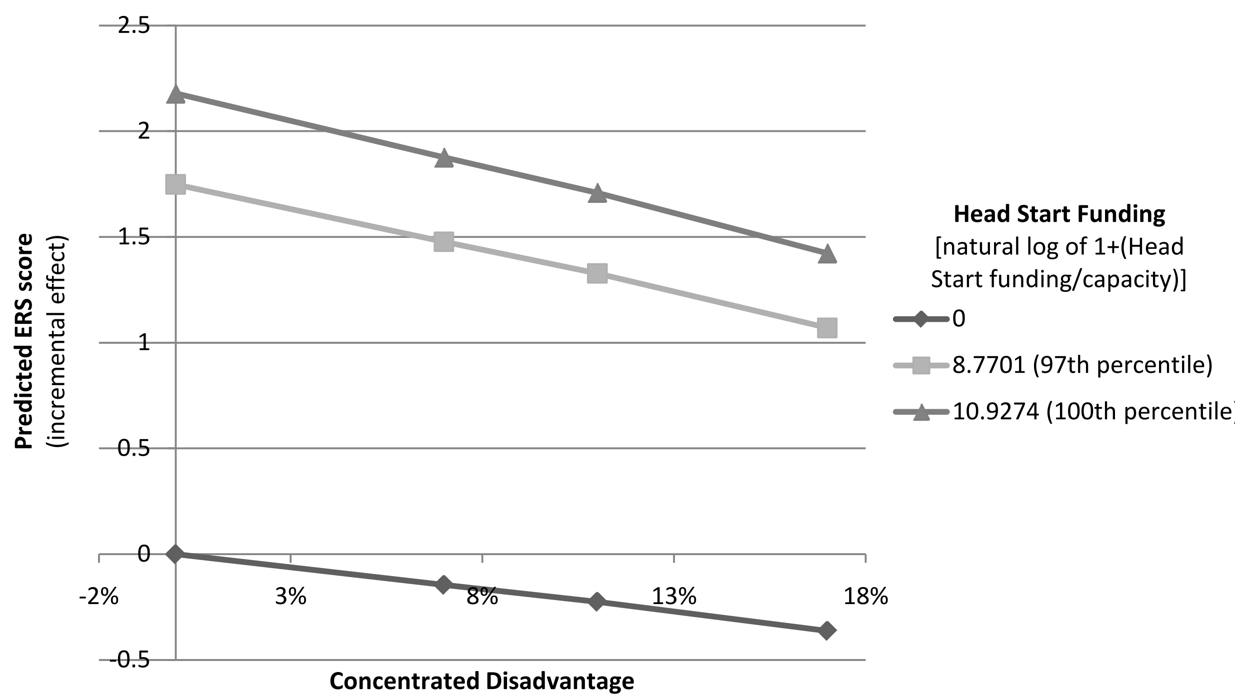


Figure 29. Head Start Funding and Concentrated Immigration

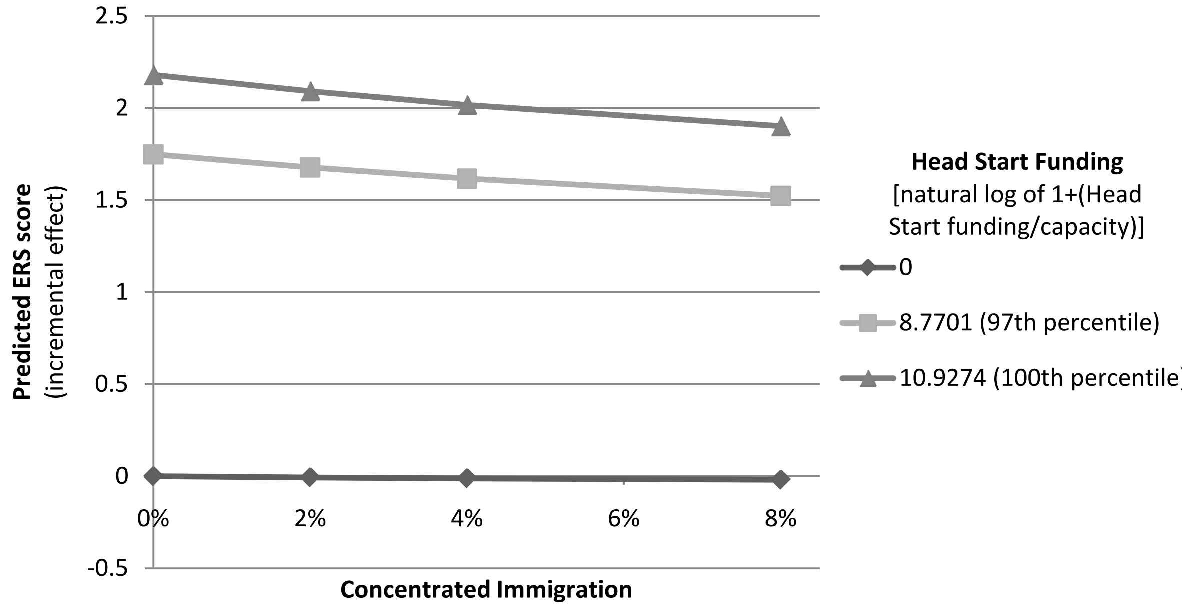


Figure 30. Head Start Funding and Residential Stability

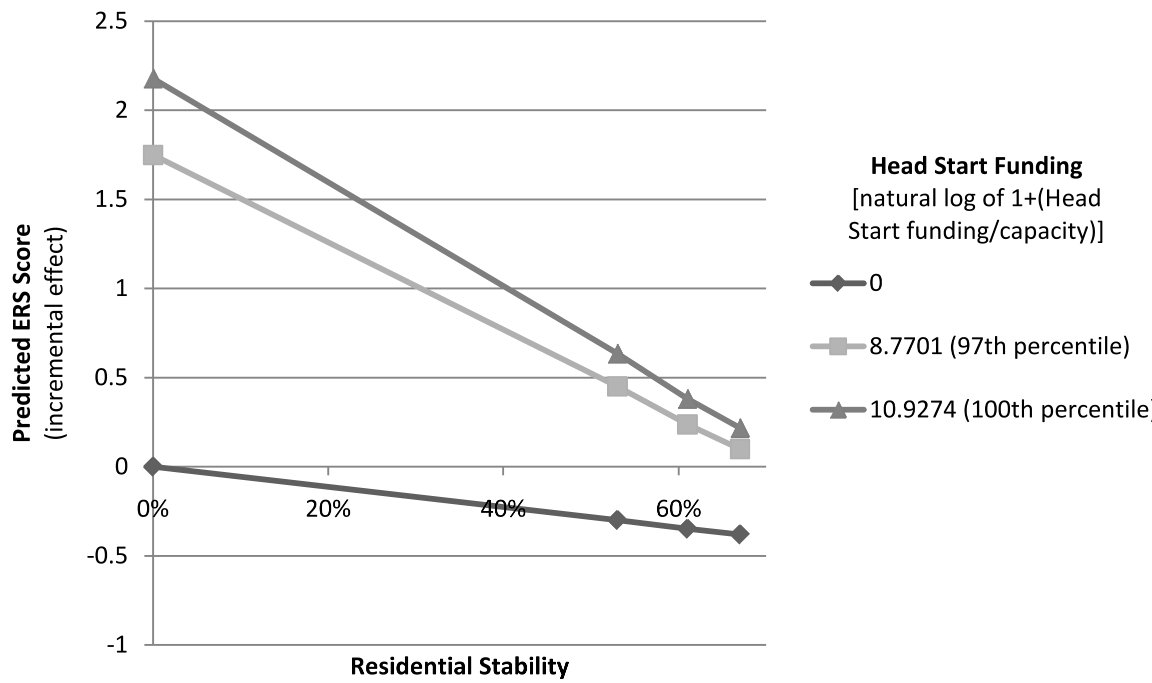
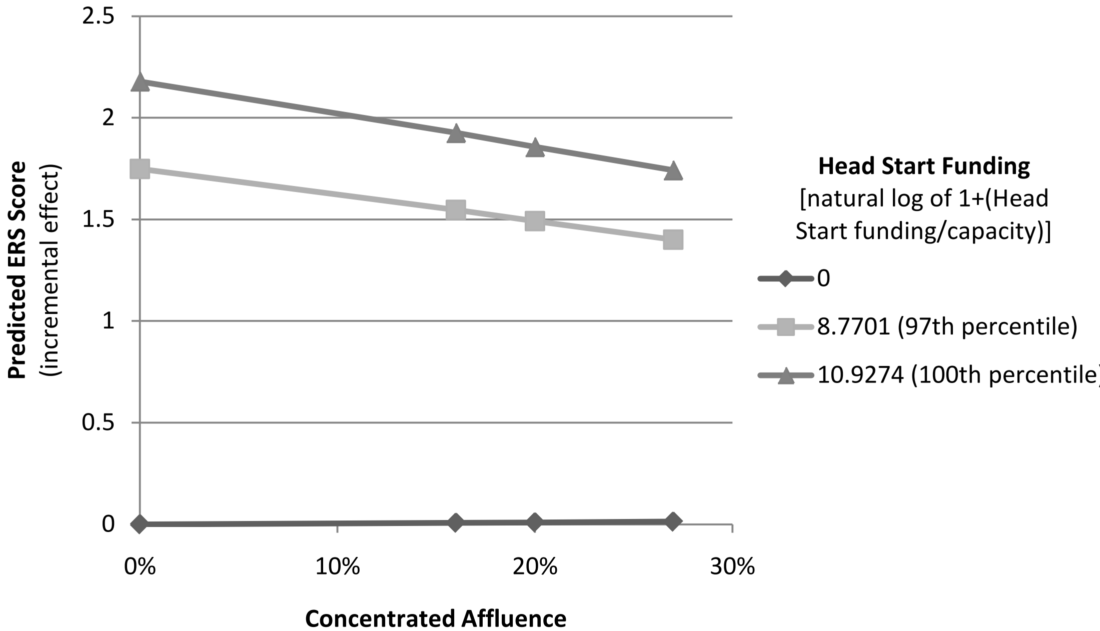


Figure 31. Head Start Funding and Concentrated Affluence



Subsample Effective 3-Level Interactions with ERS Score as Outcome

Figure 32a. FCC Homes, Concentrated Immigration, and Smart Start Quality Enhancement Funds

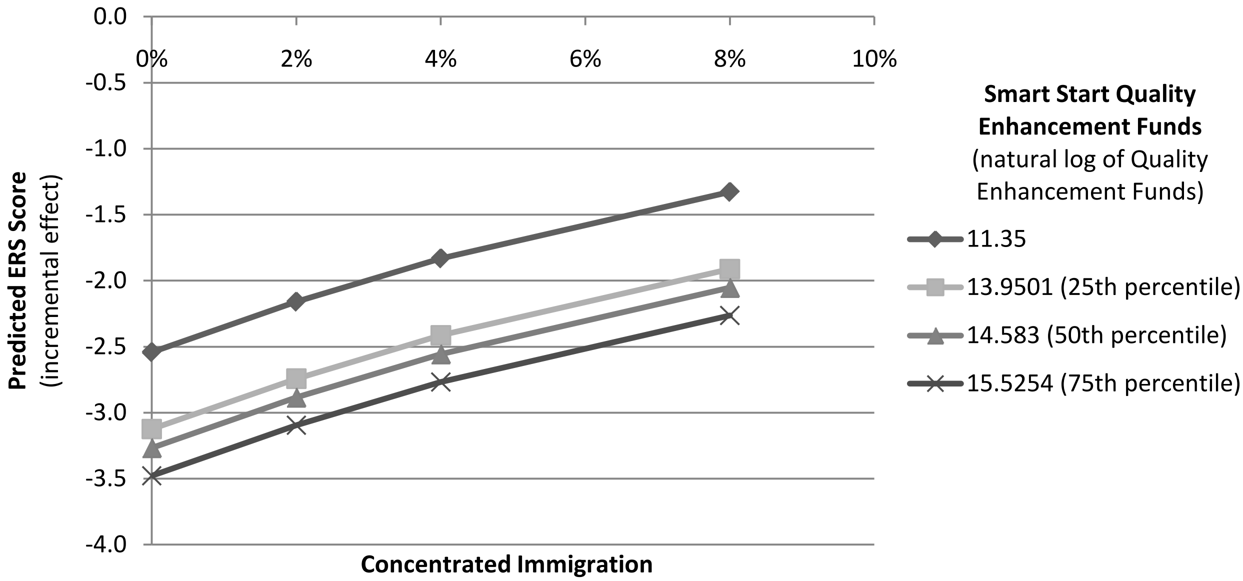


Figure 32b. Centers, Concentrated Immigration, and Smart Start Quality Enhancement Funds

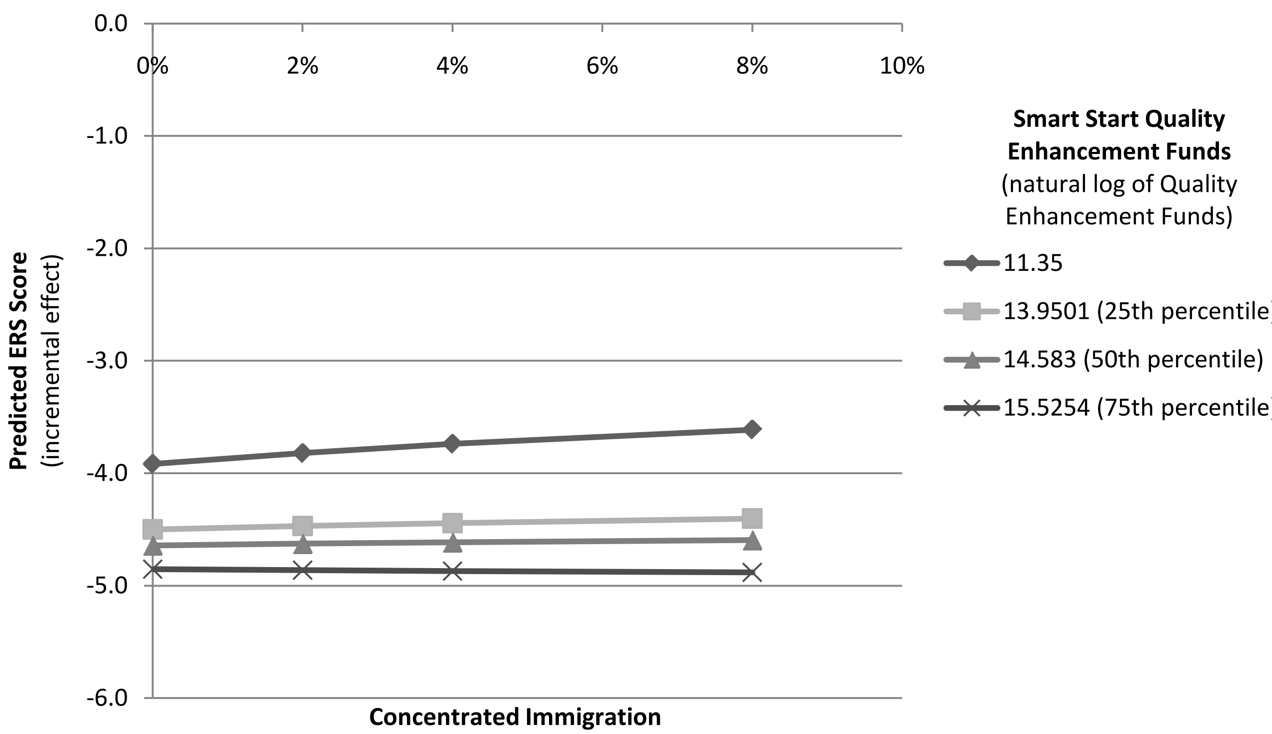


Figure 33a. No Extended Care, Concentrated Disadvantage, Smart Start Quality Enhancement Funds

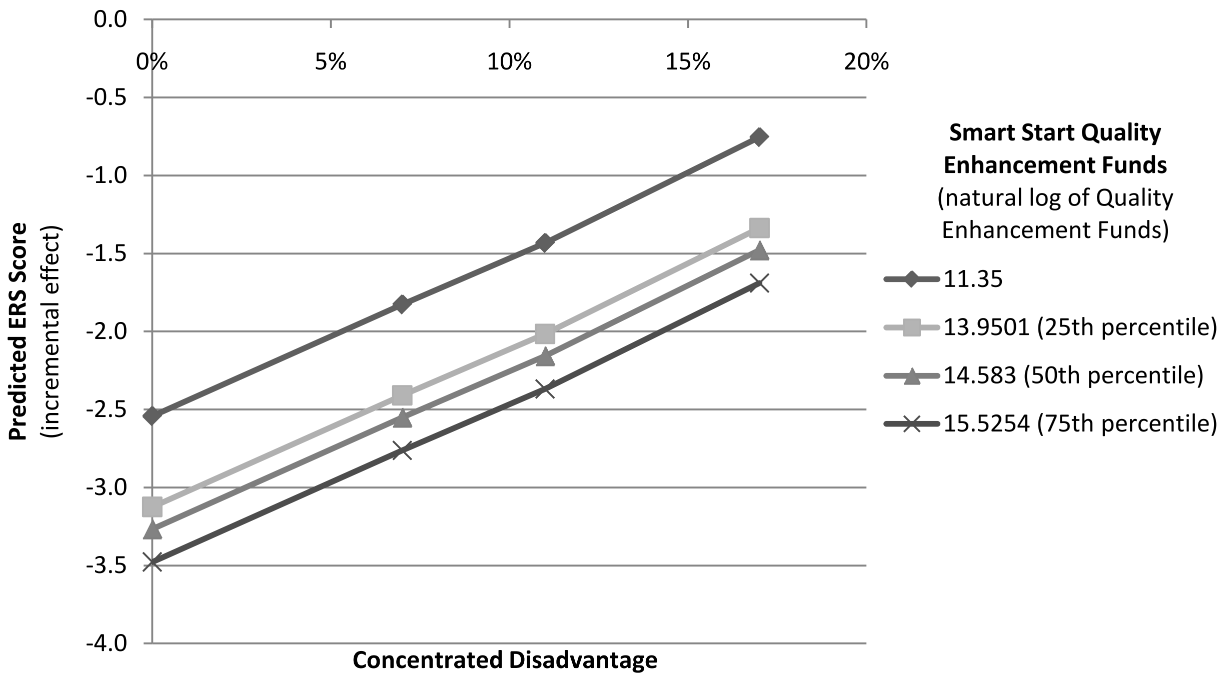


Figure 33b. Extended Care, Concentrated Disadvantage, Smart Start Quality Enhancement Funds

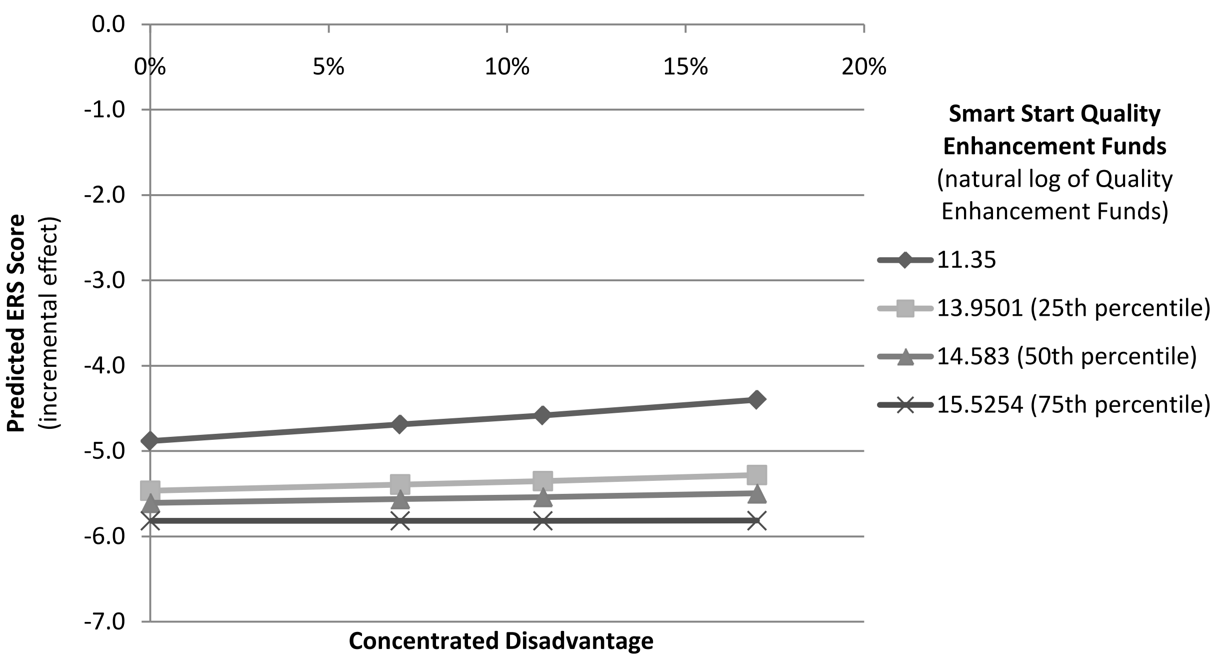


Figure 34. Program Type and Licensed Capacity

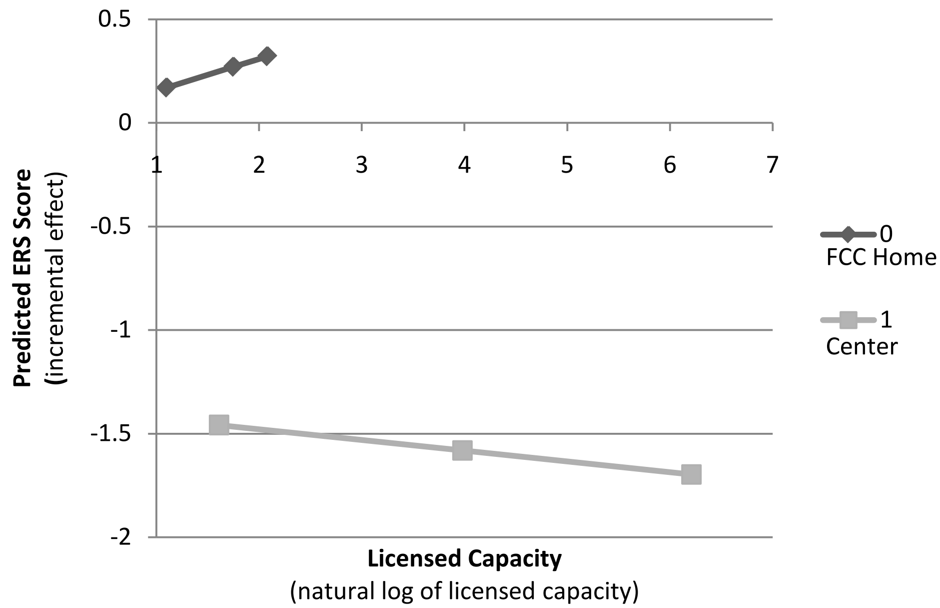


Figure 35. Head Start Funding and Concentrated Disadvantage

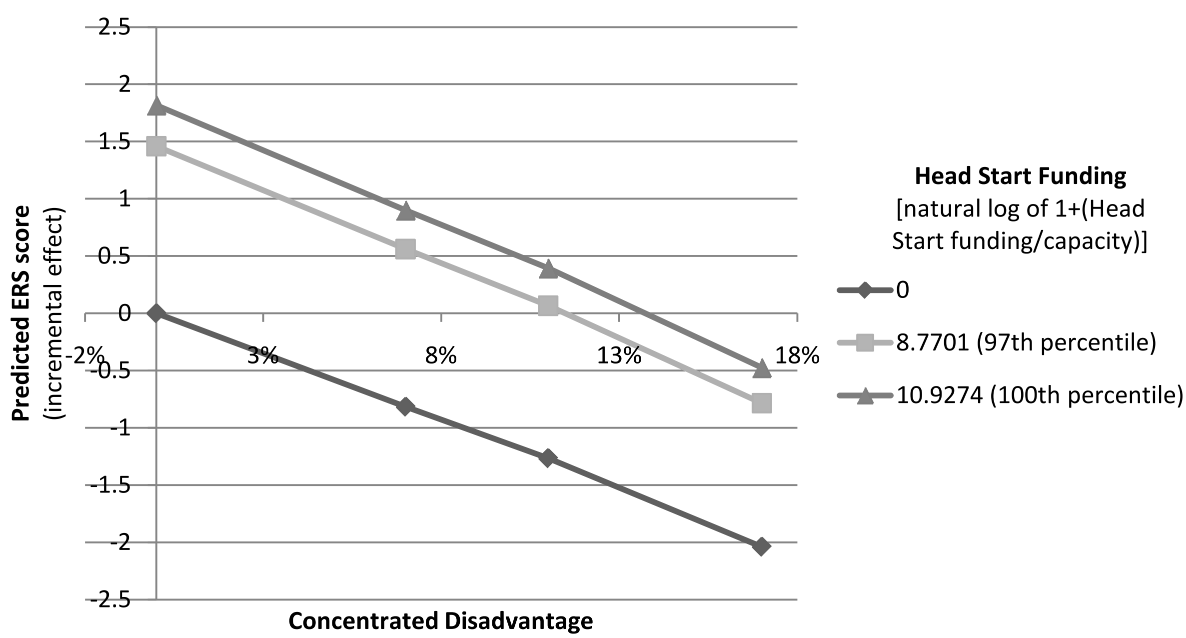


Figure 36. Head Start Funding and Concentrated Immigration

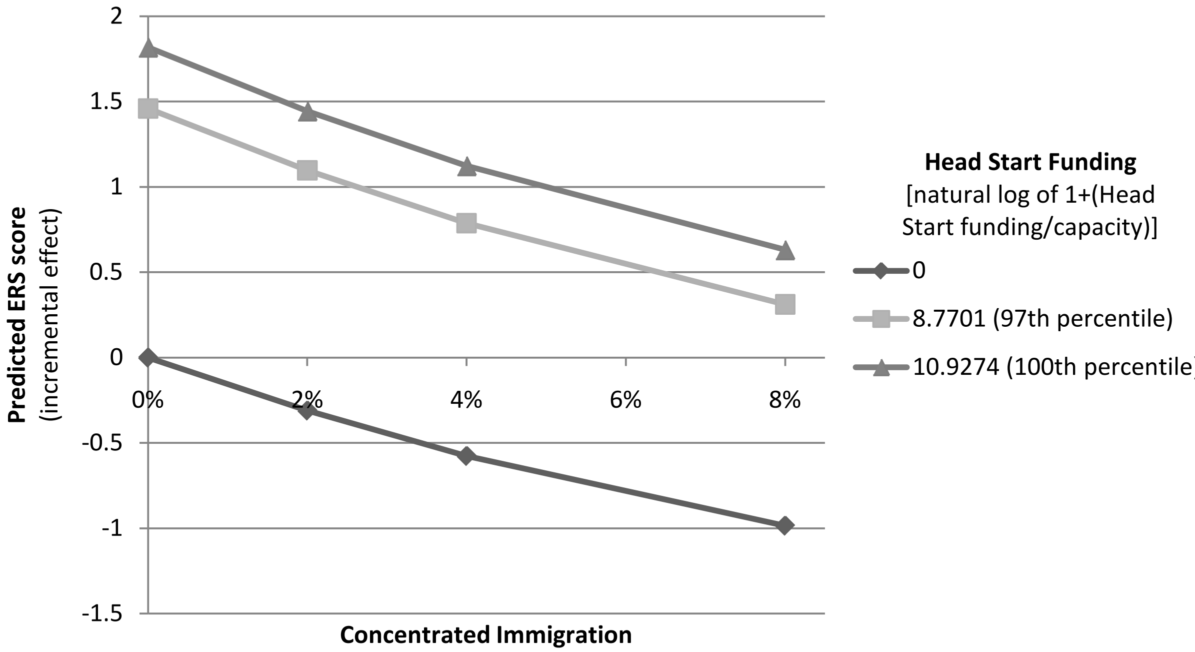


Figure 37. Head Start Funding and Residential Stability

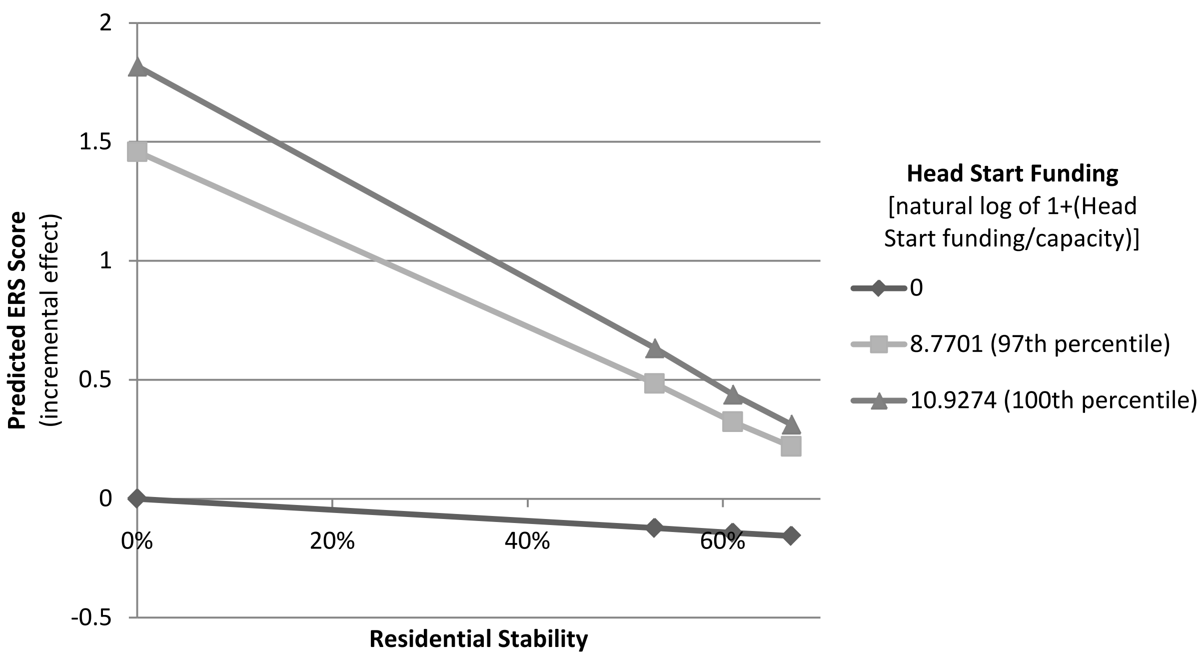


Figure 38. Head Start Funding and Concentrated Affluence