Individual and family correlates of high and low achievement among children in a Head Start Program

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INDIVIDUAL AND FAMILY CORRELATES OF HIGH AND LOW ACHIEVEMENT AMONG CHILDREN IN A HEAD START PROGRAM

by

Millah Musungu

A Dissertation
Submitted to the University at Albany, State University of New York
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Individual and Family Correlates of High and Low Achievement among Children in a Head Start Program

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ABSTRACT

Preschool children living in poverty are at risk for not attaining the required pre-academic and social-emotional skills that predict successful transition to kindergarten. The present study investigated individual and family correlates that were hypothesized to predict and classify children in high, average, and low achievement groups in a Head Start Program. The study was based on analyses of archival data from 745 children who attended the Schenectady Community Action Program (SCAP) Head Start during the period encompassing the 2005-2010 academic years. The study used a combination of binary logistic regression analysis, independent-samples t-test, and qualitative survey results to address research questions of primary interest.

Among the measures of specific child characteristics and child risk factors, the social emotional measure was found to be the single best predictor in classifying children into high, average, and low achievement groups for both the total sample of Head Start children and subsamples of children involved in the program for one and two years, respectively. Other variables such as the language measure, a composite measure of child risk, and gender were predictive of membership in some but not all of the achievement
groups. Surprisingly, a composite measure of family risk was not a significant predictor in classifying children in any of the achievement groups, either in the total sample or in the two subsamples. In addition, interactions between the child and family risk composites did not predict membership in any of the achievement groups. However, when the analyses were conducted using individual components of the family risk factor for the total sample, a significant interaction was found between the child risk composite and the primary language spoken in the home in classifications involving only the low versus the high achieving children. The independent sample t-tests produced statistically significant differences between selected subsamples of high and low achieving children on the following subscales of a Home Survey measure: (a) the child’s home literacy environment (b) the amount of time the caretaker spends with the child (c) the family support system, and (d) family stability.
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CHAPTER 1: INTRODUCTION

Risk Factors Associated with Poverty

Preschool children from disadvantaged families are at risk for not attaining the required pre-academic and social emotional skills that predict successful transition to kindergarten (Brooks-Gunn, 2003). Moreover, as these children move through elementary school and beyond, the differences persist, thus increasing the probability of a negative developmental trajectory. Longitudinal studies have found strong correlations between early childhood achievement measures and later school performance (e.g. Cunningham & Stanovich, 1997; Snow, Tabors, & Dickinson, 2001). Poor academic achievement has been found to be the strongest school-related predictor for whether students will leave high school before graduation in the United States. Between one-quarter and one-third of the nation’s student population is estimated to have dropped out of school before completing high school (Barton, 2005; Durand-Drouhin, McKenzie, & Sweet, 1998).

A number of risk factors associated with poverty have been found to have negative effects on academic achievement in young children. According to the bio-ecological system frameworks, most of the risk-producing conditions affecting the achievement of low-SES children are believed to come about through the interaction between factors in the child’s maturing body and their microsystem (Bronfenbrenner & Morris, 1998; Luthar, Cicchetti, & Becker, 2000). At the same time, the early childhood literature provides ample evidence to support the notion that multiple risk factors in the child’s home and school environments may affect both social emotional and cognitive development and hence academic achievement. Risk factors associated with poverty may
include those that exist within the child herself, such as less-than-optimal physical health, less-than-optimal cognitive abilities, and emotional and behavioral disorders (McLoyd & Wilson, 1991). Risk factors may also include family circumstances that limit the child’s exposure to important precursors of academic achievement such as language enrichment, opportunities to learn about print concepts and conventions, or basic enumeration concepts. Such limitations may come about because the child resides in a single-parent household, has many siblings, or has a poorly educated caregiver. The child may also have been exposed to a dysfunctional child-rearing environment characterized by neglect and inconsistent care; sexual, emotional, and physical abuse; inconsistent discipline and poor supervision; parental strife leading to divorce or separation; high levels of family discord; or domestic violence. All of these factors are known to contribute to educational disadvantage (Natriello, McDill, & Pallas, 1990).

Similarly, a child’s educational development is negatively affected if her parents have significant mental health and adjustment problems, psychiatric disorders, substance abuse disorders, and criminality (Fergusson, 1999; Luthar, 1999; Sameroff, Selfer, Barocas, Zax, & Greenspan, 1987). Finally, the child living in poverty may be subject to additional risk factors inherent in neighborhood schools where there may be a high proportion of disadvantaged and poorly motivated classmates, low teacher expectations, low quality of remedial and classroom instruction, and inadequate reinforcement of academic achievement from peers and teachers (Brooks-Gunn, Duncan, & Maritato, 1997).

There is abundant evidence that risk factors such as those specified in the preceding sections are especially detrimental during the first five years of life (e.g. see
Greenbaum & Auerbach, 1992; Rutter, 1979; Scarr, 1998). The literature also suggests that if one or more debilitating risk factors persist for long periods of time, the cumulative risk will increase multiplicatively (Kauffman, 2005; Korenman, Miller, & Sjaastad, 1995). Indeed, it has been demonstrated that a combination of more than three risk factors places a child at a substantially increased risk for negative outcomes (Dunst & Trivette, 1992; Sameroff et al., 1987).

Yet, despite the well-documented risks associated with poverty, there are, nevertheless, a number of protective factors that have been shown to be related to more positive outcomes for at least some children from high-poverty environments. By some accounts, these protective factors act as “shields” that serve to mitigate the effects of poverty-related risks for these more “resilient” children (Werner & Smith, 1992). Protective factors that have been identified in the area of inquiry concerned with this issue (sometimes called “resiliency research”) include social supports available in the home, school, and community as well as individual factors such as social competence, autonomy, and a positive sense of self (Constantine, Benard, & Diaz, 1999; Luthar, Cicchetti, & Becker, 2000). Classic resiliency research has often concentrated on the description of protective factors in the face of risk and adversity. However, there is a growing trend toward description of protective factors beyond the traditional social emotional perspective (Werner & Smith, 1992), specifically, to other domains such as academic literacy. Literacy researchers have increasingly focused on children who, despite living in impoverished and sometimes dysfunctional households, attain superior performance at school and adequately manage their relations with peers (Mello, 1996; Taylor, 1994; Wyner, Bridgeland, & DiIulio Jr., 2007). Consequently, the term academic
resiliency is used in the literature to refer to high levels of achievement among disadvantaged children, despite the presence of stressful events and conditions that place them at risk of doing poorly in school (Alva, 1991).

**Determinants of Academic Readiness and Achievement**

**Child’s Physical Health and Development.** A key influence on academic achievement, especially among disadvantaged families, is the child’s physical health and development. Many factors associated with poverty are believed to have an impact on health; these include life stressors, lack of access to health care, fewer opportunities for preventive care, and environmental factors such as the conditions of the neighborhoods where poor families tend to live. For example, a study by Ding, Lehrer, Rosenquist, & Audrain-McGovern (2006) found that poor health had a sizeable impact on academic achievement in children. Performance standards for the Head Start health component were created in recognition of the fact that enriching the academic and social emotional environments of disadvantaged children would not benefit children who are ill and hungry (Zigler, Piotrkowski, & Collins, 1994). A study by Starfield & Budetti (1985), found that illness is more common among poor children and more severe when it occurs. Poor children are twice as likely to have low birth weights, three times as likely to lack required immunizations during the preschool period, three times as likely to have hearing problems, and 75 percent more likely to be admitted to a hospital in a given year. Thus, good physical health and nutrition are a prerequisite for adequate development of social, emotional, cognitive, and academic skills. Children who come from disadvantaged home environments are far too often at risk for poor physical health and nutrition; as a consequence, they are far too often at risk for the deleterious effects of such deficiencies.
Cognitive and Language Development. Another determinant of academic achievement is cognition and language development. Cognition entails a child’s acquisition of knowledge about his surroundings and involves processes such as attention, perception, and memory (Bukatko & Daehler, 2004). Jean Piaget’s stage theory (Piaget, 1959; Piaget & Inhelder, 1969) and Lev Vygotsky’s language-based theory (Vygotsky, 1962, 1978) have both had a great influence in the conceptualization of early childhood education. Piaget is best known for his stage theory of cognitive development. He proposed that children go through an invariant sequence of four qualitatively distinct stages, namely: the sensorimotor stage from birth to two years; the preoperational stage from two to seven years; the concrete operational stage from seven years to 11 years; and the formal operational (abstract thinking) stage from 11 years and beyond (Piaget, 1959). On the other hand, Vygotsky focused on the sociocultural context in which people act and interact in shared experiences. He proposed that children can, with help from others who are more knowledgeable, master concepts and ideas that they would otherwise not understand on their own. Vygotsky also postulated that people use language to mediate their social environments.

A number of studies have found significant correlations between measures of cognitive ability and academic achievement (Neisser, et al., 1996) and such measures have been shown to predict academic achievement (Arlin, 1981; Rhode & Thompson, 2007). For example, the American Psychological Association conducted a comprehensive review of the literature on intelligence and reported that measures of intelligence tend to be strongly correlated with measures of school achievement (Neisser, et al., 1996).
Although early childhood research assessing the effects of family influences on academic readiness, in the broad sense of the term, is scant, one important variable that has received a good deal of attention in such research is the relationship between the amount of oral and written language enrichment provided in the preschool child’s home environment and later literacy and language development. Early literacy research that focused on the home environment documented the existence of a wide landscape of oral and written language interactions between caregivers and children in low SES families. This research suggests that variability in the nature of such interactions has a significant influence on early literacy development. For example, in a study evaluating the relationship between emergent literacy and later reading ability conducted with a large sample of Head Start children, Storch and Whitehurst (2001) found that 40% of the variance in kindergarten children’s pre-reading skills was predicted by Head Start children’s pre-reading skills. At the same time, Head Start children’s language and pre-reading skills were significantly predicted by home background variables such as the child’s literacy environment, language enrichment, and parental expectations. Similar results were obtained in predictive studies with Head Start children conducted by Lonigan, Burgess, and Anthony (2000) and by Storch and Whitehurst (2002), (see also Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Lonigan & Whitehurst, 1998; Whitehurst, Arnold, Epstein, Angell, Smith, & Fischel, 1994).

Similarly, Dickinson and Tabor (2001) assessed the nature of the language and literacy environments provided in preschool children’s home environments and found that exposure to a rich oral and written language environment was positively and significantly correlated with performance on language and literacy measures in
kindergarten. Furthermore, a number of studies have found that oral language enrichment in the home environment of preschool children predicts literacy development through the middle school years. For example, a longitudinal study conducted by Tabors, Snow, and Dickinson (2001) followed children from kindergarten through seventh grade and found that measures of receptive vocabulary and emergent literacy skills assessed in kindergarten (e.g. print concepts, environmental print, letter names, and sounds) were highly and significantly correlated with measures of receptive vocabulary and reading comprehension in both fourth and seventh grades.

In addition, a review of eight studies was conducted with economically-disadvantaged families assessing the effects of dialogic reading (shared and interactive book reading) on oral language development and phonological processing skills (Institute of Education Sciences, 2007). This review reported positive effects on oral language development in five of the studies, although no discernible effects were reported on phonological-processing skills.

Research in mathematical knowledge in preschools also shows that children vary greatly in the mathematical knowledge they possess when they enter school. These differences in initial mathematical knowledge in kindergarten appear to have large, long-term consequences and are strongly predictive of mathematics achievement test scores in elementary, middle, and even in high school (Duncan et al., 2007; Stevenson & Newman, 1986). Similarly, a report by the Third International Mathematics and Science Study (Beaton et al., 1996) also revealed that home environment factors are strongly related to mathematics and science achievement in every TIMMS country studied.

Other academic areas such as music, art, and imaginative play skills have not
been as widely researched. It is believed, however, that daily activities in homes that are rich in early music, art, and imaginative play skills can help promote later development and application of these skills in new contexts. For example, conversations, stories, songs, and art activities are excellent vehicles for developing, concurrently, math, literacy, and language skills along with music and art skills. Thus, one of the major objectives of the present study is to assess the nature and quality of the home environment in facilitating the acquisition of academic readiness skills.

**Social Emotional Development.** Another important variable that is known to contribute significantly to a preschool child’s academic readiness and achievement is the caregivers’ ability to create a safe, nurturing, and stable home environment that facilitates positive and healthy social emotional development. Indeed, there is ample evidence that a child’s social emotional development is important for school learning and adjustment. Behaviors required of children for positive adjustment to preschool include responding successfully to teachers’ and peers’ expectations regarding instruction, learning, and general interpersonal skills (Walker, Severson, & Feil, 1995). Preschool children are also expected to follow directions and to engage in social play and cooperative activities for optimum learning to take place (Greenspan & Breslau-Lewis, 2000). Children who are well adjusted, focused, and highly motivated tend to initiate and sustain productive and healthy social relationships with both their peers and their teachers more so than children who do not have these personal characteristics. They also tend to be higher achievers than children from the latter group. In fact, research has shown that there is a strong relationship between measures of social emotional adjustment and measures of academic difficulties during childhood (Lane, Gresham, & O’Shaughnessy, 2002). Social
emotional factors such as self-concept, self-control, cooperation, persistence, problem solving, communication skills, and initiative have been found to correlate significantly with academic achievement (Marsh, Chessor, Craven, & Roche, 1995). However, it is not clear if social emotional problems increase the likelihood of low academic achievement or if low academic achievement increases the likelihood of social emotional problems. Some studies suggest that the relationship is likely to be both reciprocal and recursive (Al Otaiba & Fuchs, 2006). Thus, many educators strongly advocate that low performing children receive intervention in both social emotional and academic skills because the two conditions seem to co-occur (Kauffman, 2005). Since many children exhibit both academic and social emotional deficits upon entering preschool, research should be directed at identifying factors in the home environment that may impair healthy social emotional and academic development.

**Family Influences on Academic Readiness.** Research on family factors has often identified the following variables as sources of individual differences in academic readiness and achievement among children: single parent family, educational level of the primary caregiver, family size, and the quality of the home environment (Eamon, 2001; Hanson, McLanahan, & Thomson, 1997; Linver, Brooks-Gunn, & Kohen, 2002).

One of the most researched family factors that is believed to have the greatest effect on the child is single parenthood. Researchers have often found that growing up in a single parent family is associated with negative consequences for children (McLanahan & Sandefur, 1994). For example, Dawson (1991) found that the child has increased vulnerability to health problems, increased psychological distress (Zill & Peterson, 1986), and a greater likelihood of engaging in problem behaviors or deviant activities
The primary caregiver’s level of education is also important in predicting children’s achievement (Smith, Brooks-Gunn, & Klebanov, 1997). This may be because the caregiver’s educational level may influence the type of jobs that she can obtain, hence affecting the household income, quality of life, nutrition, health care, and generally the resources available to the family (Davis-Kean, 2005).

The size of the family, especially among low SES households, may equally influence the academic readiness of children in that family. This could happen because with more children, there is even less available income for healthy food, health care, quality time, and educational materials (Wagner, Schubert, & Schubert, 2001).

The quality of the home environment has also been linked to a child’s academic achievement. Activities in the home such as the degree of enrichment, intellectual stimulation, and exposure to educational resources, have been shown to have positive effects on a child’s cognitive development and academic achievement (i.e. Snow, 1997; Soderstrom, 2007; Pan, Rowe, Singer, & Snow, 2005).

**Programmatic Efforts.** There have been on-going programmatic efforts to intervene on behalf of young children living in poverty. The first and most influential of these efforts was the Head Start program, which was initiated in the mid-1960s. Head Start, as originally conceived, was designed to promote age-appropriate physical, social emotional, and cognitive development in disadvantaged preschoolers. Thus, the program’s primary goal was to shield disadvantaged children from the negative effects of poverty by providing them with nurturing experiences and compensatory education that would prepare them for school readiness and help to promote their long-term success.
(Zigler, 2007). According to a recent report by the Administration on Children Youth and Families (2010), Head Start programs have been providing comprehensive services in the following four areas: (a) education to foster intellectual and social emotional growth; (b) health services such as immunizations, medical, dental, mental health, and nutritional services; (c) family services to promote parental involvement and to enable parents to learn about their children’s needs and educational activities that can take place at home; and (d) social services tailored to individual families such as community outreach, referrals, family needs assessments, emergency assistance, and crisis intervention. To evaluate the effects of such services, all Head Start programs are required to document children’s growth in critical areas, as assessed by performance on measures evaluating language development, early reading skills, early math skills, basic science concepts, progress in acquiring music, drama, and art skills, social emotional development, and both fine and gross motor skills (Department of Health and Human Services, 2003).

By most accounts, the Head Start initiative was a laudable and ambitious undertaking. Yet, research evaluating relevant outcomes for children served by Head Start programs has consistently shown that although some progress in the acquisition of cognitive skills and social emotional development is made by Head Start children, far too many of these children continue to perform significantly below normative standards in areas essential to school readiness. For example, findings on measures of cognitive and social emotional development from the Family and Child Experiences Survey (FACES, 1997; 2000) show that the Head Start program needs to do more to reduce the achievement gaps between children served by Head Start and the general population of preschool-age children. More specifically, the FACES studies evaluated two randomly-
selected cohorts of Head Start children enrolled in the fall of 1997 (3200 children in 40 programs) and the fall of 2000 (2800 children in 43 programs) and it was found that most children entering these programs had pre-literacy skills well below the general population of preschool age children. In assessing the achievement gains made during the program year, these studies reported minimal gains in all of the pre-literacy areas: letter recognition, knowledge of book, and print conventions, vocabulary, and early writing. However, in the social emotional development domain, children showed an increase in social skills and reduction in hyperactive behavior.

Similarly, other education reform initiatives such as the Goals 2000: Educate America Act, the No Child Left Behind Act (NCLB, 2002), and the Head Start Impact Study (Department of Health and Human Services, 2006), have been directed toward improving achievement for all children, especially those from low SES families. Despite these initiatives, less-than-desirable outcomes continue to be reported for at-risk children. For example, the National Evaluation of Early Reading First Initiative (Jackson et al., 2007) found that Head Start programs had statistically significant positive effects on children’s print and letter knowledge. However, the effect size for the differences between the intervention and control classrooms was relatively small (0.34). Moreover, the report did not find any significant impact of Early Reading First programs on phonological awareness or oral language.

**Evidence For Programmatic Success in Ameliorating the Effects of Poverty.**

Despite the many risk factors associated with poverty, there is evidence that children from impoverished backgrounds can, nevertheless, flourish in the early school years. This has been documented by studies such as the Abecedarian Project (Ramey & Campbell,
1984), the Perry Preschool study (Schweinhart, Barnes, & Weikart, 1993), the Beat the Odds Schools study (Taylor, Peterson, Pearson, & Rodriguez, 2002), It’s Being Done Schools study (Chenoweth, 2007), and a study of high-achieving middle schools in New York (Wilcox & Angelis, 2010). For example, scholars associated with the Center for the Improvement of Early Reading Achievement (CIERA), a federally-funded consortium involving collaborating universities across the United States have conducted a number of studies of inner city schools in which children from high poverty environments achieve at normative levels; they describe the schools in which these children were successfully educated as “Beat the Odds” schools (Taylor, Pearson, Clark, & Walpole, 2002). The researchers evaluating these schools found that in comparison to other schools with similar demographics, the Beat the Odds schools have the following characteristics in common: (a) strong links to parents, (b) a systematic internal assessment system, (c) a variety of systems for communication and collaboration among different stakeholders, (d) a variety of safety nets for struggling learners, including small group and individualized interventions across the grades, (e) ongoing professional development for their staff, and (f) very strong administrative and educational leadership.

Chenoweth (2007; 2009) has also documented success in programs serving disadvantaged children in what have been designated as “It’s Being Done” schools. She found that student achievement can be dramatically improved when teachers consistently: have high expectations for their students, use available data to individualize each child’s needs, increase instructional time for struggling students, and provide their students with thoughtful and individualized instruction. Such schools also hired well qualified teachers and provided them with ample opportunity for professional development and
improvement.

In keeping with the ethos of successful programs such as those mentioned above as exemplars of successful programs that serve disadvantaged children, there is considerable evidence of quality instruction being implemented at the local Head Start program serving children in Schenectady, New York. Specifically, the Schenectady Community Action Program (SCAP) Head Start, which is the study site for the proposed research, has a strong record of achievement working with disadvantaged children. Assessments conducted at this site since 2002 measured children’s performance on a wide range of achievement measures including oral language skills, early literacy skills, early math and science skills, and the arts (music, art, and drama). Of special interest is the children’s performance on the Phonological Awareness Literacy Screening battery (Invernizzi, Sullivan, Meier, & Swank, 2004), which is a nationally-standardized measure of early literacy skills. The important point to make here is that the children being served at the SCAP Head Start program consistently scored (on average) at or above national norms on the PALS (Tanzman, Vellutino, Pietrangelo, & Zhang, in preparation, see Table 1), which, of course, provides strong evidence for the effectiveness of the program in facilitating academic readiness in disadvantaged children.

Note also that regularly scheduled evaluations of the SCAP program conducted by the U.S. Department of Health and Human Services (i.e. 2006) have repeatedly described this site as an exemplary and extremely high-quality program when compared to Head Start programs at large, especially in terms of important quality indicators such as teacher qualifications, experience, and classroom quality.
Table 1

*Phonological Awareness Literacy Screening (PALS) Scores for Four-Year-Old Children at Schenectady Head Start (2005-2010)*

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n=157</td>
<td>n=181</td>
<td>n=185</td>
<td>n=168</td>
<td>n=180</td>
</tr>
<tr>
<td>Subtest Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Upper Case Alphabet Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>6.0</td>
<td>8.0</td>
<td>4.8</td>
<td>7.0</td>
<td>5.8</td>
</tr>
<tr>
<td>Spring</td>
<td>15.5</td>
<td>9.5</td>
<td>14.7</td>
<td>9.3</td>
<td>15.3</td>
</tr>
<tr>
<td>Lower Case Alphabet Recognition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>3.9</td>
<td>6.5</td>
<td>2.7</td>
<td>5.4</td>
<td>2.9</td>
</tr>
<tr>
<td>Spring</td>
<td>12.6</td>
<td>9.8</td>
<td>11.8</td>
<td>9.1</td>
<td>11.7</td>
</tr>
<tr>
<td>Sound Knowledge</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>1.3</td>
<td>3.3</td>
<td>0.5</td>
<td>2.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Spring</td>
<td>5.9</td>
<td>7.2</td>
<td>6.6</td>
<td>7.7</td>
<td>7.5</td>
</tr>
<tr>
<td>Name Writing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>3.0</td>
<td>2.0</td>
<td>2.7</td>
<td>2.2</td>
<td>2.6</td>
</tr>
<tr>
<td>Spring</td>
<td>5.8</td>
<td>2.0</td>
<td>5.3</td>
<td>2.2</td>
<td>5.8</td>
</tr>
<tr>
<td>Beginning Sound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>3.2</td>
<td>3.3</td>
<td>3.5</td>
<td>3.8</td>
<td>2.6</td>
</tr>
<tr>
<td>Spring</td>
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<td>3.7</td>
<td>6.6</td>
<td>3.6</td>
<td>6.6</td>
</tr>
<tr>
<td>Rhyme Awareness</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>3.5</td>
<td>2.6</td>
<td>2.9</td>
<td>3.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Spring</td>
<td>6.5</td>
<td>3.3</td>
<td>6.4</td>
<td>3.6</td>
<td>6.7</td>
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<tr>
<td>Print Awareness</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fall</td>
<td>4.1</td>
<td>2.6</td>
<td>3.9</td>
<td>2.9</td>
<td>3.4</td>
</tr>
<tr>
<td>Spring</td>
<td>7.5</td>
<td>2.5</td>
<td>7.1</td>
<td>2.9</td>
<td>7.3</td>
</tr>
</tbody>
</table>

However, while all the children at the SCAP Head Start site are exposed to the same high-quality academic program, they do not all profit equally. Preliminary analysis of the SCAP progress indicators reveals a wide disparity among the low, average, and high-performing children’s entry scores on both academic and social emotional measures. See Table 2
Table 2

Means and Standard Deviations for Low, Average, and High Achieving Four-Year-Old Schenectady Head Start Children at the Beginning and End of the School Year (2005-2010)

Panel A

<table>
<thead>
<tr>
<th></th>
<th>Beginning of Year</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>25.4(88)</td>
<td>15.4(8)</td>
</tr>
<tr>
<td>Math</td>
<td>28.7(87)</td>
<td>11.7(11)</td>
</tr>
<tr>
<td>Science</td>
<td>5.8(93)</td>
<td>3.0(15)</td>
</tr>
<tr>
<td>Arts</td>
<td>12.8(93)</td>
<td>3.1(17)</td>
</tr>
<tr>
<td>SEm</td>
<td>77.6(92)</td>
<td>24.2(14)</td>
</tr>
</tbody>
</table>

Panel B

<table>
<thead>
<tr>
<th></th>
<th>Beginning of Year</th>
<th>End of Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>46.0(99)</td>
<td>20.0(11)</td>
</tr>
<tr>
<td>Math</td>
<td>42.2(100)</td>
<td>13.3(12)</td>
</tr>
<tr>
<td>Science</td>
<td>7.3(101)</td>
<td>2.8(15)</td>
</tr>
<tr>
<td>Arts</td>
<td>14.2(101)</td>
<td>2.7(15)</td>
</tr>
<tr>
<td>SEm</td>
<td>92.0(101)</td>
<td>26.1(15)</td>
</tr>
</tbody>
</table>

Panel C

<table>
<thead>
<tr>
<th></th>
<th>Beginning of Year</th>
<th>End of Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>76.7(115)</td>
<td>28.8(15)</td>
</tr>
<tr>
<td>Math</td>
<td>56.2(113)</td>
<td>12.7(12)</td>
</tr>
<tr>
<td>Science</td>
<td>8.0(105)</td>
<td>2.2(12)</td>
</tr>
<tr>
<td>Arts</td>
<td>14.7(104)</td>
<td>1.7(9)</td>
</tr>
<tr>
<td>SEm</td>
<td>98.8(105)</td>
<td>20.3(12)</td>
</tr>
</tbody>
</table>

Note: Maximum for the 2005-2010 sample raw-score measures are as follows: reading 189, math 83, science 10, the arts 16, SEm=Social emotional 137. Standard scores (in parentheses) were computed with a mean of 100 and a standard deviation of 15. Low achievers, n=199, Average achievers, n=364, High achievers, n=182.

Table 2 presents means and standard deviations on academic and social emotional measures for children in the upper, average, and lower ranges of the distribution in Head Start progress monitoring measures; the means and standard deviations are given for
these measures at both the beginning and end of the program years for the time period 2005 to 2010. The academic achievement score is a composite obtained by transforming the raw scores for reading (PALS, alphabetic recitation, word recognition, and spelling) and for mathematics into standard scores with a mean of 100 and a standard deviation of 15. The standard scores for reading and mathematics were added together and an average score was computed. The composite scores obtained were then used to partition the sample into high, average and low achievers. The high achievers are the top 25% of the sample, the average achievers are the middle 50% of the sample, while the low achievers are the bottom 25% of the sample.

It is clear that the high achieving children generally come into the program with better baseline academic and social emotional skills than do the low-achieving children. Moreover, during the program year, the achievement gap widens on each of the outcome measures for all three achievement groups. Thus, it appears that even high-quality Head Start programs that are developmentally appropriate may not, by themselves, eliminate achievement disparities among disadvantaged children.

Similarly, data obtained from this site shows high achievement patterns and improved functioning on measures of reading, math, science, the arts, and social emotional development. Table 3 shows significant correlations between the PALS scores and other achievement measures for Schenectady Head Start four-year-olds in the period encompassing 2005 to 2010 academic years. These significant correlations obtained between the various curriculum measures reflect the fact that the high performers in literacy and math tend to be high performers in other areas as well.
Table 3

Correlations between PALS, Language, Mathematics, Science, the Arts, and Social Emotional Variables

<table>
<thead>
<tr>
<th></th>
<th>PALS</th>
<th>Language</th>
<th>Math</th>
<th>Science</th>
<th>Arts</th>
<th>SEm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PALS</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>0.200*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math</td>
<td>0.744*</td>
<td>0.337*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>0.352*</td>
<td>0.455*</td>
<td>0.476*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts</td>
<td>0.278*</td>
<td>0.333*</td>
<td>0.348*</td>
<td>0.469*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SEm</td>
<td>0.402*</td>
<td>0.361*</td>
<td>0.499*</td>
<td>0.523*</td>
<td>0.437*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.01 level (2-tailed), SEm= Social Emotional Measure.

Statement of the Problem

This pattern of results is similar to the results documented by the national evaluation studies of Head Start programs (i.e. FACES, 1997; 2000). Such findings suggest that there may be factors present even before Head Start children enter early childhood programs that may, in fact, be influencing the observed disparities in academic achievement. A likely possibility is that children’s home environment may account, in part, for some of these disparities by contributing differentially to cognitive, social emotional, and physical health and development.

However, another source of observed differences between high and low achieving preschoolers is variability in child characteristics that may also contribute differentially to academic readiness and achievement. For example, two critically-important characteristics that could affect academic readiness, positively or negatively, are physical health and social emotional well-being and adjustment.

A third factor is individual aptitude for acquiring knowledge and skills in given domains, for example, individual aptitude for acquiring oral and written language skills, math and science skills, or skills in other areas such as art and music. However, the ability to acquire knowledge and skills in any of these domains is, itself, dependent on
opportunities for learning, along with the amount and quality of a child’s experiences in
the home and school environments.

Moreover, individual variability in important child characteristics such as those
just mentioned could not, by itself, account for the finding that high achieving children
entered the SCAP Head Start program with more knowledge and skill in all domains
assessed than did low-achieving children. Neither could such variability, by itself,
account for the fact that the gap between these two groups continued to widen during the
Head Start school year. The latter finding is likely due, in part, to the fact that the
children in the Head Start program were being exposed to quality instruction of the type
that allowed the high achieving children to capitalize on the advantage they enjoyed at
the start of the school year. Thus, the extent to which factors in the home environment
contribute to developmental disparities in high and low achieving children is an important
question that remains to be addressed. Accordingly, the primary objective of the proposed
research is to differentiate between family influences and child characteristics as sources
of variance accounting for observed differences between high and low achieving children
on measures of academic readiness and achievement.

It should be clear that further investigation is needed to address the question of
what home environment factors serve as determinants of academic success among
disadvantaged children. At the same time, there has been little or no research designed to
distinguish between home environment factors and individual characteristics as
determinants of high and low achievement among preschool children. It may be that high
achievers tend to come from more enriching home environments that provide more
personal and social protective factors that shield them from the deleterious effects of
poverty, as compared to the home environments of their low achieving peers. There is virtually no research that has specifically addressed either this question or the related question concerned with the specific individual and family factors that may distinguish between high and low achieving preschool children from low-income families. In a comprehensive study sponsored by the Jack Kent Cooke Foundation, Wyner, Bridgeland, & DiIulio Jr., (2007), reviewed three federal databases that tracked children from elementary school through graduate school and found that among first-grade high achievers, approximately one in four children came from low-SES households. This finding prompted a call for additional research assessing the correlates of high achievement among low-income students in American schools. The investigators also called for better data-gathering and a more complete understanding of what can be done in the homes and early childhood programs to help close the achievement gap between these two groups of children.

The proposed study will use an archival database from a Head Start program in an urban center in upstate New York. This database contains performance indicants for measures of preschool literacy, language development, early math, and the arts, along with measures of social emotional well-being. In addition, demographic information about the family and child, such as health history, income, education, and family composition etc., is available and will be examined in relation to the achievement of individual children. Data analysis will focus on those children who score in the upper, average, and lower achievement groups on a composite measure of literacy and mathematics. In order to further understand characteristics that serve as protective variables, a structured interview will be conducted with the family workers and
classroom teachers of high and low achieving children in the upper and bottom quartiles. This interview will be limited to children in the 2009-2010 school years, since family workers and teachers are currently actively working with these families. The interview is intended to provide information about the language and literacy environments of the home, along with information about family activities that may facilitate or impair academic readiness such as time spent with the children, the family’s use of community resources, and the stability of the family. The interview will focus only on the children in the upper and lower quartiles because it is expected that focusing on these groups will provide more relevant information about factors that distinguish high and low achievers. A comparison of high and low academic achievers in the top and bottom quartiles is a technique that has been used effectively in previous research (i.e. Luster, Bates, Fitzgerald, Vandenbelt, & Peck, 2000; Wyner, Bridgeland, & DiJulio Jr., 2007). Finally, data will be analyzed using conventional statistics designed for multi-group comparisons, including independent sample t-tests and logistic regression analyses procedures.
CHAPTER 2: LITERATURE REVIEW

Effects of Poverty on Academic Achievement

Over the years, researchers studying early childhood education have investigated the link between socioeconomic status (SES) and academic achievement, often finding strong and consistent positive correlations between measures of these two variables. Children from high-SES homes are thought to have access to resources that afford them, for example, services and opportunities that enhance the likelihood of positive developmental outcomes and high academic achievement (Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Huston, 1991). By contrast, many children from low-SES homes tend to lack the resources that might afford them basic necessities such as proper nutrition, shelter, and opportunities for literacy enrichment, thus predisposing them to a higher risk of academic failure.

As a result of this disadvantage, children from poor backgrounds have typically been shown to perform below their more advantaged peers on a wide variety of cognitive and achievement measures (Bradley & Corwyn, 2002; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Vail, 2004). For example, an investigation using longitudinal data from the Infant Health and Development Program (IHDP, 1985-1988) found that family income and poverty levels were significant predictors of IQ scores in five-year-old children, even after accounting for maternal education, family structure, and ethnicity (Duncan, Brooks-Gunn, & Klebanov, 1994; Duncan, Yeung, Brooks-Gunn, & Smith, 1998). Similarly, Smith, Brooks-Gunn, and Klebanov (1997) found SES differences in the achievement levels of children’s performances on the Peabody Picture Vocabulary Test (PPVT). The PPVT is a measure of children’s receptive vocabulary and is a good predictor of school
performance and literacy. As might be expected, the study found the largest achievement gaps in children from families facing the most extreme levels of poverty over extended periods of time. Such gaps have been found to be especially large in children who have experienced family poverty during their first five years of life (Brooks-Gunn & Duncan, 1997; Brooks-Gunn & Markman, 2005).

Longitudinal studies have often found long-term effects of SES on cognitive development throughout the primary grade years and beyond. For example, Wyner, Bridgeland, and DiIulio Jr. (2007) reviewed three federal databases that tracked children from elementary school through graduate school over more than two decades. The researchers found substantial disparities in the academic achievement levels of children from different SES backgrounds, with low-SES children demonstrating lower levels of academic readiness at school entry. Moreover, the researchers found that although approximately one-quarter of the disadvantaged children demonstrated superior achievement in first grade, these very same children lost more educational ground and dropped from the high-achievement bracket more frequently than their higher-income peers as they progressed through elementary school years and beyond (see also Bradley, Corwyn, & Whiteside-Mansell, 1996; National Center for Education Statistics, 2010).

Students who consistently perform poorly in school are more likely than their peers to have irregular school attendance, lack family support, and display discipline problems. The result is higher school dropout rates among these children (Barton, 2005). Nationwide, estimates of school dropout rates suggest that about one in four students will fail to graduate. For example, Bridgeland, Dilulio, and Morison (2006) report that only 75 percent of the students who entered public high school during the 2000-2001 school
year graduated with their classes in 2004. The report was based on data from Greene and Winters (2005) and reviewed public high school graduation and college-readiness rates from 1991 to 2002. Another study, conducted by the Educational Testing Service (Barton, 2005), reported high school graduation rates of approximately 70 percent. By comparison, graduation rates for white and Asian-American students were about 75 percent, whereas rates for African-American, Hispanic, and Native-American students were closer to 50 percent.

**Theoretical Frameworks for Understanding Risk and Resiliency Factors**

The term “risk” is used in the literature to predict a student’s susceptibility to a range of negative life outcomes (Rutter, 1980). Children who are exposed to significant adversity are described as being “at risk.” Theoretical frameworks have been proposed to explicate the multiple factors that may influence children’s adjustment and the diverse outcomes associated with such factors. To be more specific, Luthar, Cicchetti, and Becker (2000) have identified three theoretical frameworks that guide research into the origins of risk factors and the ways in which children can be affected. These are: 1) the triarchic framework of risk and resiliency, 2) the structural-organizational perspective, and 3) the ecological transactional model.

**The Triarchic Framework of Risk and Resiliency.** The triarchic framework of risk and resiliency was proposed by Werner and Smith (1982). This theory suggests that the salient processes influencing protection and vulnerability in populations of at-risk children operate at three broad levels: the community-level support system, the level of family dynamics, and the individual child’s traits. In one of the most-often cited longitudinal studies by the proponents of the theory, the researchers sought to observe 1)
the impacts of biological and psychosocial risk factors on physical, psychosocial, cognitive, and various other aspects of development, 2) the effects of stressful life events on these aspects of development, and 3) the likelihood that at-risk children would recover in the presence of protective factors. A total of 698 children born on the island of Kauai in 1955 were tracked by mental health professionals, health care workers, and social workers at ages one, two, 10, 18, 32, and 40 years (Werner & Smith, 1992). These specific ages were chosen because the time span is considered critical for the development of trust, autonomy, identity, intimacy, industry, and generativity (Werner & Smith, 1982; 1992; 2001). One-third of the participants in the study were considered to be at risk because of the following factors: (1) the mothers had prenatal complications before giving birth, (2) the children came from families where parents had psychopathological issues and chronic family discord, (3) the children’s parents were divorced, and (4) the children’s mothers had less than an eighth-grade education. The study found that about 66 percent of those children who had experienced four or more risk factors by their second birthday developed learning or behavior problems by age 10, or were delinquent and/or had mental health issues by their 18th birthday. However, one-third of the children with multiple risk factors developed into competent, confident, and caring adults and became successful young adults. The findings showed that both internal and external factors interact to strengthen a young person’s resilience as he or she moves toward adulthood. The positive protective internal factors identified include self-motivation, flexibility, independence, and self-confidence. The external protective factors identified include families, schools, and communities that support the development of resiliency by encouraging a student’s goal setting and the development of positive life skills as well as
healthy social and personal values.

**The Structural Organizational Framework.** The Structural-Organizational Framework was proposed by Sroufe (1979). A central tenet of this model is the belief that competence is a continuous and coherent trait that unfolds over time. An individual’s active choices and self-organization are believed to have profound influences on his or her development over and above distal historical factors and current influences (Cicchetti & Tucker, 1994). A study based on this model was carried out by Vaughn, Egland, Sroufe, and Waters (1979). The authors investigated the longitudinal stability of mother-infant attachment using an urban, poor population and compared their results with results from a similar study conducted by Waters (1978) using a middle-class sample. The Vaughn et al., (1979) sample consisted of 100 first-born, (50 male, 50 female) mother-infant dyads that were examined at 12 and 18 months using the Strange Situation Procedure (SSP) in order to assess the children’s exposure to stressful life events and attachment patterns over the period of the study. The investigators found significant and stable attachment behaviors between 12 and 18 months (about two-thirds of the sample remained stable). However, they also found less stability than Waters (1978) did using an unstable middle-class sample. An analysis of maternal reports of stressful events indicated that mothers whose infants had their classification change from secure to anxious attachment reported higher levels of stressful life events over the period between 12 and 18 months than mothers of infants who remained securely attached. The results show that family stability correlates with infant/mother interactions; the results also suggest that the attachment bond first observed at 12 and 18 months continues to develop and is affected by external events beyond the initial 12-month period.
The Ecological Transactional Framework: Bronfenbrenner’s Model. The third framework, known as the ecological transactional model, conceptualizes culture, neighborhood, and family as consisting of nested layers of influence on child development with varying proximity to, and effect on, the individual. These layers interact with each other over time, shaping the individual’s development and adaptation. A classic example of an ecological transactional model is Bronfenbrenner’s (1977) ecological theory, revised to include the biological makeup of the individual in what has been termed the bio-ecological perspective (Bronfenbrenner & Morris, 1998).

Bronfenbrenner’s bio-ecological perspective offers the most inclusive context for understanding risk factors that affect child development. The model outlines a set of five overlapping ecological structures that interact with the individual and operate together to influence what a person may become as he or she develops. The first structure, known as the microsystem, considers the immediate social setting of the child, and includes such factors as the family, peer groups, and the school system. The microsystem is believed to have the most direct influence on the child. The next structure is the mesosystem, conceptualized as a bidirectional process linking two or more microsystems together, such as the parent-teacher relationship. The exosystem includes elements with which the child does not have direct experience; however, decisions made in the exosystem have significant effects on the microsystem and thus affect the child. For example, decisions emanating from a parent’s workplace, such as extended workdays or layoffs, impact the child and family system. The macrosystem, on the other hand, includes the subcultural setting in which the microsystem and exosystem are embedded; represented in this system are the child’s ethnic identity and neighborhood culture. The last structure is the
chronosystem, which encompasses the effects of consistency and change over time.

Because the first five years of a child’s life are largely affected by elements in the microsystem, Bronfenbrenner’s bio-ecological perspective of conceptualizing risk factors will be used for this study. The risk factors affecting the child will be broadly divided into those that emanate from within the child and those social factors that arise in the microsystem. Examples of individual risk factors are the child’s physical well-being, the child’s cognitive development, and his or her social emotional development. Family risk factors within the microsystem that will be examined include family structure, parental level of education, family size, quality of home environment, and family influences on social emotional development, language development, academic readiness, and achievement.

Determinants of Academic Readiness and Achievement

Individual Child Characteristics. Bronfenbrenner’s theory was renamed the “bio-ecological systems theory” to underscore the important role that the child plays in shaping his or her own development. Factors within the child are believed to interact with factors in the family and social environments to affect academic readiness and achievement. In recognition of this bidirectional process, the National Education Goals Panel (NEGP, 1991) defines school readiness indicators to include the following child characteristics: physical well-being, cognitive development, language development, and social emotional development.

Physical Well-being. The relationship between physical wellness and academic achievement has been documented in several research studies (i.e. Spernak, Schottenbauer, Ramey, & Ramey, 2006). The common finding is that children with poor
general health and various physical deficits have been shown to have lower academic achievement as compared to their healthy counterparts. Poor physical wellness may interfere with academic achievement by affecting children’s school attendance rates as well as their ability to profit from one or more aspects of instruction. Conversely, good physical wellness, especially during early childhood, is important for overall development. Aspects of a child’s physical wellness that are associated with achievement include the child’s body mass index, fine motor skills, gross motor skills, vision, hearing, activity level, attention, coordination, speech-motor articulation, and general health (Bee & Boyd, 2010; West, Denton, & Germino-Hausken, 2000). For example, research findings provided by the National Research Council (1998) show that student literacy problems occur disproportionately among children with physical deficits and poor general health. Similarly, Eide, Showalter, and Goldhaber (2010) found that speech impediments and vision problems were negatively correlated with math and reading test scores in average, upper, and lower ranges of the achievement distribution. This pattern of results was evident in both young children and adolescents. Of special interest in the present context is the finding in many studies that a child’s health status can be negatively affected by poverty and that the negative effects begin well before birth (Department of Health & Human Services, 2000b). Bradley and Corwin (2002) document a variety of factors that link SES to child well-being. The predominant factors are access to material goods and resources and reactions to conditions that induce stress in both the children and their parents.

Children from low-SES backgrounds are at risk for inadequate prenatal care, a high incidence of prematurity or low birth weight, poor nutrition, maternal diseases, and
inadequate neurobehavioral development in utero (Di Pietro, Costigan, Hilton, Pressman, 1999). Some prenatal variables that have been shown to affect the general development of children are genetic disorders, maternal diseases, environmental hazards, drugs taken by the mother, fetal alcohol syndrome, Auto Immune Disorder Syndrome (AIDS; Health & Human Services 2000b), maternal diet, and maternal age (Bee & Boyd, 2010). Some of these variables, including maternal use of drugs, have been shown to lead to low-birth weight children. Research comparing the influence of different birth weights in children on their development has shown that low-birth weight children are less likely to function within normal ranges on measures of cognitive and emotional development when compared to normal-weight children (Bradley et al., 1994; Shum, Neulinger, O’Callaghan, & Mohay, 2008).

During the prenatal and natal period, proper nutrition, immunizations, and general health care are essential for the healthy development of a child. Documentation of this fact is provided by a longitudinal study of the impact of a nutritional intervention, carried out by the Institute of Nutrition of Central America and Panama, which found that children who were provided with adequate nutrition from birth through age three showed better reading comprehension skills during the school years, and as adults, had better health and economic productivity (Martorell, Melgar, Maluccio, Stein, & Rivera, 2010).

The physical environments in which disadvantaged children live can also present health risks for those children. Unfortunately, low-income families typically live in impoverished and deleterious environments that profoundly affect both the physical and mental health of these families. Such environments often do not have physical fitness facilities, parks, or recreation centers and therefore provide little or no opportunity for
physical activity. In addition, these impoverished environments lack supermarkets and health food stores; instead they tend to have a myriad of fast food restaurants and hence, limit the residents’ access to healthy foods. Impoverished environments are also characterized by dilapidated houses that are associated with exposure to toxins such as lead, asthma triggers, and mental health stressors such as violence and social isolation (Hood, 2005).

In view of the strong association between health status and academic achievement, the performance standards for Head Start, a federally-funded early childhood program (see discussion below), includes a significant health component that was initially mandated in 1975 and reauthorized in 1998 (other Head Start components include education, parental involvement, and social services). The health component emphasizes health education and prevention, as well as early identification and treatment of health problems. Children are required to have screenings for chronic or disabling conditions, vision and hearing tests, dental checkups, immunizations, and needed health services, thereby ensuring that they receive preventive care services. The intent of this mandate is to ensure that both children and families learn to take responsibility for their own health care and health-related behaviors. Follow-up services are scheduled for children who demonstrate significant health problems (Keane, O’Brien, Connell, & Close, 1996).

**Cognitive and Language Development.** In addition to physical well-being, an individual child characteristic that has been shown to be an influential and strong determinant of academic achievement is cognitive-intellectual ability, broadly defined. Cognitive and intellectual development encompasses such mental processes as problem
solving, concept understanding, critical thinking, and information processing (Bukatko & Daehler, 2004). The study of intelligence and its extensions has a long history that encompasses the entire 20th century. Most of the research has been based on psychometric theory and the general finding is that there tend to be strong and highly reliable correlations between measures of intelligence and measures of academic achievement (Buckhalt, 2001; Kail & Pellegrino, 1985). However, the theories of intelligence emanating from this research are based primarily on work with adults. More relevant for present purposes are two prominent theories of cognitive development that have been especially influential determinants of educational practice in both early childhood and elementary school settings: Jean Piaget’s stage theory (Piaget, 1959; Piaget & Inhelder, 1969) and Lev S. Vygotsky’s language-based theory (Vygotsky, 1962; 1978). Each will be briefly summarized.

**Piaget’s Theory of Cognitive Development.** Piaget’s theory of cognitive development (Piaget, 1926, 1936) suggests that intellectual development involves a dynamic interaction between environmental stimulation and processes entailed in the formation of cognitive structures that represent the child’s conceptual knowledge (called “schemes”) at given stages of development. The child’s understanding of real-world entities and events is said to be constrained by maturational forces, but changes in existing cognitive structures that facilitate analysis and understanding of such entities and events are theorized to be primarily attributable to the interaction of two complementary processes called “assimilation” and “accommodation.” Assimilation is an inferred cognitive process whereby new knowledge is added or folded into existing cognitive structures. Accommodation is an inferred cognitive process that affects qualitative
changes in the cognitive structures that assimilate new knowledge.

Piaget’s theory also suggests that children actively construct their own knowledge of the world and that the acquisition of an increasingly more sophisticated and complex understanding of objects and events in the world takes place over four stages of cognitive development (Wood, Smith, & Grossniklaus, 2001). The first stage is called the “sensorimotor” stage. During this stage (itself encompassing six stages), the child internalizes representations of what Piaget calls “sensorimotor acts” that facilitate differentiation of self from others, as well as the acquisition of key concepts such as “object permanence” and key abilities such as the ability to symbolize, all of which lay the foundation for the development of important representational systems such as the language and visual systems.

The second stage of cognitive development is called the “preoperational” stage. During this stage, children begin to use language, and their memory and imagination also begin to develop. According to Piaget, preoperational children think intuitively and conceptually, but not logically. Their problem-solving skills are constrained by an “egocentric” world view and the absence of important concepts such as “reversibility,” “class inclusion,” and “seriation.” As a consequence, preoperational children cannot engage in logical and deductive analysis, their inferential skills are extremely limited, and they cannot solve simple practical problems such as conservation of volume, weight, and number.

During the third stage of cognitive development, which Piaget calls the “concrete operational” stage, the child acquires reversibility, class inclusion, seriation, and other important concepts that facilitate logical and deductive analysis, but can engage in such
analysis only at a concrete level.

The final stage of cognitive development specified in Piaget’s theory is the “formal operational” stage. During this stage, the child can engage in logical and deductive analysis on a more abstract plane, and inferential and ideational skills and abilities are well developed. Also, thinking and problem-solving skills are the result of combinations of operations implemented on a purely mental level of functioning, using cognitive abilities such as linguistic coding and visual and auditory imagery as vehicles for thought and problem solving.

Although Piaget’s writings did not focus on variability in stage-wise development as a source of individual and group differences in academic achievement, it seems reasonable to suggest that his theory could partially explain such differences by attributing them to individual and group differences in the acquisition of age- and grade-appropriate conceptual knowledge of the types required to achieve mastery in given academic areas. Thus, variability in either environmental stimulation or neuro-developmental factors could become possible sources of variability in cognitive development, and thereby, variability in academic achievement.

Reviews of the literature concerned with the relationship between cognitive development and school learning have shown that performance on measures of cognitive development reliably predict school achievement. For example, the American Psychological Association conducted a comprehensive review of the literature on intelligence and reported that such cognitive measures tend to be strongly correlated with measures of school achievement (Neisser, et al., 1996). Similarly, Rhode and Thompson (2007) found similar results when they investigated variation in academic achievement as
a function of general cognitive ability and specific cognitive abilities in a sample of 71 young adults (29 males and 42 females). Academic achievement was measured by grade point average, Wide Range Achievement Test III scores, and Scholastic Aptitude Test scores, while general cognitive ability was measured by the Raven’s Advanced Progressive Matrices and the Mill Hill Vocabulary Scales (Raven, Raven, & Court, 1998). The researchers found that measures of general cognitive ability predicted academic achievement, but none of the specific cognitive abilities accounted for additional variance in academic achievement after controlling for general cognitive ability. Processing speed and spatial ability accounted for a significant amount of variance when predicting math scores while holding general cognitive ability constant.

However, of special interest for present purposes are studies assessing the relationship between intelligence and academic achievement within the context of Piaget’s theory of cognitive development. In a study that investigated the characteristics of early readers, Briggs and Elkind (1977) compared 38 early-reading pre-kindergarten children (mean age = 64 months) and 38 same-age peers in a matched control group consisting of children who were not able to read on Piagetian conservation tasks. Their parents were interviewed using 47 items that required information on demography, parenting practices, and child characteristics.

Results from this investigation revealed that the early readers achieved higher scores on conservation tasks than did their peers who could not read, suggesting that achievement of Piagetian concrete operations may be an important prerequisite for learning to read. The parental interview data suggest that the parents’ organization of the home environment and their achievement orientation were important factors in
determining children’s early reading ability. The study concluded that the presence of “operativity” in children, combined with high achievement motivation on the part of their parents, facilitated the attainment of reading skills at an early age.

Similarly, a study conducted by Arlin (1981) was designed to determine which of the nine Piagetian tasks functioned as a measure of a child’s developmental readiness for reading and mathematics. The data were collected in two phases; the first phase included 192 kindergarten children (mean age = 5.7 years); phase two data were collected at the end of first grade and incorporated 121 of the children from phase one (mean age = 6.6 years). The Piagetian tasks (Kaufman & Kaufman, 1972) were administered individually over a one-month period at the end of each school year. The nine Piagetian tasks consisted of simple seriation, double seriation, simple classification, number conservation, continuous quantity, two-way classification, discontinuous quantity, class inclusion, and three-way classification. The children’s reading achievement was measured at the end of each school year using the Metropolitan Achievement Tests of reading and mathematics achievement (Primary, Form F, Metropolitan Achievement Tests, 1970). Significant correlations were observed between achievement test scores and nine Piagetian tasks. The results indicate that concrete operativity is an important component of a child’s academic readiness.

Riley (1989) also examined hypothesized relationships between cognitive abilities and academic achievement within the context of Piaget’s theory of cognitive development. The sample consisted of 87 male and female fourth and fifth graders who were learning disabled and non-learning disabled. Cognitive development was assessed using the Inventory of Piaget’s Developmental Tasks (IPDT; Furth, 1970). Reading
comprehension and mathematics achievement were also assessed using the Peabody Individual Achievement Test (Dunn & Markwardt, 1970). Piaget’s theory of cognitive development was used as a framework for constructing a number of scales to measure intellectual development. Therefore, performance on Piaget’s tasks was expected to correlate with achievement measures. The study found that performance on the achievement tests was highly correlated with performance on the measures of cognitive development. More specifically, a two-way analysis of covariance revealed a significant mean difference in cognitive ability between students with and without learning disabilities. Multiple regression analysis showed that a linear combination of reading and mathematics achievement yielded significant positive correlations with measures of cognitive ability.

Vygotsky’s Theory of Cognitive Development. Like Piaget’s theory of cognitive development, Vygotsky’s (1962; 1978; 1991) theory suggests that developmental changes in cognitive abilities result from the interaction between environmental stimulation and the cognitive processes entailed in knowledge acquisition. Unlike Piaget’s theory, however, Vygotsky’s theory suggests that language abilities ultimately come to mediate concept attainment, thinking, problem solving, and all other forms of mentation. More specifically, the theory suggests that sensory-motor abilities (which Vygotsky calls “practical intelligence”) and language abilities develop in parallel during the first two years of a child’s development, begin to converge thereafter, and eventually “fuse,” whereupon language and language-based skills become the primary vehicles for thought, problem solving, and knowledge acquisition.

Vygotsky’s theory of cognitive development also differs from Piaget’s theory in
that it gives environmental stimulation considerably greater weight as a determinant of individual differences in cognitive development than does Piaget’s theory. Vygotsky’s (1991) socio-cultural perspective also stresses the importance of the social environment in which a child is acculturated in acquiring problem-solving skills and new knowledge. Vygotsky claims that an individual’s ability to perform cognitive tasks when acting alone stems from prior socialization and that reasoning ability and new knowledge are acquired through social interactions. Thus, Vygotsky distinguishes between the “actual development” of a given skill or ability and what is termed as the “zone of proximal development,” which refers to potential that can only be realized through appropriate and adequate environmental stimulation, especially the types of stimulation provided by more knowledgeable individuals and formal education.

A number of studies have investigated the relationship between cognitive development and academic achievement within the context of Vygotsky’s theory of cognitive development. For example, a study by Wegerif, Mercer, and Dawes (1999) evaluated Vygotsky’s claim that individual reasoning ability, as measured using standard reasoning tests, has part of its origin in dialogue with others. The study sample consisted of 64 eight- and nine-year-old children who were taught the use of “exploratory talk” (a type of dialogue in which joint reasoning is made explicit). The relationship between the language used by children during joint problem solving and performance on the Raven’s Progressive Matrices test of non-verbal reasoning (Raven, Court, & Raven, 1995) was studied using discourse analysis of the language of groups of children working together as the independent variable. Results from this study suggest that the use of exploratory talk can improve group reasoning, and further, that exploratory talk can be taught. It was
also found that the teaching of exploratory talk can successfully be transferred between educational contexts. Moreover, performance on the non-verbal reasoning test significantly improved as a result of the intervention that involved teaching exploratory talk.

Similar results have been found with the High Scope preschool curriculum. The curriculum is based on the principle that adult-child interaction, in a carefully designed learning environment, strengthens achievement, initiative, and social skills in children. In this model, teachers and students are active partners in shaping the educational experience. Research conducted by Schweinhart, et al., (2005) and Schweinhart and Weikart (1980), evaluated the effectiveness of the High Scope preschool program study that compared children who received the High Scope Curriculum starting at ages three and four with those who did not attend a preschool program. The sample consisted of 50 percent female and 50 percent male African American children. The following instruments were used in this study: the Stanford-Binet Intelligence Scale, the Peabody Picture Vocabulary, the California Achievement Tests, and the High Scope Child Observation Record, a tool used to evaluate social and emotional development in children ages 2.5 to six years. The study found that mean intellectual scores, vocabulary scores, overall achievement test scores, and scores on measures of initiative and social relationship skills were higher among intervention participants than among their comparison group counterparts from the end of their first preschool year up to age seven.

Another study conducted by Stokes (1990) examined relationships between pupil characteristics of income, gender, chronological age, and level of cognitive development on the one hand and selected domain-specific skills on the other, namely: 1) solving
arithmetic word problems, (2) computing addition algorithms, (3) computing subtraction algorithms, and (4) solving measurement problems. Specifically, the relationship between achievement in mathematics and a measure of concept formation constructed within the context of Vygotsky (1962) theory was examined. Participants included 41 male and 33 female African American children ranging in age from five years and one month, to seven years and 11 months. The following instruments were used: (1) the Concept Assessment Kit-Conservation (Goldschmid & Bentler, 1968) to assess the level of cognitive development in young children (age four to seven) as theorized by Piaget; (2) the Concept Formation Test (Wang, 1984) to assess the level of cognitive development as theorized by Lev Vygotsky (1962); and (3) the Key Math Revised: A Diagnostic Inventory of Essential Mathematics (Connolly, 1988), to assess addition, subtraction, measurement, and word problems. The investigators found that the level of cognitive development was highly correlated with success with measurement and word problems and that age was highly correlated with success with problems of addition, subtraction, and algorithms. However, there was a non-significant correlation between ability to solve mathematics problems and gender. Income and gender explained small and insignificant amounts of variance for nearly all of the dependent variables.

In addition to the possible role played by oral language in acquiring reasoning, problem-solving skills, and early math skills, facility in the use of language (listening and speaking) is, of course, a prerequisite for acquiring adequate literacy (reading and writing) skills. Early literacy is often cited as the most important academic readiness skill because school learning depends very heavily on the ability to read (Snow, Burns, & Griffin, 1998; Strickland & Shanahan, 2004). Accordingly, literacy research (e.g.}
Strickland & Shanahan, 2004) has identified four key areas as essential components of early literacy, all of which are language-based skills: *language comprehension* (the process of deriving meaning from linguistic text); *phonological awareness* (conscious awareness that individual speech sounds make up words); conceptual grasp of the *alphabetic principle* (understanding the relationship between letters and sounds in oral and written language); and *concepts about print* (knowing how print is organized on the page and how it is used for reading and writing). Research has shown that children who enter school with strong emergent literacy and language skills are more likely to acquire better reading skills and less likely to experience early reading difficulties than are children who enter school with weak emergent literacy skills (Storch & Whitehurst, 2001). On the other hand, children with deficiencies in pre-reading, literacy, and language skills have been found to be at risk for early and long-term reading difficulties (Scanlon, Vellutino, Small, Fanuele, & Sweeney, 2005; Vellutino et al., 1996; Vellutino, Scanlon, Zhang, & Schatschneider, 2008).

Additional support for the important role of language-based skills as determinants of literacy development and achievement comes from studies conducted by Dickinson and colleagues (i.e. Dickinson & Tabors, 2001; Snow & Dickinson, 1991), in which it was found that measures of language ability administered to Head Start children predicted performance on measures of literacy skills from kindergarten through seventh grade. Similarly, researchers studying the causes and correlates of reading disability in young children have consistently found that children who have difficulties in learning to read have less well-developed and less efficient language skills than children who have no difficulties learning to read (see Vellutino, Fletcher, Snowling, & Scanlon, 2004 for a
Given the documented importance of language and language-based skills in the development of cognitive abilities such as concept formation, reasoning, logical deduction, and analysis, as well as academic skills such as reading and math, a generic measure of language development will be used as a proxy measure of general cognitive development in the present study.

**Social Emotional Development.** Another variable that can influence academic achievement is the child’s social emotional development. At school, children are expected to have healthy interpersonal interactions with everyone around them. They are also expected to behave appropriately and to meet the demands of the classroom teacher by following classroom rules, by paying attention to the teacher during classroom instruction, by completing independent work, and by adjusting to the expectations and behaviors of peers in free play and other social situations. Children are also expected to engage in appropriate play and establish healthy and productive friendship patterns.

Longitudinal research indicates that behavior tends to be stable from preschool through elementary school, that is, children who exhibit behavior problems in preschool continue to exhibit behavior problems in elementary school, and children without behavior problems in preschool are likely to continue to be socially competent (Egeland, Kalkoske, Gottesman, & Erickson, 1990). Perhaps the most important component of normal and healthy social emotional development is social emotional self-regulation, which is a skill that begins to develop in a child at about age three. Self-regulation becomes the basis on which social skills develop and is a strong indicator that a child has an understanding of the links between her behavior and other people’s perceptions.
(Eisenberg, Hofer, & Vaughan, 2007; Kopp, 1982). Moreover, there appears to be a strong and significant relationship between social emotional skills and academic achievement. For example, children with normal and healthy social emotional skills tend to have reasonably well-developed language and literacy skills. Conversely, young children who experience social emotional problems often have deficits in language and literacy skills (Lane, Gresham, & O’Shaughnessy, 2002).

Children who are especially at risk for social emotional and self-regulation difficulties and accompanying academic difficulties are those with difficult temperaments, those who were born prematurely, those who have delayed language acquisition, and those whose parents tend to express highly-negative emotions (Bee & Boyd, 2010). Moreover, a number of studies (e.g. Duncan, Brooks-Gunn, & Klebanov, 1994; Eamon, 2001) have documented significant differences in social emotional behaviors among children from different SES backgrounds. For example, children who come from poor households and poor neighborhoods are more likely to experience social emotional problems and consequent academic difficulties than are their peers from well-to-do households and advantaged neighborhoods. The research suggests that poor households tend to be stressful and disorganized and are often characterized by high levels of negative emotions (see also Cummings & Davis, 1996). Such studies have also found that children from low-SES backgrounds were more likely to exhibit maladaptive symptoms such as internalizing and externalizing behaviors, problematic peer relations, and disruptive classroom behaviors (Patterson, Kupersmidt, & Vaden, 1990; Sameroff, 1998; Sameroff et al., 1987). The children from disadvantaged backgrounds were also more likely to exhibit lower levels of sociability and initiative (Hanson, McLanahan, &
Thomson, 1997) than children from more advantaged homes. Poor neighborhoods may negatively influence social emotional development and academic achievement through increased stress, perhaps stemming from 1) community violence; 2) social disorganization, including a lack of positive role models and shared values; 3) a lack of institutional resources, such as strong schools and police protection; and 4) negative peer influences, all of which may lead to problem behaviors (Bee & Boyd, 2010; Department of Health & Human Services 2000).

The research just discussed provides strong evidence that academic achievement is negatively affected by deficiencies in the acquisition of normal and healthy social emotional skills and that these deficiencies are often caused by the stressful environmental conditions associated with poverty. Further evidence for a strong relationship between social emotional development and academic readiness and achievement comes from studies demonstrating that interventions to improve social skills have a positive effect on measures of academic skills. For example, a pilot study designed to improve the social skills and literacy of behaviorally at-risk Head Start children was conducted by Gunn, Feil, Seeley, Severson, and Walker (2006). The study sample consisted of 16 participants who were randomly assigned to either an intervention group or a comparison group. Children in the intervention group received a three-month social skills intervention program, and a literacy program designed to develops phonemic awareness, oral language skills, and alphabetic knowledge (Early Literacy Essentials). Results from this study suggest that a combined intervention addressing literacy and social skills shows great promise in boosting academic achievement among behaviorally at-risk Head Start populations.
Similarly, a four-year study by Walker et al., (1998) was designed to divert at-risk kindergartners from an antisocial pathway in their subsequent school years and specifically targeted kindergartners who displayed early signs of antisocial behavior. The sample consisted of two cohorts of at-risk kindergartners (consisting of 24 and 22 children, respectively), both of whom were exposed to a social skills intervention program (First Step to Success) during the 1993-1994 and 1994-1995 school years, respectively. A randomized, experimental, wait-list control-group design was used to evaluate intervention effects. The children in the first cohort were followed through first grade while the children in the second cohort were followed through second grade; the children did not necessarily have the same teachers and peer groups throughout the study period. The results indicated a positive and measurable effect for the intervention that persisted into the primary grades.

Based upon the frequent co-occurrence of early deficits and behavior problems observed among preschool children (e.g., Hinshaw, 1992; Kaiser, Cai, Hancock, & Foster, 2002) and the strong association of these problems with school failure, it is important that early childhood research focus on developing school readiness in both literacy and social domains (Foundations and Agencies Network, 2000; Rimm-Kaufman, Pianta, & Cox, 2000). Since many children exhibit both academic and social emotional deficits upon entering preschool, research should be directed at identifying factors in the home and school environments that may impair healthy social and emotional development (Storch & Whitehurst, 2001). Thus, it is of some significance that studies of pre-kindergarten and kindergarten teachers’ views of school readiness show that teachers tend to give a higher priority to children’s skills in meeting social expectations than to
academic skills, in keeping with the assumption that social skills are a prerequisite to successful academic achievement (Wesley & Buysse, 2003). For example, a study conducted by Powell, Diamond, Bojczyk, and Gerde (2008) assessed Head Start teachers’ perspectives on early literacy development. Although the researchers found that the teachers generally supported the inclusion of literacy development as a component of the Head Start curriculum, they differed on what the relationship between literacy and social emotional skill development should be. Some teachers felt that there should be simultaneous attention given to growth in both literacy and social emotional skills, while others wanted to emphasize children’s literacy skills as a necessary prerequisite to progress in the social emotional domain. Nevertheless, the most widespread view among teachers was that the acquisition of healthy social emotional skills is a crucial pre-condition to satisfactory literacy development in pre-school age children.

In sum, the importance of developing adequate social emotional skills to support academic achievement has been well documented in early childhood research (e.g. Zigler & Styfco, 2004; Shonkoff & Phillips, 2000). Thus, it is not surprising that the U.S. Department of Health and Human Services (Child Outcomes Framework, 2000) mandated that the following social emotional variables be assessed for all children in the Head Start program during the academic year: self-concept, self-control, cooperation, initiative, persistence, and problem-solving skills. These variables are measured in order to monitor and provide intervention for children who might be at risk for social emotional problems.

**Family Factors that Influence Academic Achievement.** Research has identified the following family factors as sources of individual differences in physical,
cognitive, language, social emotional development, and academic readiness and achievement: number of parents in the family, educational level of the parent or the primary caregiver, family size, and the quality of the home environment (Eamon, 2001; Hanson, McLanahan, & Thomson, 1997; Linver, Brooks-Gunn, & Kohen, 2002). These family factors have been shown to be either positively or negatively associated with children’s achievement gains in reading and mathematics (U. S. Department of Education, National Center for Education Statistics, 2004). Each will be discussed in turn.

**Number of Parents in the Family.** The family structure in the United States has changed dramatically over the past 30 years. The proportion of two-parent families has declined and only 74 percent of the children in this country live in two-parent families (U.S Census Bureau, 2008). Moreover, there is a great deal of diversity among two-parent families. For example, in addition to the traditional family structure consisting of two biological parents, families now include same-sex parents, foster parents, and blended families (families in which a divorced, or never-married single parent marries a non-parent). A study conducted by Scott (2004) assessing the effects of family structure on the well-being of children in the U. S. found that having two biological parents is the optimum situation for developing children. Other studies have found that children living in blended families tend to have higher rates of delinquency and lower academic achievement when compared to children who live in families with two biological parents (e.g. see Lee, Burkham, Zimiles, & Ledewski, 1994).

Single-parent families may consist of only a mother, a father, an aunt, uncle or grandparent as the primary caretaker. However, the majority of single-parent families (89
percent) have the maternal parent as the primary caregiver (Bee & Boyd, 2010). Research assessing the developmental outcomes of children living in non-traditional family structures has produced evidence that children of single mothers are twice as likely to drop out of school and to have a child before the age of 20 when compared to children of two biological parents. Children of single mothers are also less likely to have a job in their early twenties (McLanahan & Sandefur, 1994). Most single-parent families are likely to be poor and the parents in such families tend to work long hours in low-paying jobs trying to make ends meet. As a consequence, these parents often lack sufficient quality time to spend with their children (U. S. Census Bureau, 2008).

Poverty also affects family interactions by creating pressures that result in depression and other mental health issues among family members. Parental depression, in particular, can often result in negative parenting practices such as harsh discipline, physical and emotional abuse, a lack of positive family structure, low nurturance, and lack of parental involvement in activities that promote children’s welfare (Eamon, 2001; Hanson, McLanahan, & Thomson, 1997; Linver, Brooks-Gunn, & Kohen, 2002).

**Level of Parental Education.** A parent’s level of education is also a good predictor of academic readiness and achievement (Davis-Kean, 2005; Klebanov, Brooks-Gunn, & Duncan, 1994; Smith, Brooks-Gunn, & Klebanov, 1997). The level of parental education is often defined as the highest education level achieved by the head of the household and by the spouse, if one is present. Several models have been advanced to explain how the family’s level of education mediates and influences a child’s academic outcomes (e.g., the socialization model and the family-process model, Davis-Kean, 2005). The level of education of a child’s family members has been shown to correlate
highly with the type of jobs they hold, which in turn influences family income and
variables that may be affected by family income, including general health and well-being,
satisfaction with family and individual circumstances, and satisfaction with self and
members of the family. Some researchers propose that the link between parental level of
education and children’s academic achievement is based on the supposition that parents
acquire tools, skills, and knowledge that influence the ways in which they interact with
their children, especially the degree and quality of enriching activities parents provide in
the home (i.e. Eccles, 1993; Corwyn & Bradley, 2002). Moreover, some studies (i.e.
Alexander, Entwisle, & Bedinger, 1994; Halle, Kurtz-Costes, & Mahoney, 1997) suggest
that parents with higher education generally have higher expectations for their children;
consequently, their children tend to achieve higher levels of education.

A longitudinal study conducted by Davis-Kean (2005) provided some support for
this premise. Using data from a national, cross-sectional study of children, the 1997 Child
Development Supplement of the Panel Study of Income Dynamics (PSID-CDS)
(Hofferth, Davis-Kean, Davis, & Finkelstein, 1998), the study examined how a parent’s
level of education affects children’s academic achievement through parents’ beliefs and
behaviors. The PSID is a nationally-representative, longitudinal dataset collected since
1968 from approximately 8,000 families and individuals. In 1997, all PSID families who
had children from birth to 12 years were recruited to participate. A total of 834 eight- to
12-year-olds (436 females, 433 males) participated. The sample was 49 percent non-
Hispanic European American and 47 percent African American. The study found a
positive relationship between the parents’ years of schooling and the children’s academic
achievement.
**Family Size.** The size of the family encompasses both the number of children and the number of adults in the household. Research on family size suggests that a large number of children in a family tends to have deleterious social emotional, intellectual, and health effects on these children, especially among low-SES families (Wagner, Schubert, & Schubert, 2001). A family’s accessibility to financial resources has been found to be associated with level of maternal stress; in general, adequate financial resources are associated with diminished levels of maternal stress, which, in turn, allows for better parenting (McLeod & Shanahan, 1993; McLoyd & Wilson, 1991; Zill, Moore, Smith, Steif, & Cairo, 1995). In contrast, having inadequate financial resources has been associated with high degrees of maternal stress and poor parenting. In a review of research on the effect of family size on children’s well-being, Wagner, Schubert, and Schubert (2001) found that given a constant family income, every successive child reduces the income available for healthy food, health care, educational materials, quality time, and leisure activities. Families with fewer children have been found to have more parental time and resources available for each child (Gershoff, Aber, Raver, & Lennon, 2007). Wagner et al., (2001) suggest that siblings from smaller families tend to benefit from more parental attention because they are exposed to more adult language than are children in families with more children. In fact, exposure to adult language has been shown to affect a child’s performance on intelligence tests, especially those with large verbal components (Downey, 2000). Wagner et al., (2001) have also documented that children from large families tend to have lower scores on intelligence and achievement tests as compared to their peers from smaller families.

A traditional family normally has at least two adults, usually a father and mother;
however, recently there has been an increase in the number of adults (grandparents, aunts, uncles, and older siblings) living in low socio-economic households. According to Casper and Bryson (1998), policy analysts and researchers first began to notice increases in the number of adults living in the same household between 1970 and 1997; an especially large increase was observed in the 1980s during the last great recession. Minkler (1998) has suggested that the increases in the numbers of adults living in households can be explained by: 1) teen pregnancy, as teen mothers often are forced to live in the same household with parents, 2) drug abuse among parents, as this may result in other family members stepping in to care for children whose parent(s) are abusing drugs, 3) the rapid rise of single-parent households, especially among low-SES families, which has made it necessary for families to seek additional child care support from extended family members.

Quality of the Home Environment. Another family variable that has been linked to a child’s academic achievement is the quality of the home environment. There is ample documentation to suggest that the quality of a child’s home environment, in terms of the degree of enrichment, intellectual stimulation, and exposure to environmental events and circumstances, has both direct and indirect effects on a child’s cognitive development and academic achievement (i.e. Snow, 1997; Soderstrom, 2007; Pan, Rowe, Singer, & Snow, 2005). Studies have shown that the quality of the home environment explains half the variance in the relationship between family income and academic outcomes (Duncan & Brooks-Gunn, 1997). For example, considerable research demonstrates a strong link between language and literacy enrichment activities in a child’s home environment and later language and literacy development (DeTemple, 2001; Tabors, Beals, & Weizman,
With regard to language development, studies have amply documented that children benefit significantly from home environments that provide a great deal of language enrichment in the form of extensive conversation with experienced and sophisticated language users who help the child increase his or her vocabulary and general language skills. Children who live in home environments that provide few opportunities for such language enrichment are at a disadvantage in this respect (DeTemple, 2001; Institute of Education Sciences, 2007). In addition, the educational level of a child’s parents has been shown to predict the complexity and variety of speech used by these parents in communicating with their children, which in turn has been shown to predict a child’s language and reading skills at later points in time (Hoff, 2003). Similarly, De Coulon, Meschi, and Vignoles (2008) found that by age three, children of the least-educated parents were already as much as one year behind their more advantaged peers on vocabulary tests. Moreover, George, Hansen, and Schoon (2007) found that three-year olds from low-SES homes have poorer language skills when compared to those from higher-SES homes.

With regard to the acquisition of literacy skills, research has shown that children benefit greatly when home environments provide a multitude of books, writing materials, and other resources (magnetic letters, literacy games, and television shows focusing on literacy) along with opportunities to engage in guided reading and writing experiences as compared with home environments that do not provide such literacy enrichment (Patterson, 2002; Storch & Whitehurst, 2001; Tabors, Snow, & Dickinson, 2001). The home environment also influences a child’s literacy development through language enrichment, print enrichment, endorsement, and continual validation of the child’s literacy
skills. Children from enriched environments consequently begin with greater academic readiness and stay ahead of those peers who do not have similar exposure (Pan, Rowe, Singer, & Snow, 2005; Zill, Moore, Smith, Steif, & Cairo, 1995). For example, there is strong research demonstrating that pre-first grade children who learn letters, letter sounds, and print concepts and conventions have better reading readiness when compared to children who have not acquired such knowledge (Dickinson & Tabors, 2001; Vellutino et al., 1996; 2008). Researchers have also linked vocabulary acquisition to reading achievement. In fact, some researchers (e.g., Dickinson & Tabors, 2001; Vellutino et al., 2004) have theorized that deficits in a child’s vocabulary may be a basic cause of difficulties in learning to read for some impaired readers. Additionally, several researchers have shown strong correlations between a child’s early language skills and later reading abilities (e.g. Hart & Risley, 1995; Dickinson & Tabors, 2001).

**Family Factors and Social Emotional Development.** The parent-child relationship is believed to be the foundation on which all subsequent relationships are built and some suggest that it is the primary pathway affecting a child’s subsequent social and emotional development (Baumrind, 1996; National Research Council, 2000; Schermerhorn, Cummings, & Davis, 2008). A parent’s responsibility is to foster a secure attachment with the child by providing ample warmth and affection, consistent parenting, and an environment conducive to exploration and learning. The attachment between the parent and child is the child’s most important resource for navigating subsequent life events and challenges (National Research Council, 2000).

Family factors discussed in the previous sections (single parenthood, parental level of education, family size, and quality of home environment) have been shown to
influence social emotional development in children (Thomson, McLanahan, & Curtin, 1992; Zigler & Styfco, 2004). For example, harsh punishment and maternal neglect affects the development of a child’s secure attachment and is strongly associated with subsequent behavior problems (Hill & Bush, 2001; Simons, Johnson, & Conger, 1994).

In a classic investigation known as the Rochester Longitudinal Study, Sameroff and colleagues (Sameroff, Seifer, & Zax, 1982; Sameroff, Seifer, Zax, & Barocas, 1987; Sameroff, Seifer, Baldwin, & Baldwin, 1993; Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1999) examined the effects of the family environment on early emotional behavior and later mental health. Researchers assessed a group of children from birth to 18 years and seven waves of data were collected with the following sample sizes: 337 infants during the first wave, 262 four-month olds during the second wave, 263 twelve-month olds during the third wave, 234 thirty-month olds during the fourth wave, 214 four-year olds during the fifth wave, 180 thirteen-year olds during the sixth wave, and 157 eighteen-year olds during the last wave. A total of 55 percent of the children studied were female and 45 percent were male. The ethnic composition was 67 percent white, 32 percent African-American, and one percent Hispanic. The researchers found that although individual characteristics of mental health and higher intelligence contribute to developmental competence, the effects of such characteristics do not overcome the effects of high environmental risk. The analyses consistently found that groups of low-resilient children in high-risk environments had lower mental health and cognitive competence later in life than did groups of highly resilient children in low-risk environments. The following variables were identified by the study as risk factors: 1) high maternal anxiety, 2) parental perspectives that reflect rigidity in attitudes, beliefs,
and values, 3) few positive maternal interactions with the child as observed during infancy, 4) head of household in unskilled occupations, 5) minimal maternal education, 6) disadvantaged minority status, 7) single parenthood, 8) stressful life events, and 9) large family size. The children from the poorest families in the sample exhibited the poorest development in social emotional competence. Similarly, Rutters (1979) found that the following family environment risk factors had a deleterious effect on children’s social emotional development: severe marital distress, low SES, large family size or overcrowding, paternal criminality, maternal psychiatric disorder, and admission of the child to foster care.

Additionally, a number of researchers have found that the greater the number of risks a child faces, the greater the chances are that he or she will be negatively affected. For example, a study by Rutter (1979) and the longitudinal study by Sameroff (1998) just discussed both show that when a child is exposed to more risk factors, the impact is not just additive; rather, risk factors multiply each other’s destructive effects. As a result, researchers are increasingly using cumulative risk scores to identify individual differences in the effects of risks to which children are exposed. For example, in two separate studies, Williams, Anderson, McGee, and Silva, (1990) and Sameroff, (1998) found that when a composite risk score was computed, there were major differences between the mental health status of the children based on the composite score. Thus, it is the cumulative disadvantage more than a single risk factor that deleteriously affects children.

**Family Influences on Language, Literacy, and Math Skills**

**Language and Literacy Skills.** Research assessing the general effects of family
influences on academic readiness skills among disadvantaged preschoolers is scarce. However, a family variable that has been extensively investigated is the relationship between oral language and literacy enrichment in the child’s home environment and later literacy and language development (National Institute of Child Health and Human Development, 2005; Snow, Tabors, & Dickinson, 2001; Storch & Whitehurst, 2002).

The skills involved in learning to read are commonly seen as falling into two main categories: (1) code-related skills and (2) oral language skills (Storch & Whitehurst, 2002). Code-related skills involve knowledge of the alphabet, knowledge of what sounds the letters make, print knowledge, and phonological awareness. Oral language skills include vocabulary knowledge, grammatical knowledge, narrative skills, and pragmatic skills. These two sets of skills exert their most important effects at different points in literacy development. Code-related skills have been shown to be important during the first few years of school when children are learning to decode and spell written words, while oral language skills have their most important role from grade three onward and especially contribute to reading comprehension (Frost, Madsbjerg, Niedersøe, Olofsson, & Sørensen, 2005; Storch & Whitehurst, 2002).

There is great variability in the environments of low-SES homes in terms of the activities that promote academic readiness such as language enrichment, exposure to print conventions, and exposure to rudimentary number concepts. The quality of children’s language skills at school entry is especially important because language skills lay the foundation for later reading and writing; children with poor language skills are more likely to have difficulties learning to read and acquiring skills in other academic areas, especially those that depend on skill in reading (Whitehurst & Lonigan, 1998). Moreover,
longitudinal studies have shown that children who have difficulty learning to read in the
depreschool years tend to continue having difficulties over time (Scarborough, 2001; Snow,
Burns, & Griffin, 1998).

For example, Storch and Whitehurst (2001) evaluated the relationship between
emergent literacy and later reading ability among Head Start children. The sample
consisted of 367 children who were a subset of a larger sample of children initially
contacted by Whitehurst and colleagues as part of the longitudinal study. The children
belonged to one of three cohorts who attended Head Start during the 1991-92, 1992-93,
or 1993-94 school years and who were eligible to enroll in public kindergarten the
following year. The sample of children was 50 percent male; mothers were the primary
caregiver in 85 percent of the sample. The sample was 44 percent African American, 34
percent Caucasian, 17 percent Hispanic American, and one percent Asian, a racial mix
which closely mirrored the national Head Start composition (U.S. Department of Health
and Human Services, 1999). The only children who were included in the analyses
conducted in the study were those who remained in the sample through the spring of their
second-grade year. The children’s language and literacy skills were assessed four times:
in the spring of Head Start, in kindergarten, in first grade, and in second grade.

The researchers assessed what they called “inside-out” skills and “outside-in”
skills, using emergent literacy measures along with home and family measures in order to
evaluate possible relationships between child and family variables. The inside-out
components consisted of sources of information within the printed word that foster the
child’s ability to translate print into sounds and sounds into print; for example, phonemic
awareness and letter knowledge were defined as inside-out skills. The outside-in
components consisted of sources of information that directly support a child’s understanding of the meaning of print, for example, vocabulary, conceptual knowledge, and story schemas. The home and family variables consisted of the following aspects of home life: frequency of shared reading with the child, duration of shared-reading episodes, number of picture books in the home for the child’s use, frequency of visits to the library with the child, frequency with which the child asks to be read to, frequency with which the child looks at books alone, the grade the caregiver expects the child to earn in reading, the grade the caregiver expects the child to earn in spelling, the caregiver’s own enjoyment of reading, the frequency with which the caregiver reads for pleasure, and the primary language spoken at home.

Overall, home and family characteristics accounted for approximately 40 percent of the variance in preschool outside-in skills, with parental characteristics contributing most strongly to this domain, followed by the home literacy environment and parental expectations factors. Similar results were obtained in predictive studies with Head Start children (i.e. Lonigan, Burgess, & Anthony, 2000; Storch & Whitehurst, 2002; Lonigan, Anthony, Bloomfield, Dyer, & Samwel, 1999; Lonigan & Whitehurst, 1998)

In a large-scale longitudinal study conducted by Dickinson and his colleagues (Dickinson, & Tabors, 2001), the relationship between language and literacy skills was assessed in a group of children from low-income families from preschool through high school. Assessments were carried out in the home environment as well as in preschool, elementary school, and high school classrooms. Data collection was initiated when the children were three years old. This research, which has come to be known as the Home-School Study of Language and Literacy Development (henceforth called the Home-
School Study, Tabors, Snow, & Dickinson, 2001) focused on language and literacy development in 74 children and their families. Various research findings have emerged from an analysis of the data collected by these researchers. For example, DeTemple (2001) investigated the degree to which parents and children read books together in a sample of 54 mothers and children from the Home-School Study, in an effort to evaluate the relationship between reading at home with young children and the children’s later language and literacy skills. Researchers found that home support for literacy, as measured by the number of books owned, the frequency of parent-child reading, and the variety of enriching reading activities provided, was predictive of children’s early literacy skills.

Studies of oral language skills have also identified early narrative competence as a significant predictor of reading achievement and academic success (Wells, 1985; Snow & Dickinson, 1990). For example, Tabors, Snow, & Dickinson (2001), using the Home-School Study database, examined relationships between kindergarten narrative production scores, formal definitions, emergent literacy and receptive vocabulary, and later reading comprehension scores in the same children in fourth and seventh grades respectively. The samples for the dependent variables consisted of 54 children in fourth grade and 51 children in seventh grade. The researchers visited the children periodically in their classrooms and interviewed their teachers. They also had the children complete a battery of School-Home Early Language and Literacy (SHELL) tests (Snow et al., 1995). In addition, the Peabody Picture Vocabulary Test-Revised (PPVT-R, Dunn& Dunn, 1981) was administered to measure receptive vocabulary, while the California Achievement Test (CAT; CTB, Macmillan/McGraw-Hill, 1992) was administered to
measure reading skills.

Narrative production scores in kindergarten were significantly correlated with fourth- and seventh-grade reading comprehension. The researchers suggested that children’s narrative activities depend heavily on decontextualized oral language skills, which, in turn, are crucial for children’s literary and academic success.

Another oral language skill that has been shown to be related to later language and literacy development is the amount of mothers’ and children’s pretend talk. For example, a study by Katz (2001), using the Home-School Study database, investigated the amount of mothers’ and children’s pretend talk when the children were preschoolers and the children’s performance on language and literacy assignments when they were in kindergarten. The interactions of 52 children and their mothers during toy play sessions were analyzed when the children were three, four and five years old. The researchers found that skill with pretend talk in the preschool years was important to the development of language and literacy skills in kindergarten. Children who demonstrated higher-level language and literacy skills in kindergarten were, on average, the same children who, as preschoolers, had experienced interesting talks with parents that exposed them to many new words (Tabors, Roach, & Snow, 2001).

Other studies assessing the relationship between the home environment and later language and literacy development have assessed the effects of dialogic reading on oral language development and on phonological processing skills. Dialogic reading is a technique whereby parents interact with their children during shared reading of picture books, strategically posing questions about the story, the pictures, and what the child expects to happen. A review by the Institute of Education Sciences (2007) of eight
studies conducted with economically-disadvantaged families assessing the effects of
dialogic reading reported that this procedure had positive effects on oral language
development in five of the studies, although no discernible effects of the procedure on
phonological-processing skills were reported. It appears that the emergent literacy
knowledge and skills that children bring to first grade from prior experiences in their
homes, preschool centers, and kindergartens are critical determinants of how well they
will do in learning to read in elementary school.

Finally, one of the most extensive and large-scale longitudinal studies of the
relationship between oral language and later literacy development was the Child Care and
Youth Development Study sponsored by the National Institute of Child Health and
Human Development (NICHD, 2005). In this study, the researchers examined both the
direct and indirect role of oral language and phonological skills on word recognition and
reading comprehension using data from 1,137 children. The investigators initiated the
study when the children were three years of age and followed them through third grade.
They specifically examined the contribution of preschool oral language skills to reading
performance in early elementary school. Results suggest that preschool oral language
skills make a strong and important contribution to later reading competence. More
specifically, the researchers found that broad oral language skills were predictive of
preschool literacy skills and reading achievement in first and third grades.

**Mathematical Skills.** Another academic readiness variable that has been shown
to be related to the quality of the preschool home environment is emergent mathematical
knowledge. Research shows that mathematical skills, like oral language and literacy
skills, also vary greatly when children enter kindergarten. Individual differences in initial
mathematical knowledge among children in kindergarten appear to be strongly predictive of mathematics achievement test scores in elementary, middle, and even in high school (Duncan et al., 2007; Stevenson & Newman, 1986). For example, Duncan et al., (2007) used a meta-analysis of six longitudinal datasets to assess links between three key elements of school readiness and achievement at later points in time: (1) school-entry academic skills (i.e. reading and math readiness skills), (2) attention, and (3) social emotional skills. The children in these studies were initially assessed in kindergarten and again in subsequent years up through ninth grade. In all six studies, the strongest predictors of later achievement were school-entry math, reading and attention skills. Results also showed that early math skills had the greatest predictive power, followed by reading, and attention skills.

Similar findings were reported from analyses using the Early Childhood Longitudinal Study data (Walston & McCarroll, 2010). These investigators followed the same children from kindergarten through eighth grade from the fall of 1998 to the spring of 2007. The study was designed to provide data that could be used to understand whether various child, home, classroom, school, and community factors at various points in the child’s life were related to cognitive and social development. The Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) was sponsored primarily by the National Center for Education Statistics (NCES) in collaboration with federal agencies and organizations. The study consisted of a nationally-representative sample of approximately 23,000 kindergartners in approximately 1,300 kindergarten programs from both public and private schools, including children from diverse ethnic and socioeconomic backgrounds.
The researchers collected data on student and family characteristics, geographic region, school type, and a school’s level of algebra enrollment. The results indicated that the likelihood that students would be enrolled in algebra classes was related to prior mathematics ability. More specifically, higher scores on the mathematics assessment in fifth grade were associated with higher levels of algebra enrollment by eighth grade. The report found that about 4 in 10 students were enrolled either in algebra or a higher mathematics course in the eighth grade. Algebra enrollment was more common for Asian students, students living above poverty guidelines, students whose mother had a bachelor’s degree or higher, students living in a two-parent home, and students from private schools. In some schools, enrollment for eighth-grade algebra coursework was as high as 75 percent of the school’s eighth-graders; students living in the western region of the country were more likely to be attending one of these schools than were students in other regions of the country.

Similarly, the Third International Mathematics and Science Study (TIMMS, 1996) assessed the relationship between home factors and mathematics (Beaton, Mullis, Martin, Gonzales, Kelly, & Smith, 1996a) and science achievement (Beaton, Mullis, Martin, Gonzales, Kelly, & Smith, 1996b) in more than 41 countries, at five grade levels: third, fourth, seventh, and eighth grades, and the final year of secondary school. The study was sponsored by the International Association for the Evaluation of Educational Achievement (IEA), an independent, international cooperative of national research institutions and governmental research agencies.

An analysis of the correlations of home factors with mathematics and science achievement found strong positive relationships between academic achievement and
home factors. These included having study aids in the home (a dictionary, a computer, and a study desk for the student’s own use), as well as having books in the home. The parents’ level of education was also considered.

Research predicting achievement in other academic areas, including music, art and drama (imaginative play), is not readily available. However, since measures of home literacy enrichment have been shown to be highly correlated with measures of academic skills in domains such as oral language, literacy, and mathematics, it seems reasonable to assume that enriching arts activities provided in the home environment are also beneficial to children’s attainment of early music, art, and imaginative play skills.

To summarize thus far, the determinants of academic readiness and achievement discussed in the previous sections are well documented. In the sections that follow, programmatic efforts at implementing effective interventions on behalf of children living in poverty are discussed. Certainly, the most prominent national intervention effort has been the Head Start program. Thus, the goals and emphases of this program are discussed historically. State and federal studies of the effectiveness of this program are also discussed, along with studies of similar intervention initiatives implemented in the private sector.

**The Head Start Program**

The Head Start program was created by the United States federal government in 1965 (Currie & Thomas, 1995) to promote school readiness among preschool children from poor families faced with multiple risks, including that of children failing in school. The program was designed to intervene on behalf of preschool children and their families by providing a support system enabling at-risk children to develop to their fullest
potential.

At the start, the primary objective of most Head Start programs was to promote normal physical, social emotional, and cognitive development. During the early years of Head Start, there was less emphasis on the development of academic-readiness skills in literacy and math. Largely influenced by Piaget’s stage theory, which suggests that three- and four-year-old children do not have the necessary conceptual skills to profit from instruction that focuses on academic skills, comprehensive and direct instruction to promote academic-readiness skills was long considered to be developmentally inappropriate for Head Start children.

In 1998, however, Congress amended the Head Start Act to produce the resultant Head Start Performance Standards and Measures (P.L. 105-285). These standards reflected a broader and more comprehensive educational curriculum than that characteristic of Head Start programs at large and included activities to promote greater academic readiness than did the more traditional Head Start curriculum; specifically, the new curriculum included activities to facilitate the acquisition of early literacy and math skills.

The Head Start Program Performance Standards, as outlined by the Administration for Children and Families (ACYF), require that Head Start delegates and grantees obtain: 1) an assessment of physical development and health needs along with an age-appropriate screening to assess sensory, behavioral, motor, language, social emotional, cognitive, and perceptual skills no later than 45 days following entry into the program; 2) a complete physical examination, including vision and hearing screenings, beginning at three years of age and every two years thereafter, 3) regular follow-up
screenings to ensure that all children are up-to-date in age-appropriate care, including immunizations, medical, dental, and mental health care, and to ensure that each child has regular access to health care, and 4) a nutritional evaluation, in collaboration with the child’s family, to identify a child’s nutritional needs (U. S. Department of Health and Human Services, 2008).

Further, in 2000, the Head Start Child Outcomes Framework was released by the U.S. Department of Health and Human Services (DHHS) in order to guide Head Start programs in curriculum planning and program assessment. This framework included legislative mandates requiring that children in Head Start programs master specific learning objectives, such as “knowledge of at least 10 letters of the alphabet,” “association of sounds with written words,” and “recognition of a word as a unit of print.” The framework also expanded the mathematics domain by citing the importance of a child’s ability to count to 10 and to make use of one-to-one correspondence in counting, even though these particular skills were not specifically mandated in the 1998 legislation.

In 2003, the DHHS required that Head Start children be assessed three times a year in order to document their progress in acquiring the academic-readiness skills specified in the Head Start Child Outcomes Framework, thereby promoting greater academic readiness (School Readiness Act, 2003).

In accord with DHHS mandates, current Head Start classrooms feature a variety of components including a combination of structured, teacher-led educational activities, open-ended free-play times, and dramatic or pretend play (Administration on Children, Youth and Families, 1998). The current educational curriculum also includes activities
that promote emergent language and literacy skills. These skills include vocabulary knowledge, phonemic awareness, story and print concepts, alphabetic knowledge, and letter and word identification, as well as early math skills such as the ability to count pictured objects and the ability to understand simple addition and subtraction concepts. In addition, the currently-mandated curriculum includes activities designed to promote an understanding of natural phenomena and basic science concepts, as well as activities designed to facilitate the development of visual-motor skills and an appreciation of art and music. The federal government’s commitment to improving educational outcomes for children of poverty was reaffirmed again in Public Law 110-134, Improving Head Start for School Readiness Act of 2007. According to this legislation, the intent of the Head Start program is to:

Promote the school readiness of low-income children by enhancing their cognitive, social, and emotional development in a learning environment that supports children’s growth in language, literacy, mathematics, science, social and emotional functioning, creative arts, physical skills and approaches to learning.

There have been several research studies evaluating the effectiveness of the Head Start programs over the years but they have generally produced mixed results. These studies have differed in terms of their sample sizes and characteristics, study design, and study length. A brief summary of the most important findings of these early studies follows.

Evaluating the Effectiveness of Head Start Programs

The Westinghouse Study. The first major study of the effectiveness of Head Start programs was conducted by the Westinghouse Learning Corporation in 1969. Its most important findings were summarized in a report issued by the U.S. Department of Health and Human Services (McGroder, 1990). The following quote summarizes the
central findings.

Summer programs were found to have no lasting impact. Full-year programs resulted in cognitive and language gains at the first-grade level but appeared to “fade out” by second or third grade. Gains were particularly noteworthy among blacks and among children attending Head Start in central cities and in the Southwest (p. 3).

It should be noted, however, that the Westinghouse study has been criticized for failing to equate experimental and control groups for risk factors and for failing to control for environmental circumstances in the years following participation in the Head Start program (McGroder, 1990).

**Head Start Synthesis Project.** A meta-analysis conducted by McKey et al. (1985) reviewed results from more than 210 studies of local Head Start programs and reported immediate gains on measures of cognitive and social emotional skills; these gains eventually faded, relative to control groups of disadvantaged children who had not been involved in Head Start programs. However, results also indicated that Head Start programs were successful in improving the general health of the children they served and in promoting improved levels of psychological well-being and economic and social status among parents who actively participated in the programs.

**Philadelphia School District Study.** In 1987, the school district of Philadelphia analyzed ten years of data on approximately 15,000 children who had attended the Philadelphia Follow Through programs in 33 city school districts. Results showed that the children in these programs who also attended Head Start programs were less frequently retained in grade from kindergarten through sixth grade, had better attendance rates, and lower attrition rates than their non-Head Start peers (Copple, Cline, & Smith, 1987).
**Minnesota Family Impact Study.** In 1988, researchers at the University of Minnesota assessed the effects of two different Head Start interventions on family functioning (Leik & Chalkey, 1989). Children enrolled in a local Head Start program (n = 81) were divided into two groups; one of these groups received the regular Head Start program and the other received an enhanced program with more intensive parental involvement. Results indicated that family dysfunction diminished significantly for the families involved in the enhanced programs. Moreover, parents in both Head Start groups were more likely to assess their children as being “competent” and demonstrated more competence themselves than did parents in the control group.

**Oregon Longitudinal Study.** In 1989, the State of Oregon conducted a study assessing former Head Start children who were in kindergarten through fifth grade at the time of the assessment; researchers found that the children tended to perform at grade level on tests of reading and math skills. Former Head Start children were also more likely to be enrolled in “gifted and talented” programs than were non-Head Start children (Norris, 1989).

In sum, a review of the literature concerned with the effectiveness of Head Start programs suggests that Head Start can and does affect school readiness and that the effects are long term. However, studies conducted early in the 1990s were deemed insufficient to draw conclusions about the impact of the national program (Government Accountability Office, 1997). The U.S. Government Accountability Office (GAO), established in 1921 as the U.S. General Accounting Office, has as its mission the task of identifying federal programs at high risk for waste, fraud, abuse, and mismanagement.

One of the handicaps faced by the GAO in evaluating Head Start programs had
been a lack of reliable data for measuring the costs and results associated with agency operations and for evaluating agency decisions. Early in the 1990s, studies of Head Start programs were criticized because of concerns over the use of small regional samples; evaluators decided that studies were needed that had samples representative of the national composition of the Head Start program.

In 1998, DHHS encouraged a closer examination of the effect of Head Start on children and families and thus initiated and supported the implementation of a series of investigations called the Family and Child Experiences Survey (FACES) studies. The FACES studies provide descriptive data on the characteristics, experiences, and outcomes of Head Start children and families, along with the characteristics of the Head Start programs that serve them. The FACES studies used nationally-representative samples of Head Start children and are essentially descriptive in nature as there are no comparable control groups.

Another criticism of studies conducted early in the 1990s was the lack of rigorous experimental designs. In 2002, the Advisory Committee on Head Start research mandated an Impact Study to examine what difference Head Start made in the development and school readiness of the children it served and under what circumstances Head Start had the greatest impact. The Head Start Impact study was the first such study that used a rigorous experimental design with a nationally-representative sample. A brief summary of the federally-funded studies are discussed below: the FACES studies (1997; 2000; 2003; 2006), the Early Reading First Study (2002), and the Head Start Impact Study (ACF, 2010).

Federally-Funded Studies
The Family and Child Experiences Survey (FACES) Studies. The FACES studies were launched as part of the Head Start program performance initiative designed to assess the characteristics, experiences, and outcomes for children and families served by Head Start, along with the quality and effectiveness of the program. To date, four separate periods of data collection involving four cohorts of children have been documented. The first assessment was conducted in 1997; the second, third, and fourth assessments were conducted in 2000, 2003, and 2006, respectively.

The following instruments were used in all four studies: the Peabody Picture Vocabulary Test (PPVT-III, Dunn & Dunn, 1997), used to assess vocabulary knowledge; the Woodcock-Johnson Tests of Achievement-Revised (Woodcock, & Johnson, 1989), which was used to assess early reading, early writing, and early math skills; the Social Skills Rating System (Gresham & Elliot 1990), which was used to assess social skills; and the Early Childhood Environment Rating Scale (ECERS-R, Harms, Clifford, & Cryer, 1998), which was used to assess the quality of the classroom environment.

The 1997 FACES Report. The 1997 FACES report was based on data obtained from a nationwide representative sample of 3,200 children and their families in 40 programs. The report indicated that at the end of the school year, the average Head Start child had some early literacy and math skills. However, the children had scores well below the overall means of the standard scores for the national standardization samples, which are set at 100, with standard deviations of 15. The children’s mean scores were as follows: 89.5 for the Peabody Picture Vocabulary Test; 88.9 on the WJ-R Letter-Word Identification test; 89.4 on the WJ-R Applied Problems math test; and 86.3 on the WJ-R Dictation pre-writing test.
The 2000 FACES Report. Data collected for the FACES 2000 study were obtained from a national cohort of 2,800 children and their families in 43 different Head Start programs across the nation (Administration on Children, Youth and Families, 2001). Head Start children were found to be well below the national norms for same-aged peers at program entry. The study found that Head Start entrants had a mean standard score of 85.3 on the Peabody Picture Vocabulary Test (PPVT-III). On the Woodcock-Johnson Revised (WJR) achievement battery, these children obtained a mean standard score of 87.9 on the applied problems (early math) test, an 85.1 on the dictation (early writing) test, and a 92.4 on the letter-word associations test.

Head Start children, on average, knew four letters of the alphabet at program entry and left the program knowing, on average, about nine letters. This level of performance falls below the congressional mandate that Head Start children should be able to name at least 10 letters of the alphabet by the end of the school year.

Head Start children made some progress in the social emotional domain, showing a reduction in hyperactive behavior and growth in social skills during the Head Start year, as measured by the Social Skills Rating System (Gresham & Elliot 1990). The FACES 2000 report also indicates that Head Start programs, on average, met the minimum performance standards in the following areas: the types of curricula used in the classroom, classroom quality, and teacher qualifications. The report also found that approximately 70 percent of the Head Start teachers in the year 2000 cohort reportedly used a single curriculum, 21 percent used a combination of curricula, and 9 percent did not use any curriculum. The Creative Curriculum (Dodge & Colker, 1992) was the most widely used curriculum (39.1 percent), followed by the High Scope (Hohmann &
Weikart, 2002) curriculum (20 percent), while 41 percent of the programs used some other curriculum.

**The 2003 FACES Report.** The FACES 2003 study consisted of a representative sample of 2,400 Head Start children and their families from among 63 programs. The results from this study show a trend that is similar to the previous FACES studies. Most of the children in the 2003 cohort entered Head Start with early pre-academic skills that were below national norms on vocabulary, early math, early reading, and early writing. The children from this cohort had a mean standard score of 85.6 for vocabulary as measured by the Peabody Picture Vocabulary Test III (Dunn & Dunn, 1997), and mean standard scores of 88.4 for early math, 95.0 for early reading, and 86.5 for early writing, as measured by selected items from both revised and third editions of the Woodcock-Johnson Psycho-Educational Battery. However, during the program year, significant standard score gains were reported for vocabulary (2.9 points), early math skills (1.5 points), and early writing skills (0.7 points). Significant gains were reported for four-year olds in early reading from the fall to the spring semesters and significant gains were also reported on the social emotional measure (cooperative classroom behavior) during this time period.

**The 2006 FACES Report.** The FACES 2006 study included a representative sample of 60 programs, 135 centers, 410 classrooms, 365 teachers, and 3,315 pupils in the fall of 2006 (West, Malone, Hulsey, Aikens, & Tarullo, 2010). As observed in the previous FACES studies, the performance indicants in all domains continued to show low pre-academic readiness skills for the Head Start children in the 2006 cohort. For example, children entering Head Start for the first time in the fall of 2006 scored below the national
norms on measures of language, literacy, and math development. The mean standard scores for Head Start entrants were 85.4 on a measure of receptive vocabulary, 93.9 on a measure of letter-word identification, 95.1 on a measure of early writing, and 89.8 on a measure of applied math problems. These standard scores were similar to those for children assessed in FACES 2000 and 2003; the only exception was the early writing scores, which were higher for the 2006 cohort than for the other three cohorts.

**The Early Reading First Impact Study.** The Early Reading First (ERF) program was created by the No Child Left Behind (NCLB) Act of 2001 to advance teacher practices, instructional content, and classroom environments in preschools and to ensure that young children begin school with the skills needed for academic success. Two key elements of the ERF program were the use of scientifically-based methods and the goal of enhanced professional development. The grant program provided funding to preschools that serve children from disadvantaged families for purposes of supporting age-appropriate development of children’s language and literacy skills. It is important to note here that only some of the preschools in the ERF program were Head Start programs (36 percent.) The program’s design reflects research supporting the kinds of skills that young children must acquire in order to become successful readers. These skills include oral language (expressive and receptive language and vocabulary development), phonological awareness (rhyming, blending, segmenting), awareness of print conventions, and alphabet knowledge (letter and letter-sound identification (Whitehurst & Lonigan, 2001; Pullen & Justice, 2003).

Five rounds of ERF grants have been awarded since the program began in 2002. These awards ranged from $750,000 to $4.5 million per site for a three-year period. The
NCLB Act mandated an independent national evaluation of the ERF program and required a final report to Congress. The evaluation treatment sample consisted of four-year-olds attending preschool in 28 of 30 ERF grantee sites. The experimental group consisted of 86 preschools, 78 classrooms, 92 teachers, and 803 children. The comparison group consisted of children attending preschool in 37 of the 65 unfunded applicant sites, with a total of 75 preschools, 91 classrooms, 102 teachers, and 855 children. The comparison sample consisted of sites with the highest application scores that had not received funding and that agreed to participate in the study. On average, three classrooms were selected from each participating site, with proportional numbers of eligible students in each class. The study team randomly selected approximately 11 four-year-old students per classroom; in each case, parents provided written consent for participation in the study. Data were collected twice: in the fall of 2004 and in the spring of 2005. The same data-collection instruments and procedures were used in the funded and unfunded sites.

The following instruments were used to measure children’s language, literacy skills, and their social emotional behavior in the Early Reading First study: The Pre-Language Assessment Scales (Duncan & DeAvila, 1998) were used to measure proficiency in English. The Preschool Comprehensive Test of Phonological and Print Processing (Lonigan, Wagner, Torgesen, & Rashotte, 2007) was used to measure print and letter knowledge; the Expressive One-Word Picture Vocabulary Test (Brownell, 2000) was used to measure expressive vocabulary; the Preschool Language Scale (Zimmerman, Steiner, & Pond, 2002) was used to measure auditory comprehension, and, lastly, the Social Competence & Behavior Evaluation Teacher Rating (La Freniere & Dumas, 1996) was used to measure three sub-skills: social competence, anger-aggression,
and anxiety-withdrawal.

Classroom practice and the overall quality of the preschool classrooms were measured using two observation instruments, the Teacher Behavior Rating Scale (Landry et al., 2004) and 11 items from the Early Childhood Environment Rating Scale-Revised (Harms, Clifford, & Cryer, 1998).

The Early Reading First study found statistically-significant effects on classroom, teacher, and child outcomes. Classroom outcomes included the following: an increase in book-reading practices, phonological awareness, teaching practices, quality of teacher-child interactions, the organization of the classroom, and the planning of children activities. Teacher outcomes included an increase in professional development hours, the use of mentoring as a mode of training, extensiveness of child-assessment practices, teaching practices that support print and letter knowledge and writing, language environment of the classroom, and book-reading practices. However, the ERF study only found a positive impact on children’s print and letter knowledge but not on phonological awareness or oral language; neither were there any changes observed in children’s social emotional development.

**Head Start Impact Study.** The Head Start Impact Study was commissioned in 2002 and came about directly because of the 1998 amendment of the Head Start Act and congressional reauthorization that increased the pressure to evaluate the effectiveness of Head Start (ACF, 2005). At that time, Congress required the U.S. Department of Health and Human Services to study the impact of the Head Start program on the children and families served by these programs. The study began in the fall of 2002 and ended in spring, 2006, following children through the spring of their first grade year (ACF, 2005;
ACF, 2010). Conducted by Westat (http://www.westat.com/), the study is known as the Head Start Impact Study (ACF, 2010). An interim report identifying program effects during the first year of the study was released and submitted to Congress in June, 2005 (ACF, 2005). The final report to Congress was released in 2010 and examines how Head Start affects children’s school readiness and parenting after one program year (an average of 8 ½ months), at the end of kindergarten, and at the end of first grade (ACF, 2010).

The researchers obtained information on all children who were eligible for enrollment in Head Start programs for the fall of 2002. An average sample of 27 children per center was selected from this pool: 16 of the children were assigned to the Head Start experimental group and 11 were assigned to the comparison group. Children in the comparison group were allowed to enroll in other non-parental care programs or non-Head Start child care programs selected by their parents. The children could remain at home in a parent’s care, or enroll in a child care or preschool program. Random assignment was used to place children in the experimental or comparison groups. The study samples, which consisted of newly entering three-year olds and newly entering four-year-olds, were taken from 23 different states and were enrolled in 84 randomly-selected Head Start grantees, 383 randomly-selected Head Start centers, and a total of 4,667 newly entering children, including 2,559 in the three-year-old group and 2,108 in the four-year-old group. The study also evaluated full- and part-time program services, and both center and home-based program options. The following standardized instruments were used to assess program effects: the Woodcock Johnson III and the adapted PPVT, parent and teacher reports of child behaviors (e.g. aggressive behavior), and observations of the child’s relationships and school adjustment. The results have
been documented in the following four areas: cognitive development, social emotional development, child health, and parenting practices.

In the area of cognitive development, small-to-moderate but statistically-significant positive effects were reported for both three- and four-year-old children in four of six academic readiness skills relative to the control group: measures of pre-reading, pre-writing and vocabulary skills, and parental reports of literacy skills. On all these measures, the Head Start children performed better than the non-Head Start children. However, no significant differences were found between these two groups on measures of oral comprehension, phonological awareness, and early mathematics skills in either age group.

Results reported in the social emotional domain were less than desirable. Three constructs were measured, specifically, 1) social skills (following directions, joining in activities, and waiting turns in games), 2) approaches to learning, and 3) problem behaviors (inattentive-hyperactive behavior; aggressive-disruptive behavior, and anxious, depressed or withdrawn behavior). No statistically-significant group differences were found on measures of social skills and approaches to learning in either the three-year-olds or the four year olds. However, there was a small and statistically-significant group difference reported for the measure of problem behaviors in the three-year-olds.

The child health domain consisted of two measures: parental reports of children’s access to health care and health status for children enrolled in Head Start. There were small-to-moderate but statistically-significant differences between the Head Start and non-Head Start groups reported for both measures in the three-year-olds sample. However, in the four-year-olds sample, there was a moderate but statistically-significant
difference between these groups on the measure assessing access to health care, but no significant group difference on the measure assessing health status.

In children who entered Head Start and non-Head Start programs as three-year-olds, there were small but statistically-significant effects for measures assessing parental use of educational activities and physical discipline. More specifically, parents in the Head Start group were found to make significantly greater use of educational activities for enrichment purposes than parents in the non-Head Start group, while parents in the latter group made significantly greater use of physical discipline than parents in the Head Start group. In children who entered these programs as four-year-olds, statistically-significant group differences were observed on the measure assessing parental use of educational activities.

It appears that Head Start efforts to encourage parental engagement in the classroom and to provide services such as parental education along with parental support and goal setting may have played a role in improving the use of educational and enrichment activities in the home environment and in reducing parental reliance on physical discipline.

Note also that the Head Start Impact Study differs from other evaluations of early childhood programs because it employs a randomized control design, the strongest design for testing impacts. It also followed children through their early years of elementary school and also compared children who had access to Head Start with those in a control group that included many children in center-based and other types of early childhood education programs. The overall findings indicate that the Head Start program produced small-to-moderate but significant impacts across a wide variety of outcomes for both
three- and four- year olds. They suggest that the effects of the program may narrow but
do not close the gap between Head Start children and the general population of three- and
four-year olds.

**Criticisms of the Head Start Program**

The findings of studies evaluating the effectiveness of Head Start programs are
less impressive than expected. For example, McKay et al., (1985) conducted a meta-
analysis of published and unpublished Head Start research from 1965 to the mid-1980s
and found that Head Start children generally showed some cognitive, socio-emotional,
and health status gains throughout the program year; however, the researchers made note
of a “fadeout” in cognitive gains by third grade ( Barnett, 2004). Such a trend prompted
Whitehurst and Massetti (2004) to suggest that “Head Start, nationally, is having little
effect on children’s preparation for reading” (p. 259).

However, Bronfenbrenner has blamed this fadeout in children’s gains on the
brevity of the Head Start program and the discontinuity between the program and
children’s home and family experiences; in other words, it was inferred that the
children’s negative family and home experiences are pervasive and tend to offset
program gains (Zigler & Muenchow, 1992).

Another criticism relates to the fact that the FACES reports generally indicate that
although the children enter the program with low cognitive and social skills and make
significant gains in these areas during the program year, gains in the cognitive domain are
well below normative standards (Administration on Children, Youth and Families, 1997;
2001; 2006; 2010). For example, as shown in the 2003 sample (Administration on
Children, Youth and Families, ACYF, 2006), at the end of the academic year, Head Start
children had mean standard scores of 85.6 for vocabulary, 88.4 for early math, 95.0 for early reading, and 86.5 for early writing.

Similarly, Krista Kafer, a senior policy analyst for education at the Heritage Foundation, offers a scathing criticism of the Head Start program. Kafer quotes Nicholas Zill, vice president of the Westat research firm, stating that, “When you look at where Head Start has been in the last few years, they’ve been bending over backwards to avoid literacy skills.” (May 4, 2004).

One explanation for why Head Start children tend not to make significant gains in early reading skills throughout the academic year is that they are not being taught these skills. The ACYF (2001) study states that only about 66 percent of the teachers reported teaching letters of the alphabet or words on a daily basis. Moreover, Head Start children tend to be involved in other academic or play activities more frequently than academic activities such as those that facilitate learning letters of the alphabet.

Furthermore, lead teachers’ interviews show that a larger number of teachers identified social skill acquisition as a more important benefit of the Head Start program than acquisition of academic skills (78 percent versus 60 percent). More significant is the finding that less than four percent of teachers explicitly identified language and/or verbal skills as a main benefit of Head Start (ACYF, 2001).

The failure of many Head Start educators to provide more comprehensive academic readiness instruction to their students reflects an ongoing debate within Head Start. There are educators who believe in the benefits of explicit teaching of emergent literacy and other academic readiness skills (Zigler & Muenchow, 1992; Snow, Burns, & Griffen, 1998; Snow & Paez, 2004; Whitehurst, 2001; Whitehurst & Massetti, 2004).
Other educators, however, believe that it is developmentally-inappropriate to expose preschool children to direct and explicit literacy instruction (Elkind, 1987; 2001; Shepard & Smith, 1988).

For example, Elkind (2001), a Piagetian scholar, begins his thesis arguing against early preschool academic instruction by quoting Friedrich Froebel (1895): “Children must master the language of things before they master the language of words.” Elkind (2001) argues that because preschool children have not acquired key concepts associated with what Piaget calls “concrete operations” (e.g. reversibility, class inclusion, seriation etc.), they are incapable of comprehending the complexities of an English alphabetic orthography. Similarly, such children are judged to be incapable of acquiring important math concepts such as ordinality and cardinality. Elkind (2001) also points out that the logical structure of reading and math requires syllogistic reasoning abilities on the part of the child, abilities which preschool children do not achieve until age five or six. Accordingly, he argues that it makes little sense to introduce formal instruction in reading and math until children have become cognitively more advanced, that is, until they have achieved what Piaget would call “concrete operations.” In fact, Elkind (2001) refers to early academic instruction as “miseducation” and claims that explicit academic readiness instruction would interfere with the child’s drive for learning.

Elkind (2001) states further that preschool children should only be expected to master listening skills, along with the ability to take turns and complete simple tasks. Elkind (2001) quotes cross-cultural studies by Bruner (1966) to provide evidence attesting to the importance of developmentally-appropriate education in the early years.

Bruner reports that in French Switzerland where reading instruction is begun at the preschool level, there is a large percentage of children with reading problems.
In German Switzerland, where reading is not taught until ages six or seven, there are few reading problems. In Denmark, where reading is taught late there is almost no illiteracy. In Russia too, reading is not taught until the age of six or seven years. The benefits of early academic instruction are thus not supported by cross-cultural data. (Elkind, 2001 p. 13)

In countering this perspective, Whitehurst (2001), states that Elkind’s (2001) paper ignores research supporting precocious reading in young children who have not attained concrete operations. Elkind (2001) also overlooks research that supports the presence of good decoding skills in hyperlexic children, despite low-level cognitive and linguistic abilities. Whitehurst additionally cites research by DeVries (1974) who found that measures of reading ability were unrelated to measures of Piagetian concrete operations in five-, six-, and seven-year old children.

Whitehurst also underscores and discusses the different roles of teachers in child-centered and content-centered classrooms. In child-centered classrooms, the teacher’s role is to provide engaging materials and to cultivate children’s natural development by sharing control with them, focusing on their strengths, helping them to form close relationships, supporting their play ideas, and demonstrating how to adopt a problem-solving approach to social conflict. In contrast, a teacher’s role in a content-centered classroom is organized around the principle that there are skills and dispositions that children need to be taught if they are to be prepared for later schooling and life. Accordingly, research addressing the different roles of a teacher suggests that children who attended less academically-enriched preschool programs were less prepared for kindergarten than were children from academically-oriented preschool programs (West, Denton, & Germino-Hausken, 2000; West, Denton, & Reaney, 2001). Similarly, early intervention research has shown that children benefit from literacy instruction that is
tailored to their individual levels of cognitive ability (West, Denton, & Reaney, 2001). This realization has prompted a shift of focus in early childhood education away from less academically-oriented instructional programs to more academically-oriented instructional programs that directly promote students’ acquisition of specific emergent school-readiness skills. The shift in academically-oriented instructional programs is reflected in recent federal legislation calling for more comprehensive educational instruction in Head Start programs to facilitate the development of academic readiness and social skills, as well as for more frequent assessment to evaluate progress in acquiring these skills (School Readiness Act, 2003).

Despite the disappointing findings shown in the large-scale, federally-funded programs discussed above, evidence from non-Head Start programs demonstrates that success can be achieved in programs that serve predominantly disadvantaged children. A discussion of selected programs is presented below.

**Evidence for Programmatic Success in Ameliorating the Effects of Poverty in Non-Head Start Programs**

Although children living in poverty have been shown to be at risk for school failure, there is evidence that such children can flourish. One of the most important determinants of academic readiness and achievement is a high-quality educational program. Examples of high-quality non-Head Start educational programs that have achieved success in improving achievement among disadvantaged children include the Carolina Abecedarian Project (Ramey & Campbell, 1984; 1995), the Perry Preschool Project (Schweinhart, Barnes, & Weikart, 1993), the Beat the Odds Schools study (Taylor, Pearson, Clark, & Walpole, 2000; Taylor, Peterson, Pearson, & Rodriguez, 2002), and It’s Being Done Schools (Karin Chenoweth, 2007; 2009).
The Carolina Abecedarian Project. The Carolina Abecedarian Project was a study designed to examine the potential benefits of early childhood education for disadvantaged children. The project focused on cognitive and social development among four cohorts of children born between 1972 and 1977. The children selected were considered to be at risk for academic failure based on the following family risk factors: the last year of school completed by parents, maternal I.Q., family income, and the family’s social history (Ramey & Campbell, 1984). Fifty-seven 18-month old infants were randomly assigned to receive early intervention and fifty-four 18-month old infants were assigned to the control group.

Children in the intervention group received child care for six to eight hours per day, five days per week, starting from infancy and continuing for five years. Educational activities were game-based and emphasized language. The control group received only certain services, such as nutritional supplements, social work services, and medical care in order to ensure that the programmatic effects were exclusively the factors accounting for different outcomes between the two groups (Ramey & Campbell, 1991).

The findings from the study show that the children in both the intervention and control groups had achieved the same developmental level by six months; however, by 18 months, those in the intervention group scored higher on tests of infant-toddler development and maintained a significant advantage over the control group in standardized intelligence test scores (Ramey & Campbell, 1984). It is worth noting that the children in the control group did show a gradual rise in scores after age three, a trend that Burchinal, Lee, & Ramey (1989) attributes to the possibility that these children were beginning to attend preschool programs.
A follow-up study by Ramey, Campbell, Burchinal, Skinner, Gardner, and Ramey (2000) found that children in the intervention group had significantly-higher scores on cognitive, reading, and math measures at ages 12, 15, and 21 years, as compared to children in the control group. The study also found that enhanced language development was instrumental in raising the cognitive test scores of the disadvantaged children.

**High Scope Perry Preschool Project.** The High Scope Perry Preschool Project was an experimental longitudinal study designed to examine how a preschool curriculum affected later achievement among African Americans with multiple risk factors and a high risk for school failure (Schweinhart, Barnes, & Weikart, 1993). The study followed 123 African American children, at ages three and four, beginning in 1963, and randomly assigned 58 of the children to a treatment group that received a high-quality preschool program. A total of 65 children of the same ages were assigned to a comparison group that received no preschool program. The treatment group children received a 2.5-hour educational program on weekdays during the school year, supplemented by weekly home visits by teachers. The program was based on the principle of active learning, with teachers guiding students through the formation of key developmental factors in intensive child-teacher interactions (Schweinhart, Barnes, & Weikart, 1993).

In the study’s most recent phase, 97 percent of the study participants still living were interviewed at age 40 (Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005). The participants in the treatment group significantly outperformed participants in the control group in high school graduation rates (65 percent vs. 45 percent). In particular, more females in the treatment group (84 percent) graduated as compared to
females in the control group (32 percent). In addition, more participants receiving high-quality early education were employed at age 40 (76 percent vs. 62 percent) as compared with participants in the control group. Those exposed to the preschool program had median annual earnings more than $5,000 higher than those in the control group ($20,800 vs. $15,300). More of those who had received treatment owned their own homes, and more of those in the treatment group (76 percent) had a savings account (50 percent in the control group). Finally, the treatment group participants had significantly fewer arrests (36 percent vs. as compared to 55 percent in the control group).

**Beat the Odds Schools.** More recently, scholars associated with the Center for the Improvement of Early Reading Achievement (CIERA), a federally-funded consortium of universities across the United States, have done extensive collaborative research evaluating the school-wide practices and instructional activities characterizing what have come to be known as the “Beat the Odds Schools” (Taylor and colleagues, 1999; 2000; 2002), so-called because at-risk learners educated in these schools were found to be making exceptional educational gains. In a 1999 study, the researchers used quantitative and descriptive methods to investigate school and classroom factors related to primary-grade reading achievement. Fourteen schools, geographically dispersed in Virginia, Minnesota, Colorado, and California, took part in the study. The school populations in the study tended to come from disadvantaged backgrounds: between 28 and 92 percent of the children included in the study came from families considered to be at poverty level. The populations studied included four rural, four small-town, and one suburban school, as well as five inner-city schools from three large metropolitan districts. Schools with moderate-to-high numbers of students on subsidized lunches were identified
as most, moderately, or least effective, based on several measures of reading achievement in the primary grades.

Factors that were found to be important in the most effective schools included administrative and educational leadership, systematic assessment of pupil progress, strong communication among teaching and administrative personnel, and a collaborative model for the delivery of reading instruction, including early intervention, a variety of complementary reading interventions, and strong links to parents. The teacher factors identified to have an influence on achievement among at-risk children include: the amount of time spent in small-group instruction, the amount of time spent in independent reading activities, the level of pupil engagement in learning activities, and strong communication between teachers and parents. The most accomplished teachers were frequently observed teaching word recognition by coaching and scaffolding as children were reading. The teachers in the most effective schools also provided explicit phonics instruction as compared to those in the least effective schools. In addition, teachers in effective schools were more frequently observed asking higher-level questions after reading than their counterparts in the least-effective schools. Most important, in all of the most effective schools, reading was a priority at both the building and classroom levels.

**It’s Being Done Schools.** Chenoweth (2007; 2009) has also documented success in programs serving disadvantaged children in what have been designated “It’s Being Done Schools.” These schools were identified as either very high-achieving or rapidly improving, with substantial enrollments of students from low-income families, or students of color, or both. Schools with large numbers of children from low-income families are generally not expected to be high-performing since they typically have an
overabundance of at-risk students; nonetheless, the schools Chenoweth studied were all found to be high-performing, despite the fact that most of the students in these schools came from low-income families.

To identify “It’s Being Done Schools,” Chenoweth used web-based data from the Education Trust (http://www2.edtrust.org/edtrust/dtm/), along with the web tool “Dispelling the Myth.” Chenoweth placed schools in this category using the following criteria: schools with significant populations of poor children and children of color; schools with very high achievement or with rapid-improvement trajectories among the majority of students; schools with small gaps between student achievement and statewide achievement standards; schools with at least two years of data; schools with high graduation rates for high school; schools that had met adequate yearly progress requirements; and schools with open enrollment for neighborhood children.

Chenoweth (2007) observed that the most effective schools had several common characteristics and practices that resulted in superior achievement when compared to similar schools that failed to excel. Specifically, “It’s Being Done Schools” provided a rich curriculum coupled with heavily-focused instruction. Moreover, administrative and teaching personnel in these schools were found to have high expectations for all students, used achievement data to track student progress and to identify individual student needs, and systematically employed purposeful professional development to improve teachers’ skills. Chenoweth’s (2009) book provides detailed accounts of “how it is being done,” explaining how schools with high-poverty and high-minority student populations, schools where students are not expected to succeed, have nonetheless dramatically boosted student achievement and diminished or eliminated achievement
gaps. These schools focused on what students need to learn and their teachers adhered closely to performance standards. The “It’s Being Done Schools” also were found to have strong teacher collaboration, with students frequently assessed to evaluate educational progress. In addition, teachers used assessment data to inform instruction and relied on methods that have been proven to work. The professionals in these schools also had close personal relationships with their students.

Similar findings have been reported by Wilcox and Angelis (2010) in a study comparing schools whose students consistently exceed the New York Standards for English Language Arts (ELA) and math on high-stakes tests in eighth grade with schools whose students tend to underachieve. In this case study, salient features of best practices were gathered from teacher and administrator interviews and from documentary evidence in ten high-performing middle schools serving at-risk students; six average-performing schools were used for comparison purposes.

The sample was identified using regression analysis after taking into account the following criteria: scores on eighth-grade math and English high-stakes tests; percentages of students qualifying for free or reduced lunch; percentages of English Language Learners; and ethnic and geographic distribution.

Within these 16 study schools, between two and five administrators (the school principal, district superintendent, and other administrators who chose to participate) and between five and ten teachers (representing each grade level and special area) were asked to participate in interviews and to share relevant documents (e.g., school mission statements and curricular documents). Information was gathered through face-to-face interviews during two-day site visits. The interview questions focused on five central
themes: 1) the study curriculum and academic goals (this theme focuses on the learning goals for all students, by grade and subject, 2) staff selection, leadership, and capacity building (this theme focuses on the selection and cultivation of school leaders and teachers who are given professional development opportunities to make the learning goals achievable by students in the system, 3) instructional programs, practices, and arrangement (this theme focuses on the arrangement of time, the instructional resources, materials, and technology, 4) monitoring, including compilation, analysis, and use of data (this theme addresses the question of how educators know whether students have learned what the school expects the students to learn, and 5) recognition, intervention, and adjustment (this theme involves monitoring of student performance via pyramids of intervention provided at multiple levels of need).

Findings suggest that consistently higher-achieving middle schools in New York state demonstrate all five of the following characteristics: 1) they provide a climate of trust and respect in which everyone is held to the same expectations, 2) they facilitate teamwork and collaboration among all stakeholders when important school decisions are made, 3) they encourage instructional practices that are data based, 4) they provide strong social and emotional support for students, including appropriate role models, and 5) they have a shared and clear mission based on agreed-upon goals toward which everyone is motivated to work.

It is clear from the evidence provided above that high-quality programs with large proportions of children living in poverty are able to enhance academic achievement in such children. As noted earlier, the current study site, the Schenectady Community Action Program (SCAP) Head Start, provides one such high-quality program that has
been shown to promote a successful start for preschoolers when compared to the national Head Start norms. A brief discussion of the (SCAP) Head Start program is presented below.

**The Schenectady Community Action Program (SCAP) Head Start.** The Schenectady Community Action Program (SCAP) Head Start has been hailed as a high-quality program. Assessments conducted at this site since 2002 have measured children’s performance on a wide range of achievement measures, including oral language skills, early literacy skills, early math and science skills, as well as the arts (music, art, and drama). For example, children at this site have consistently scored (on average) at or above national norms on the Phonological Awareness Literacy Screening test (PALS Prek, Invernizzi, Sullivan, Meier, & Swank, 2004), a nationally-standardized measure that assesses early literacy skills in children from pre-kindergarten through third grade (see Table 1).

A report by the National Association for the Education of Young Children (NAEYC, 2004) states that school readiness requires access to opportunities such as high-quality early education programs and early-intervention efforts for children deemed at risk. The SCAP Head Start more than meets the minimum standards for a high-quality program as defined by the Head Start Program Performance Standards in terms of the type of curriculum, classroom quality, and teacher qualifications (U. S Department of Health and Human Services, 2002).

Perhaps the most important component of the SCAP Head Start program, one that distinguishes it from more traditional Head Start programs, is the addition of comprehensive academic readiness activities that supplement the normal Head Start
curriculum (currently the Creative Curriculum; Dodge, Colker, & Heroman, 2002). These activities consist of more explicit and more direct but developmentally-appropriate instruction, and place heavy emphasis on literacy sub-skills. The value of this supplementary program seems amply demonstrated by the fact that children in the SCAP Head Start program consistently meet national normative standards on measures of emergent literacy skills, as indicated in previous sections of this review. Experimental support for this program is provided by the results of two studies conducted by Tanzman, Vellutino, Pietrangelo, and Zhang (in preparation). Both studies involved direct and explicit teaching of a full range of emergent literacy skills, including print concepts and conventions, phonological awareness skills, and alphabetic coding skills, to children assigned to the experimental treatment groups. Children assigned to comparison groups received some combination of the High Scope curriculum (Hohmann & Weikart, 2002) and the Creative Curriculum (Dodge, Colker, & Heroman, 2002) in each of the classrooms as the program was transitioning between these curricula (the Creative Curriculum remained the official standard). Neither of these curricula involves direct and explicit instruction of a full range of emergent literacy skills. Results from both studies favored the treatment groups on most measures, with the strongest effects observed on measures of phonological awareness skills, which were not explicitly taught in the comparison groups. Neither are these skills taught in most Head Start programs.

Results from the Tanzman et al. study combined with the normative data presented in Table 2 provide ample documentation of the effectiveness of the SCAP Head Start program. However, whereas all of the children at the SCAP Head Start are exposed to the same high-quality program, preliminary results displayed in Table 2
indicate that these children are not profiting equally from the program. As indicated earlier, there are baseline disparities which widen during the course of the academic year; such disparities reflect a trend that has been documented in several large longitudinal research studies evaluating preschool programs (i.e., Administration on Children, Youth and Families, 2001; 2003; 2006; 2010; Denton & West, 2002). Research findings suggest that achievement gaps tend to widen each year as children progress through school (Tabors, Snow, & Dickinson, 2001; Wyner, Bridgeland, & DiIulio Jr., 2007). For example, the latest Nation’s Report Card, which provides results from the most recent National Assessment of Educational Progress study in reading (NAEP, 2009), reveals that only 33 percent of children performed at or above proficiency in fourth grade. Equally disappointing is the finding that by eighth grade, no improvements had been made, with only 32 percent of the student population performing at or above proficiency.

Since the disparities in achievement observed throughout the school years are first observed when the children enter preschool, it seems reasonable to infer that there are factors either within the child or present in the family, which may be contributing to differential performance at school entry and beyond. The child’s home environment may contribute to the observed disparity in achievement, in terms of available resources that may either limit or enhance his or her exposure to academic readiness skills; one such enhancing resource in the home environment might be enriched literacy. Similarly, parental factors, including the caregiver’s educational level, income, and family size, may also impact the child’s school readiness. These parental factors may contribute differentially to the cognitive, social emotional, and physical health and development of the child. Moreover, variability in child characteristics may also contribute differentially
to academic readiness. For example, among the many child characteristics that could affect academic readiness, three are likely to be especially influential: physical health, social-emotional well-being, and individual aptitude.

Accordingly, the primary objective of the present study is to address the question of which child and family characteristics contribute to these extreme disparities in achievement in Head Start children exposed to the SCAP Head Start Program; the question will be asked in the interest of addressing the more general and wider question of which factors account for differences in performance among high-achieving and low-achieving Head Start participants at large. This study will use child and family information from an archival database stored at the Schenectady Community Action Program’s (SCAP) Head Start. This database was initiated in the fall of 2002 in order to satisfy DHHS requirements (Child Outcomes Framework, 2003).

**Research Questions**

1 (a) Will measures of specific child characteristics and child risk factors obtained from a representative sample of Head Start four-year-old children accurately classify these children as high, average, and low academic achievers, conditional on controlling for Head Start experience differences?

1 (b) Will a measure of family risk factors obtained from a representative sample of Head Start four-year-old children accurately classify these children as high, average, and low academic achievers, conditional on controlling for specific child characteristics, child risk factors, and Head Start experience differences in classifying achievement groups?

1. Will a measure of family risk factors obtained from a representative sample of four-year old Head Start children moderate the effects of child risk factors on academic
achievement and accurately classify these children as high, average, and low academic achievers?

2. Will the pattern of results on measures of specific child characteristics, child risk factors, and family risk factors, obtained from a representative sample of Head Start four-year-old children to distinguish among high, average, and low achievers, be essentially the same in four-year-old children exposed to the Head Start program for one year (4-1s) compared with four-year-old children exposed to the Head Start program for two years (4-2s)?

3. Will high- and low-achieving four-year-old children exposed to the Head Start program for two years differ on measures assessing the quality of the home environment in facilitating the development of pre-academic readiness skills?
CHAPTER 3: METHODOLOGY

Participants

Children. The total sample used in the present study consisted of five cohorts of 4 year-old children enrolled during the 2005-2010 academic years at SCAP Head Start. There were 745 children in the total sample: 161 children were enrolled during the September 2005-2006 academic year, 153 children were enrolled during the 2006-2007 academic year, 141 children were enrolled during the 2007-2008 academic year, 146 children were enrolled during the 2008-2009 academic year, and 144 children were enrolled during the 2009-2010 academic year. Table 4 displays the gender, ethnicity, and primary language for the sample, broken down by year.

The sample for this study, as described in Table 4 consists of 56% females and 44% males. The ethnic composition of the sample consisted of 30% African Americans, 23% Caucasians, 19% Biracial, 16% Hispanic, and 12% consisted of other minority ethnic groups (e.g. Sudanese, Afghanis, Chinese, etc.) whose parents were recent immigrants. Approximately 85% of the children speak English as the primary language at home whereas approximately 9% of the children speak Spanish as the primary language at home. The primary languages spoken by the remaining population of Head Start children are rather diverse (e.g. Arabic, Chinese, Pushtu etc.).

As displayed in Table 5, the mother is the primary caregiver in approximately 89% of the households; the grandmother is the primary caregiver in approximately 5% of the households while the father is the primary caregiver in approximately 4% of the households. Aunts, grandfathers, and foster care individuals are the primary caregivers in approximately 2% of the cases.
Table 4

*Gender, Ethnicity, and Language for the Total Sample by Year*

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Female</td>
<td>415</td>
<td>87</td>
<td>92</td>
<td>77</td>
<td>72</td>
<td>87</td>
</tr>
<tr>
<td>Male</td>
<td>330</td>
<td>74</td>
<td>61</td>
<td>64</td>
<td>74</td>
<td>57</td>
</tr>
<tr>
<td>Yearly Totals</td>
<td>745</td>
<td>161</td>
<td>153</td>
<td>141</td>
<td>146</td>
<td>144</td>
</tr>
</tbody>
</table>

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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>224</td>
<td>49</td>
<td>40</td>
<td>48</td>
<td>46</td>
<td>41</td>
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<td>Biracial</td>
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<td>31</td>
<td>29</td>
<td>24</td>
<td>21</td>
<td>37</td>
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<tr>
<td>Caucasian</td>
<td>172</td>
<td>34</td>
<td>41</td>
<td>32</td>
<td>35</td>
<td>30</td>
</tr>
<tr>
<td>Hispanic</td>
<td>119</td>
<td>25</td>
<td>22</td>
<td>25</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Guyanese</td>
<td>20</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
<td>2</td>
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<tr>
<td>Sudanese</td>
<td>20</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>15</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Asian</td>
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<td>5</td>
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<td>2</td>
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<td>Other</td>
<td>21</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>633</td>
<td>131</td>
<td>129</td>
<td>122</td>
<td>124</td>
<td>127</td>
</tr>
<tr>
<td>Spanish</td>
<td>66</td>
<td>13</td>
<td>11</td>
<td>14</td>
<td>15</td>
<td>13</td>
</tr>
<tr>
<td>Arabic</td>
<td>19</td>
<td>6</td>
<td>6</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Pushtu</td>
<td>14</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 5

*The Primary Caregiver in the Total Sample*

<table>
<thead>
<tr>
<th>Primary Caregiver</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother</td>
<td>659</td>
<td>88.5</td>
</tr>
<tr>
<td>Father</td>
<td>28</td>
<td>3.8</td>
</tr>
<tr>
<td>Grandmother</td>
<td>40</td>
<td>5.4</td>
</tr>
<tr>
<td>Aunt</td>
<td>8</td>
<td>1.1</td>
</tr>
<tr>
<td>Foster Care</td>
<td>9</td>
<td>1.2</td>
</tr>
<tr>
<td>Grandfather</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>745</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Approximately 49% of the children were from single adult families, while 44% of the children came from two parent families. A few of the children (7%) were from families of more than two adults in the household. Table 6 displays percentages for the number of adults in the family.

Table 6

<table>
<thead>
<tr>
<th>Number of Adults</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>362</td>
<td>48.6</td>
</tr>
<tr>
<td>2</td>
<td>329</td>
<td>44.2</td>
</tr>
<tr>
<td>3</td>
<td>42</td>
<td>5.6</td>
</tr>
<tr>
<td>4</td>
<td>9</td>
<td>1.2</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>745</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The average educational level of the primary caregiver in this sample was 11\textsuperscript{th} grade. The average annual income was $11,128. The average number of adults in the household was 1.6 while the average number of children in the family was about 2.7 children. Table 7 displays the descriptive statistics for the family variables.

Table 7

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>745</td>
<td>0</td>
<td>58000</td>
<td>11128.4</td>
<td>7219.2</td>
</tr>
<tr>
<td>Years of School</td>
<td>745</td>
<td>3</td>
<td>17</td>
<td>11.0</td>
<td>2.5</td>
</tr>
<tr>
<td>Number of Adults</td>
<td>745</td>
<td>1</td>
<td>5</td>
<td>1.6</td>
<td>0.7</td>
</tr>
<tr>
<td>Number of Children</td>
<td>745</td>
<td>1</td>
<td>9</td>
<td>2.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

All the children in the SCAP Head Start program met the Health and Human Services standards for entry into Head Start and the sample was similar to both the local and nationally derived samples that have been used in large scale studies of Head Start investigations (i.e. Storch & Whitehurst, 2002; ACYF, 1998, 2001, 2003) in terms of
poverty, family demographics, and risk factors. Approximately 64% of the children were in their first year of the Head Start program and 36% of the children were in their second year. The children admitted to the program for two years entered the program as three year-olds in classrooms containing only children at this age level. There are a limited number of spaces available for these children at the SCAP-HS site. Thus, permission to enter the program is given to the neediest children first, need being assessed and valued according to risk standards mandated by Health and Human Services. Hence, the children who were in their second year of the program as four-year-olds typically had a higher risk status than the children entering the program at age four for the first time.

**Sample Composition by Number of Years in the Program**

The research sample for the present study consisted of 472 four-year-old children who had been in the program for one year (henceforth termed “4-1s”) and 273, four-year old children who had been in the program for two years (henceforth termed “4-2s”). Because these two groups were combined for purposes of constituting high, average, and low achievement groups (see description below) and given that the 4-2s performed better than the 4-1s on the achievement measures (see Table 18 in the Results section), a dummy variable representing group differences on an achievement composite was used as a predictor in all of the regression analyses involving the total sample, using this and other variables to predict group membership (see description below).

**Teachers.** There were a total of 24 teachers represented in this study; 11 of these teachers have a Master’s Degree, five teachers have a Bachelor’s Degree, and one teacher has an Associate’s Degree. Nine of the teachers have New York State Teacher Certification. During the years in which data were collected for this study, the teachers
who were involved in the study had wide ranging experience spanning between 1 and 35 years; 11 teachers had 1-3 years of teaching experience, six teachers had 4-6 years of teaching experience, while four teachers had over 8 years of teaching experience. The teachers are all female and Caucasian with the exception of one Hispanic female teacher, and one bi-racial female teacher.

Classrooms and Curricula. There were 32 classrooms represented in this study, 41% of which were classified as Regular Head Start (RHS); 52% of the classrooms were classified as Universal Pre-K Head Start (UPK), while 7% of them were classified as Integrated Classrooms (IC), which consist of children with and without disabilities. The regular Head Start classrooms operate under the aegis of the Schenectady Community Action Program (SCAP) Head Start and can have as many as 16 children in each. There are usually two adults in these classrooms, one teacher and an assistant teacher. The RHS programs use the Creative Curriculum (Dodge & Colker, 1992) along with a supplementary Head Start literacy curriculum. The supplementary literacy curriculum involves direct, systematic, and explicit teaching of emergent literacy skills that include: print concepts and conventions, alphabetic coding skills and phonological awareness skills (Tanzman, Vellutino, Pietrangelo, & Zhang, in preparation). Teacher qualifications in this sample were within the standards set by Head Start and do not necessarily require a bachelor’s or master’s degree. An associate’s degree or a Child Development Certificate (CDC) is sufficient.

The UPK Head Start classrooms are jointly supported by the local school district and SCAP Head Start. The teachers in these classrooms also use the Creative Curriculum (Dodge & Colker, 1992), the supplemental Head Start literacy curriculum, and additional
materials supplied by the school district. Class sizes in UPK classrooms can be up to 19 children per room and there are three adults in each of the classrooms: a teacher, an assistant teacher, and an aide. A teacher in a UPK classroom is required to hold a Master’s Degree or be enrolled in a Master’s Degree program. Teacher certification in New York State is also a requirement.

The Integrated Head Start classrooms operate under the joint aegis of the SCAP Head Start program and Clover Patch, an independent program for children with disabilities. Half of the children in the integrated classes are identified as handicapped. There are typically fewer children (12) in these classrooms and there are 4 teachers (two teachers from the Head Start program and 2 from Clover Patch). The teachers in the integrated classrooms use the Creative Curriculum (Dodge & Colker, 1992), and the supplemental Head Start literacy curriculum. Note also that all of the children identified with disabilities are excluded from all of the analyses conducted for the present study.

**Child Outcomes Measures**

The data used to address the research questions of special interest in this study are archived data collected by Head Start teaching personnel between academic years 2005 and 2010 for purposes of assessing and monitoring progress made by individual children in acquiring the knowledge and skills targeted in the Head Start curriculum. The specific instruments used to address these questions are included in the SCAP Child Outcomes Assessment, which consists of several measures of progress in the acquisition of academic and non-academic skills administered by Head Start teachers three times during the academic year (October, February, and May). This battery assesses language, academic competence, and social-emotional functioning and is a combination of
experimental (non-standardized) measures developed by SCAP Head Start and University personnel and standardized measures developed by professionals in the educational research community. The literacy component of the battery includes the Phonological Awareness Literacy Screening-Pre-K (PALS-Pre-K) test battery, a published instrument constructed by Invernizzi, Sullivan, Meier, & Swank (2004). The measures included in the PALS-Pre-K battery were supplemented by three additional literacy subtests employed by University personnel in prior research (Tanzman, Vellutino, Pietrangelo, & Zhang, in preparation; see description below). Additionally, a child risk composite and a family risk composite were also used as measures of a child’s risk status on entering the Head Start program. Each was constructed using information gathered by the Head Start family workers. Finally, for a selected subsample of target children, a detailed Home Environment Survey was also employed in the study. Each of these instruments is described in greater detail below.

**Language Skills.** The language measure is a composite derived from several subtests assessing component language skills through teacher observations of spontaneous language used by the child in informal settings. Each measure is described in the following sections.

**Listening and Understanding.** This subtest assesses language-based behaviors such as whether the child responds to his or her name and is able to answer simple questions. The total possible score for this subtest is 7.

**Following Directions.** This subtest assesses whether the child can respond to a series of 2 and 3-step directions describing specific actions the he/she must perform as directed by the teacher such as: “shake your head and clap your hands”, “open your
mouth and touch your ear”, “open the book and pick up the pencil”, “put the block in the cup”, and “close the book”. The total possible score for this subtest is 12.

‘WH Questions’. This portion of the subtest assesses the child’s understanding of indirect or embedded questions often called WH questions (e.g. what, where, who, why, how), the total possible score for this subtest is 5.

Object Use. This subtest assesses the child’s understanding of objects and their use with open ended questions such as, “You use a crayon/marker to____”, “you use a chair to _____”, and “you use a blanket when____”. The total possible score for this subtest is 3.

Communication Skills. This subtest is measured by noting the child’s language in learning and social situations such as reflected in his/her inclination and ability to ask questions, initiate/respond to greetings, initiate conversation, answer questions requiring explanations, indicate negation, and express feelings or needs. The total possible score for this subtest is 6.

Spontaneous Language. This subtest assesses typical utterances in natural play settings, as observed by the teacher, but not elicited by the teacher. The number of words in the utterance is counted. This is a “length of utterance” measure and does not examine grammar, syntax, or vocabulary. Each word used is given a score of 1. The maximum score for this subtest is 20.

The total possible score that the child can receive on the language measure is 53; this is obtained by summing scores from each subtest. The total score for the language measure was used as a predictor of achievement in all the analyses conducted in this study. Since the language measure is an experimental measure, an estimate of reliability
was calculated by correlating the scores that the children obtained on the first, second, and third measuring periods. The correlations were found to be statistically significant at all the three measurement periods as can be seen from Table 8.

Table 8

<table>
<thead>
<tr>
<th></th>
<th>Total Language 1</th>
<th>Total Language 2</th>
<th>Total Language 3</th>
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</thead>
<tbody>
<tr>
<td>Total Language 1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total Language 2</td>
<td>0.765*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Total Language 3</td>
<td>0.579*</td>
<td>0.809*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: * *p < .001

**Literacy Measures.** The PALS-Pre-K (Invernizzi, Sullivan, Meier, & Swank, 2004) is a measure of emergent literacy skills that is predictive of future reading success at school age. It is comprised of eight subtests (actual ranges and acceptable “end of academic year” ranges in parentheses): Upper case alphabet recognition (0-26; 12-21); lower case alphabet recognition (0-26; 9-17); letter-sound correspondence (0-26; 4-8); beginning sound awareness (0-10; 5-8); print and word awareness (0-10; 7-9); rhyme awareness (0-10; 5-7); name writing (0-7; 5-7); and nursery rhyme awareness (0-10; 6-10). The total possible PALS-Pre-K score is 125 and is obtained by summing the scores obtained on each of the eight subtests. Table 9 displays the internal consistency and inter-rater reliability estimates for each of the PALS-PreK subtests as reported by Invernizzi et al., (2004).
Table 9

*Internal Consistency and Inter-Rater Reliability Estimates for PALS-PreK Tasks*

<table>
<thead>
<tr>
<th>Sub-Skills</th>
<th>Sample Size</th>
<th>Cronbach’s Alpha</th>
<th>Guttman Split-Half</th>
<th>Inter-Rater Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name Writing</td>
<td>99</td>
<td>___</td>
<td>___</td>
<td>0.99</td>
</tr>
<tr>
<td>Alphabet Knowledge</td>
<td>138</td>
<td>___</td>
<td>___</td>
<td>0.99</td>
</tr>
<tr>
<td>Beginning Sound</td>
<td>126</td>
<td>0.93</td>
<td>0.94</td>
<td>0.99</td>
</tr>
<tr>
<td>Rhyme</td>
<td>126</td>
<td>0.84</td>
<td>0.87</td>
<td>0.99</td>
</tr>
<tr>
<td>Print and Word Awareness</td>
<td>125</td>
<td>0.75</td>
<td>0.71</td>
<td>0.99</td>
</tr>
<tr>
<td>Nursery Rhyme Awareness</td>
<td>99</td>
<td>0.77</td>
<td>0.75</td>
<td>0.99</td>
</tr>
</tbody>
</table>

In addition to administration of the PALS-Pre-K, three other subtests were administered as supplementary measures of emergent literacy; these measures are described in the following sections.

**Alphabet Knowledge.** This subtest requires the child to recite the letters of the alphabet or sing the alphabet song. A maximum score of 26 is awarded to a child that is able to recite or sing all the 26 letters of the alphabet.

**Word Recognition.** This test was administered to increase the ceiling on the literacy measure. The child is presented with twenty high frequency words on individual cards (a, dog, can, go, do, have, my, help, no, I, see, look, this, that, will, the, not, we, you, and who). One point is given for each word identified (named) correctly. The maximum score for this subtest is 20.

**Invented Spelling.** This subtest assesses emergent spelling ability and requires that the child write five words from dictation: “lap”, “sick”, “elephant”, “pretty”, and “train”. Each word is presented both in isolation and in the context of a meaningful sentence. Adapting a scoring procedure developed by Tangel and Blachman (1992), points are awarded based on how close the response is to the correct spelling of the word.
Points per word vary depending on the number of phonemes that the child correctly produces for any given word; the maximum possible score for the subtest is 27.

The total literacy score is a composite consisting of the PALS subtests along with the supplementary measures assessing alphabet knowledge, word recognition, and invented spelling. The total possible score that the child could obtain on the literacy composite is 198.

**Mathematics Skills**

The mathematics test assesses the following math skills: counting, number recognition, one-to-one correspondence, quantity comparison, geometry and spatial sense, common shapes, puzzle completion, and patterns and measure. Each of the measures is described below.

**Counting.** In order to assess counting, the child is asked to name the numbers in order. One point is assigned for each number in correct sequence up to 25; the maximum possible score for this subtest is 25.

**Number Recognition.** This skill is assessed by presenting randomly the numbers 1-10 on individual cards and the child is asked to identify each. The child receives 1 point for each number identified. The total possible score for this subtest is 10.

To determine whether the child has acquired the concept of one-to-one correspondence, he or she is presented with an illustration of twenty pennies in two rows and asked to count the pennies while pointing to each. One point is awarded for each penny if the child both pointed to and counted that penny. The total possible score for this subtest is 20.

**Quantity Comparison.** In order to assess quantity comparison, the teacher
observes whether the child can compare two groups of stimuli having differing quantities by asking her/him to indicate which of the two groups has “more” or “less”; a score of 1 is awarded for a correct comparison.

The geometry and spatial sense subtest measures a range of geometric and spatial skills including classification of objects by physical features such as color or size, placement of objects on or under other objects, copying a three block bridge, arrangement of objects in series, describing the movement of an object, and demonstration of positions such as up, down, back, over, under, top and bottom. The total possible score for this subtest is 11.

**Knowledge of Common Shapes.** This skill is assessed by asking a child to label shapes such as a circle, a square, a triangle, a cross, and a rectangle. The maximum possible score for this subtest is 5.

**Puzzle Completion.** During the puzzle completion subtest, the teacher notes the complexity of puzzles completed by the child in the classroom. Simple form board (0-1 point), 8-10 piece puzzles (0-1 point), 10-12 piece puzzles (0-1 point), 12-15 piece puzzles (0-1 point), 20+ piece puzzles (0-1 point). The maximum possible scores for this subtest 5.

**Knowledge of Patterns and Measures.** In order to assess knowledge of patterns and measures, the teacher observes the child in the classroom and records behaviors demonstrating evidence of his/her ability to detect patterns or sequences in art material, in block building, and in using table top toys, his/her ability to compare objects in terms of size, shape, or color (0-4 points), his/her concern with measurement, i.e. “it won’t fit, it’s too big.” (0-1 point), and whether he/she shows some understanding that a ruler or
yardstick provides information about size (0-1 point). The maximum possible score for this subtest is 6 points.

The total possible score for the mathematics measure is 83 and is obtained by summing the subtest scores. An estimate of reliability for the math measure among the three different measurement periods was calculated by correlating the scores that the children obtained on the first, second, and third measuring periods. The correlations were found to be statistically significant at all the three measurement periods (See Table 10).

Table 10

<table>
<thead>
<tr>
<th></th>
<th>Math 1</th>
<th>Math 2</th>
<th>Math 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math 1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math 2</td>
<td>0.812*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Math 3</td>
<td>0.714*</td>
<td>0.877*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: N=745, *p < .001.

Social Emotional Skills

The Child Outcomes Assessment also includes a measure of social emotional skills. This measure assesses several different sub skills including self-concept, independence, pride, self-control, cooperation, social relationships, knowledge of self and the community, initiative, persistence, and problem solving.

**Self-concept.** In order to assess self-concept, the teacher asks the child questions such as: “what makes you different from______?” or “tell me something about you”. A score of 1 point is given for each response, for example... “I'm a good runner.” “I like to color.” “I’m a big girl.” In addition, the teacher asks the child to describe or provide information about his/her family. A score of 1 point is given for responses, such as- “I have a sister,” “My mommy works,” “I play with my cousins” the maximum possible
score for this subtest is 12.

**Independence and Pride.** The independence and pride domains are rated by the teacher on a five point scale assessing demonstration of autonomy and self-esteem in classroom behavior, interactions activities, routines, and tasks. The maximum possible score on the independence measure is 5; similarly, the maximum score for pride is 5.

**Self-control.** Self-control is measured by how the child expresses needs in difficult situations by word or gesture. The teacher is asked to respond to questions such as: “Is the child able to withhold an angry response and seek help?”, “Does the child understand that actions affect others?”, “Does the child follow the rules and routines?”, “Does the child understand safety issues and respect for others”? A score of 0 indicates that the behavior does not occur. A score of 1 indicates that the behavior was observed once or twice. A score of 2 indicates that the behavior was occasionally observed in some areas. A score of 3 indicates that the behavior was observed about 50% of the time. A score of 4 indicates that the child typically behaves this way, while a score of 5 indicates that the behavior is displayed most or all of the time. The maximum possible score for the self-control subtest is 25.

**Cooperation.** Cooperation is assessed through teacher observations of the nature of the child’s interactions with peers in classroom activities that require cooperation and reciprocity, as demonstrated in behaviors such as sharing materials, sharing responsibility, helping one another, helping the teacher, taking turns in game situations, and using compromise and discussion to resolve conflicts rather than aggressive behaviors. Cooperative behaviors are quantified using a five point rating scale. The child is given a rating of 0 if cooperative behavior does not occur; a rating of 1 if such behavior
has been observed once or twice; a rating of 2 if cooperative behavior has been
occasionally observed in some areas; a rating of 3 if cooperative behavior has been
observed about 50% of the time in various situation; a rating of 4 if the child typically
behaves in a cooperative manner; and a rating of 5 if the child behaves this way all or
almost all of the time. The total possible score for Cooperation is 15.

**Social Relationships.** Social relationships are measured by teacher observation of
the child in various social situations. A child is observed in conversations with adults or
other children in or outside the classroom and the teacher evaluates the degree to which
he/she interacts with others in ways that reflect established social relationships and hold
promise for initiating new relationships, for example, accepting guidance from familiar
adults, responding to them or to other children in a friendly manner (5 points), developing
new friendships (5 points), responding sympathetically to those who are hurt and/or upset
(5 points). The total possible score for the social relationships subtest is 15.

**Knowledge of Self and Community.** This skill is assessed by observing the child
in various situations and noting whether she/he identifies self-defining personal
characteristics such as gender, physical stature and appearance, perceived skills and
abilities and perceived membership and role in a family constellation (5 points); whether
he/she demonstrates and/or expresses understanding of individual differences among
peers and/or adults(5 points); whether she/he has any awareness or understanding of the
purpose, structure, and organization of different communities, for example the formation
of a community based on a common purpose, the nature of different roles and
responsibilities of members of a community, the knowledge and skills required for
accepting those roles and responsibilities, and the types of individuals who are likely to
accept them (5 points). The maximum possible score for this subtest is 15.

**Initiative.** This skill is assessed by observing whether the child chooses to participate in a variety of activities (5 points), makes independent choices (5 points), shows eagerness to learn, and discusses a growing range of topics, ideas, and tasks (5 points). The maximum possible score for this measure is 15.

**Persistence.** This skill is assessed by observing whether the child endures in and completes a variety of tasks (5 points), is able to develop goals and follow through on plans (5 points), is able to maintain concentration on a task or set of directions, even with distractions and interruptions (5 points). The maximum possible score for this subtest is 15.

**Problem Solving.** This skill is measured by teacher observation of whether the child seems to be able to find more than one solution to a problem (5 points), recognizes and solves problems through exploration, interactions, and discussions with peers or adults (5 points), demonstrates the ability to classify, compare and contrast objects, events, and experiences (5 points). The maximum possible score for this measure is 15.

The total possible score for the entire social emotional measure is 137. An estimate of reliability was calculated by correlating the scores that the children obtained on the first, second, and third measuring periods. The correlations were found to be statistically significant at all the three measurement periods and are presented in Table 11.
Table 11

_Correlations of the Social Emotional Measure During the Year_

<table>
<thead>
<tr>
<th></th>
<th>Social Emotional 1</th>
<th>Social Emotional 2</th>
<th>Social Emotional 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Emotional 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Emotional 2</td>
<td>1</td>
<td>0.882*</td>
<td>0.860*</td>
</tr>
<tr>
<td>Social Emotional 3</td>
<td>0.745*</td>
<td>0.860*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note: N=745, * p < .001.

In this study, composite measures of family and child risk were initially used as predictors rather than individual measures of each type of risk. A number of resiliency researchers (i.e. Rutter, 1979; Sameroff, 1998) have shown that when a child is exposed to several risk factors, the impact multiply each other’s destructive effects. Researchers are therefore increasingly using cumulative risk scores rather than individual risk scores in conducting analyses that investigate the effects of risks to which children are exposed. Resiliency researches investigating the effects of composite risk factors versus individual risk factors have found differences between these measures. For example, Williams, Anderson, McGee, and Silva (1990) and Sameroff (1998) found differences in the results of the mental health status of children whose mothers had mental health issues when they compared the results from the individual risk factors versus the composite of risk factor, thus, it is the cumulative disadvantage more than a single risk factors that deleteriously affects children.

**Child Risk Composite**

As already noted, the proposed study also uses archived information detailing the health history for each child who is represented in the data base described above.

Included in a child’s health history are risk-factors such as problems during pregnancy, problematic delivery and/or other concerns at birth (e.g. low birth weight and
Table 12

**Child Variables and Possible Values for the Risk Composite**

<table>
<thead>
<tr>
<th>Child Variable</th>
<th>Contribution to Risk Composite</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern During Pregnancy</td>
<td>0</td>
<td>No concern</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Any concern</td>
</tr>
<tr>
<td>Premature Birth</td>
<td>0</td>
<td>Full-term</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Premature</td>
</tr>
<tr>
<td>Concerns at Birth</td>
<td>0</td>
<td>No concerns</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Any concern(s)</td>
</tr>
<tr>
<td>Significant Injury</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Any injury(ies)</td>
</tr>
<tr>
<td>Regular Medications</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Any meds</td>
</tr>
<tr>
<td>Regular Medical Care</td>
<td>0</td>
<td>No regular medical care</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Regular medical care</td>
</tr>
<tr>
<td>Regular Dental Care</td>
<td>0</td>
<td>No regular dental care</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Regular dental care</td>
</tr>
<tr>
<td>Diagnosed Disability</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Disability</td>
</tr>
<tr>
<td>Receives Speech &amp; Lang Therapy</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>ST</td>
</tr>
<tr>
<td>Receives Occupational Therapy</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>OT</td>
</tr>
<tr>
<td>Receives Physical Therapy</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>PT</td>
</tr>
</tbody>
</table>

combines conditions such as preterm delivery; significant illness or injury; whether the child has regular and prescribed medication for a pre-existing medical or psychiatric condition; whether the child has regular medical and dental care, and whether the child has a diagnosed disability and is receiving services such as language therapy, occupational therapy and/or physical therapy. Values were assigned to child risk factors based on SCAP Head Start Selection Criteria. A child risk index was computed by adding the values of the various child risk variables. Table 12 describes the child variables and the possible values for
each variable. The maximum possible score for this measure is 12.

**Family Risk Composite**

The archival data set also contains family information such as the income(s) of working members of the family, number of children in a household, number of adults in the household and educational level of the primary caregiver (see Table 13).

Table 13

*Family Variables and Possible Values for the Risk Composite*

<table>
<thead>
<tr>
<th>Family Variable</th>
<th>Contribution to Risk composite</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children in Family</td>
<td>0</td>
<td>1,2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>&gt;2</td>
</tr>
<tr>
<td>Number of Adults</td>
<td>0</td>
<td>2+ adults</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1 Adult (Single Parent)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This is HS assignment for single parent.</td>
</tr>
<tr>
<td>Language</td>
<td>0</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Head Start assigns 3 points if Primary Lang is non-English</td>
</tr>
<tr>
<td>Foster Care</td>
<td>3</td>
<td>Head Start assigns 3 points if the child is in foster care.</td>
</tr>
<tr>
<td>Education Level of Primary Caregiver</td>
<td>0</td>
<td>Grade 11 or greater</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Less than 11</td>
</tr>
<tr>
<td>Income</td>
<td>0</td>
<td>Greater than $11,500.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Less than $11,500.</td>
</tr>
<tr>
<td>Adequate Housing</td>
<td>0</td>
<td>Adequate</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Problem</td>
</tr>
<tr>
<td>Disability in Family</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Disability</td>
</tr>
<tr>
<td>Parent Incarcerated</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Either parent</td>
</tr>
<tr>
<td>Time Family Sought Service in Past Year</td>
<td>&lt;2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>&gt;2</td>
<td>Three or more times</td>
</tr>
</tbody>
</table>

*Note*: Education Level (Grade 11) and income ($11,500) are based on the averages obtained from the SCAP-HS archival data set.
The data set also contains information about whether a parent has been incarcerated, whether a family member has been diagnosed with a disability, adequacy of housing, and the number of times the family has sought service from the social welfare system during the year before the child entered the Head Start program. A family risk composite was computed, based on values assigned to the various family variables (see Table 13).

**Home Environment Characteristics**

Qualitative information describing high and low achieving children’s home environments was obtained in order to further understand family characteristics that serve as protective variables and facilitate the development of emergent academic skills. Such information was obtained through a structured interview that used a researcher modified version of the Home Observation for Measurement of the Environment (HOME; Caldwell & Bradley, 1984). The HOME assesses various aspects of the home environment that have been linked to cognitive development in pre-school children. As noted above, the interview focused only on the children scoring at the top and bottom quartiles of the distribution generated by the measure of academic skills used as the dependent measure in this study. The interview was intended to provide information about the language and literacy environments of the home, along with information about family activities that may facilitate or impair academic readiness. A copy of the modified HOME instrument is included in the Appendix.

**Components of the HOME Instrument**

**Home Literacy Environment.** The home literacy environment component of the HOME is designed to obtain information regarding opportunities for the child to engage
in and profit from literacy activities at home. Thus, this component of the instrument includes questions such as the number of books available in the home, the importance of education in the family, caretakers’ interest in keeping up with and communicating with Head Start personnel on issues that affect the child’s literacy development, and the child’s program attendance. The maximum possible score for the Home Literacy Environment questions is 14.

**Amount of Time the Caretaker Spends with the Child.** This component of the HOME requires the interviewee to respond to items which assess organized family activities in the home which enhance quality time that the caretaker spends with the child engaged in educationally related activities such as homework help, reading to and with the child, teaching letters and numbers, conversations about the school day, and whether the caretakers regularly attend school conferences and non-educational activities organized by the family. The maximum possible score for this measure is 11.

**Family Support System.** This component of the HOME assesses educationally relevant support services provided to primary caregivers by the extended family and community services. The extended family can compensate and complement the services provided by primary caregivers. Services such as child care and reading provided by other family members can facilitate and enhance normal development of a child from a dysfunctional home. Similarly, involvement in community organizations and services like membership in the library or involvement in summer or after-school educational programs can greatly enhance the child’s experiences and improve academic achievement. The maximum possible score for the Family Support System measure is 5.

**Family Stability.** This component of the HOME was designed to assess how
often, during the course of the Head Start year, the family had moved, changed jobs or experienced a health, financial or legal crisis. Family stability and absence of a crisis may be an indicator of family well-being and may enhance academic and socio-emotional development. The maximum possible score for Family Stability is 5.

**Procedure**

As indicated in a previous section, almost all of the data used for addressing the research questions of interest in this study were archived data collected from five cohorts of 4 year-old children enrolled in the SCAP Head Start program between academic years 2005 and 2010 inclusive (N=745). The data generated by the measures assessing child characteristics and academic progress were collected by the Head Start classroom teachers who administered each of the tests included in the SCAP Child Outcomes Assessment battery three times during each academic year (October, February, and May). The data generated by the measures assessing child and family risk were collected by the family workers at the beginning of each Head Start year. Finally, the data generated by the measure assessing the quality of the home environments of high and low achieving children (HOME, Caldwell & Bradley, 1984) were collected by the family workers at the end of the Head Start academic year 2009-2010.

The archived data used in the present study were processed and stored at the University at Albany’s Child Research and Study Center. Data processing and storage is typically done by undergraduate and graduate students supervised by University faculty who have had a long-standing professional relationship with SCAP Head Start administrative and teaching personnel. Written permission to analyze the archived data used in the present study was obtained from the Director of the Schenectady Community
Action Program, which is the agency that is responsible for overseeing the SCAP Head Start program. In addition, the procedures involved in collecting and processing both the archived data and the HOME survey data used in the study were approved, prior to commencement of the study, by the University at Albany’s Institutional Review Board (IRB), which operates under the auspices of the University’s Office of Research Compliance (see Appendix A).

In order to recruit the family workers and classroom teachers who eventually participated in the present study, an “invitation to participate letter” (see Appendix G) was sent to each of these individuals and all agreed to participate. Moreover, each was interviewed for purposes of establishing dates and times that were convenient for them and there was no incentive provided for participation in the study. The participants responded to a structured interview which took approximately 15 to 20 minutes per case to complete.

**Data Analyses.** For the purposes of this study, binary logistic regression analyses were performed to answer the first two research questions while independent-samples t-tests were performed to analyze the HOME survey data. In addition, the study explored and presented family workers’ views of differences in the quality of the home environments of the high achieving and low achieving children.

**Dependent Measures**

The dependent measures for the present study were the dichotomous variables representing achievement groups classified by the logistic regression analyses (high-low; high-average; low-average) and the subscales from the Home Observation for Measurement of the Environment (Caldwell & Bradley, 1984).
Achievement Groups. For purposes of constituting and systematically comparing high, average, and low achievers, an achievement composite was created by transforming the raw scores for both the total reading measure (PALS subtests along with the supplementary alphabetic recitation, word recognition, and spelling measures) and the total math measure into standard scores having a mean of 100 and a standard deviation of 15. The standard scores for these two measures were thereafter summed and the average of these two scores served as a composite that operationally defined each child’s achievement level. These composite scores were then used to partition the sample into high, average, and low achievers. The High Achievers were defined as the top 25% of the distribution of composite scores; the Average Achievers were defined as the middle 50% of the distributions of composite scores, while the Low Achievers were defined as the bottom 25% of the distribution of composite scores. This approach to classification of achievement groups has been used in large scale studies (i.e. Wyner, Bridgeland, & DiLulio Jr., 2007).

Home Environment Measures. As already indicated, the Home Observation for Measurement of the Environment (HOME) uses a structured interview format to obtain information regarding the degree to which the child’s home environment facilitates the development of emergent academic skills. The interview sample was drawn from the 2009-2010 academic year sub-samples. The lower quartile consisted of children scoring at or below the 25th percentile on the literacy-math composite, while the upper quartile consisted of children scoring at or above the 75th percentile on this measure. A total of 32, 4-year-old children in their second year of Head Start were randomly selected for the qualitative analysis, 17 of which represent the top scoring 25% of the distribution and 15
of which represent the bottom scoring 25% of the distribution. Approximately 52% of the children are male and 48% are female. Approximately 32% of the children attended regular Head Start, 55% attended the Universal Pre-Kindergarten, and 13% attended the integrated classroom.

For each of these 32 children, information was obtained from both the family worker and the classroom teacher who worked with given children and their families. The family worker information was used for data analyses because the family worker is the primary liaison between a child’s family and school personnel. However, both the family worker and classroom teachers were interviewed to assess the reliability of the information obtained from each group. In order to quantify results from the HOME interviews, the sum of the raw scores for each of the home environment measures was computed, and an average score was calculated for the high and low achievers on each of the measures. Independent t-tests were computed to compare the mean differences among the two groups of children on each of the home environment measures; (a) the child’s home literacy environment (b) the amount of time the caretaker spends with the child (c) the family support system, and (d) family stability.

For all the analyses conducted to answer the first two research questions, two sets of classification analyses were conducted at the beginning of the year (Time 1), using scores from October assessments and the end of the year (Time 3), using scores from May assessments.

**Independent Measures**

**Child Variables.** There were five major child variables used as predictors in all classification analyses addressing Research Questions 1 and 2. Three of these variables
were continuous predictors and two were categorical predictors. The three continuous predictors were the social-emotional measure, the language measure, and the child risk composite. The two categorical measures were gender (female=1, male=0), and years in the program (two years=1, one year=0). All five variables were used as predictors in analyses involving the total sample performed at both the beginning (Time 1) and end (Time 2) of the Head start year. Of course, the categorical variable representing number of years in the program was not used as a predictor in separate analyses that were subsequently performed involving each of the two subgroups of children represented by this variable (i.e. 4-1s and 4-2s).

In order to determine which of the individual child risk variables included in the child risk composite would successfully predict achievement group membership; supplementary analyses were also performed using a subset of the variables constituting the child risk composite. Six of these variables were used as predictors in these analyses: the child’s birth weight, whether or not the mother had concerns during pregnancy (yes=0, no=1), whether or not the child had significant birth injury (yes=0, no=1), whether or not the child had a disability (yes=0, no=1), and gender (female=1, male=0).

Because of statistical problems associated with a “zero cell count”, the following child risk variables were excluded from the supplementary analyses: premature birth, concerns at birth, regular medications, regular medical care, receives speech and language therapy, receives occupational therapy, and receives physical therapy. Note, in this connection, that a zero cell count refers to a situation where “the dependent variable is invariant for one or more values of a categorical independent variable” (Menard, 1995, p. 68). For example, if all children who were reported as receiving speech and language
therapy were classified as low achievers, there would be a problem with a zero cell in the contingency table for the relationship between the frequency of cases of children in the high versus the low achievement groups who receive speech and language therapy. The odds for an occurrence of an event of 0 or 1 for a single case is not a problem, but it becomes a statistical problem when the odds are 0 or 1 for the entire group of cases. Zero cell counts result in very high estimated standard errors for the coefficients associated with both the predicted category and the reference category (Hosmer & Lemeshow, 1989; Menard, 1995). Menard (2002) suggests that the problem of zero cell counts can be handled by recoding the categorical independent variable in a meaningful way, eliminating the problem category, or by adding a constant to each cell of the contingency table to eliminate the zero cells.

**Family Risk Variables.** In order to determine whether the family risk factors would classify children into high-low, high-average and low-average achievement groups, the family risk composite was also used as a predictor in all of the Time 1 and Time 3 analyses that were initially performed, along with the child variables used as predictors in these analyses. However, none of the coefficients for the family risk composite was statistically significant, suggesting that family risk might not be an important variable in distinguishing among high, average, and low achievers. To further evaluate this possibility, subsequent analyses were performed using individual family risk variables as predictors. Three continuous variables and six categorical variables were used as predictors. The three continuous variables were the number of children in the family, the number of adults in the family, and the years of schooling of the primary caregiver. The six categorical variables were the primary language spoken in the home
income (Head Start mean=1, below Head Start mean=0), whether or not the family had adequate housing (adequate housing=1, inadequate housing=0), whether or not the primary caregiver had a disability (without disability=1, with disability=0), whether or not one or both parents had been incarcerated (not incarcerated=1, incarcerated=0), and whether or not the mother was the primary caregiver (mother=1, other=0). Foster care and the number of times that the family has sought service during a given year were excluded from the analysis because of zero cell counts problems (Menard, 1995; 2002).

**Procedures Used for Data Analysis for Binary Logistic Regression**

Binary logistic regression procedures were used to classify children into high, average, or low achievement groups. Binary logistic regression was used because this procedure allows a researcher to predict a discrete outcome, such as group membership, from a set of variables that may be continuous, discrete, dichotomous, or a mix of any of them (Liang & Zeger, 1986). The General Estimating Equation (GEE) module in SPSS was used for all the binary logistic regression analyses because it extends the generalized linear model to allow for analysis of correlated observations generated by clustered data. More specifically, the archived data used for this study were derived from children clustered within classrooms. Children in the same classrooms are likely to be more similar to each other on given measures than to non-class members. Therefore to control for such clustering, the correlated observations characteristic of clustered data need to be taken into account when performing the analyses. If they are not taken into account, the standard errors of the estimates will be underestimated rendering significance tests invalid (Snijders & Bosker, 1999). Significance tests become invalid because the
standard errors that are typically reported with an analysis assume that each observation is independent of all other observations in the data set. When correlations between observations become larger, each observation contains less unique information. This kind of correlation (between observations) is called an intraclass correlation, which is a measure of clustering effects. Accordingly, preliminary analyses were performed to determine the magnitude of the effects of classroom clustering in the data set and it was found that the intraclass correlations were substantive for the achievement measures ($r = .109$; see Hilbe, 2009). Thus, all of the analyses reported and discussed below included a classroom variable that controlled for clustering effects.

**Assumptions of Binary Logistic Regression**

According to Garson (2009), binary logistic regression is based on the following assumptions: adequacy of the sample size, the absence of outliers, and the absence of multicollinearity.

**Sample Size.** Binary logistic regression uses maximum likelihood estimation rather than ordinary least squares (OLS) to derive parameters. Maximum likelihood relies on large-sample sizes and estimates decline when there are few cases for each observed combination of independent variables. When small sample sizes are used in a regression analysis, they result in high standard errors and inflated parameter estimates.

Several recommendations have been suggested regarding ways to estimate the adequacy of sample sizes in any analysis. Harrell (2001) suggests that the number of cases in the smaller of two binary outcomes in binary logistic regression divided by the number of predictor variables should be at least 20. However, Hosmer and Lemeshow (1989) recommend a minimum of 10 cases per independent variable used in the analysis.
A more stringent recommendation is suggested by Pedhazur (1997), who suggests that a sample size be at least 30 times the number of parameters. In this study, there are 6 independent variables; the study sample of 745 cases therefore represents a more than adequate sample recommended for binary logistic regression. Within achievement levels, the high/low achievement sample has 376 cases which exceeds the minimum requirement of (30 x 6=180 cases), the high/average achievement sample has 492 cases thus exceeding the minimum requirement of (30 x 6=180 cases), similarly the low/average achievement sample has 582 cases thus exceeding the minimum requirement of (30 x 6=180 cases). The sample size is similarly adequate for sub-group analysis by program year (i.e. 4-1s versus 4-2s).

**Outliers.** A second assumption that needs to be met before a binary logistic regression is performed is the absence of outliers in the data. To identify if there are outliers in a distribution, Tabachnick and Fidell (2007) suggest the calculation of $z$ scores for continuous variables. Cases with standardized scores in excess of 3.29 ($p < .001$, two-tailed $t$ test) in the data are identified as potential outliers. On the other hand, Garson (2009) suggests that a researcher should consider standardized residuals greater than 2.58 as outliers at the .01 level and consider removing the outliers from the analysis. The study’s standardized residuals for the current sample ranged from -1.00 to 2.50 showing that that there were no outliers in the data.

**Multicollinearity.** Collinearity is assumed to be present in the data if bivariate correlations are greater than ($r > 0.90$) or several variables have correlation coefficients that are greater than ($r > 0.7$) in the correlation matrix formed by all the independent variables (Garson, 2009; Menard, 2002). A check of the bivariate correlations table based
on the study data indicated no evidence of multicollinearity; the correlation coefficients for the data ranged from -0.17 to 0.35, the highest significant correlation noted was that between the social emotional and language variables (0.346; see Table 14).

Table 14

Correlations between the Predictor Variables and the Outcome for Time 1 and Time 3

<table>
<thead>
<tr>
<th>Panel A</th>
<th>Time 1</th>
<th>SEm</th>
<th>Language</th>
<th>CR</th>
<th>FR</th>
<th>Gender</th>
<th>YIP</th>
<th>Achievement</th>
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<tr>
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<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
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<td>0.11**</td>
<td>-0.09*</td>
<td>0.02</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YIP</td>
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<td>0.11**</td>
<td>0.04</td>
<td>0.07*</td>
<td>-0.01</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
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<td>0.53**</td>
<td>-0.12**</td>
<td>-0.06</td>
<td>0.13</td>
<td>0.24**</td>
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<table>
<thead>
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<th>CR</th>
<th>FR</th>
<th>Gender</th>
<th>YIP</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>-0.09*</td>
<td>0.00</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR</td>
<td>-0.09*</td>
<td>-0.03</td>
<td>0.02</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.19**</td>
<td>0.09*</td>
<td>-0.09*</td>
<td>0.02</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YIP</td>
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<td>0.10**</td>
<td>0.02</td>
<td>-0.09*</td>
<td>0.01</td>
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<td>1</td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
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<td>0.29**</td>
<td>-0.14**</td>
<td>-0.08*</td>
<td>0.15**</td>
<td>0.07*</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>NOC</th>
<th>NOA</th>
<th>Income</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>NOC</td>
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<td>1</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOA</td>
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<td>0.11**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>0.09**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>-0.07</td>
<td>0.01</td>
<td>-0.02</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel D</th>
<th>Time 3</th>
<th>FD</th>
<th>NOC</th>
<th>NOA</th>
<th>Income</th>
<th>Achievement</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOC</td>
<td>0.05</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NOA</td>
<td>0.03</td>
<td>0.11**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>-0.01</td>
<td>0.21**</td>
<td>0.09*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Achievement</td>
<td>-0.10</td>
<td>0.06</td>
<td>0.02</td>
<td>0.03</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Note: SEm=Social Emotional Measure, FR=Family Risk, YIP=Years in the Program, FD=Family Disability, NOC=Number of Children, NOA=Number of Adults, *p <.05, **p <.01.

Interpreting Binary Logistic Regression
The output from a binary logistic regression in GEE produces a table which lists the parameter estimates (Beta or “B” coefficients), the standard error of B, the Wald statistic, levels of significance for the Wald statistic, and the odds ratio (“Exp B”). The model intercept is the log odds (logit estimate) of the dependent variable when the model predictors are evaluated at values of zero. However, in practice, parameter estimates produced by predictor variables are rarely zero. The B coefficients are used to predict the log odds (logit) of the dependent variable. It is also important to note that logistic regression calculates changes in the log odds of the dependent variable, not changes in the dependent variable itself as in the case of ordinary least squares regression (Garson, 2009; Menard, 2002).

The Exp (B) in SPSS output refers to the odds ratios. The odds ratio is the natural log base e to the exponent B, where B is the parameter estimate. Note that when B=0, \(\text{Exp (B)} = 1\), thus an odds ratio of 1 corresponds to a predictor variable which does not affect the dependent variable. For continuous variables, the odds ratio represents the factor by which the odds of an event change for a one unit change in an independent variable. For continuous covariates, when the parameter estimate B is transformed into an odds ratio, it is normally expressed as a percent increase in odds for the occurrence of an event (Garson, 2009).

De Maris (1992) also recommends reporting the percent change in the odds ratio for continuous variables for logistic regression. The formula for computing the percentage change is \((\text{Exponent B}-1) \times 100\), where B is the regression coefficient given in the output. By default the event is \(y = 1\) for a binary dependent variable coded 0, 1, and the reference category is 0. The natural log of the odds of an event equals the natural log
of the probability of the event occurring divided by the probability of the event not occurring. In binomial regression, dichotomies (e.g. 0=male, 1=female) may be entered as a factor or as a covariate. If entered as a factor, the higher value is predicted and the lower category is the reference. If entered as a covariate, the lower value is predicted and the higher category is the reference. In the case of interactions between given variables, an Exp (b*) is interpreted as changes in estimates of the odds ratio corresponding with different values of a given moderator variable (Garson, 2009). For steps on how to perform binary logistic regression in SPSS18 see the Appendix H.

Data Analysis Plan and Itinerary for Logistic Regression Analyses

Main Effects Analyses. As indicated in a previous section, preliminary analyses were conducted to determine whether any of the child and family variables used as predictors would successfully classify children in one of the three achievement groups, when all other variables in a given model were controlled. Separate analyses were conducted for the total sample and for each of the 4-1s and 4-2s sub-samples at both Time 1 and Time 3. There were six predictors used in preliminary analyses involving the total sample: the social-emotional measure, the language measure, the child risk composite, the family risk composite, gender, and number of years in the program. All but numbers of years in the program were predictors in the separate analyses conducted with the 4-1s and 4-2s groups.

Results from these preliminary analyses indicated that all but the family risk composite contributed significantly to one or more of the classification models. Although this finding could be taken as an indication that family risk might not be an important variable in distinguishing high, average, and low achievers, as indicated above, a
multitude of findings in the research literature are contrary to this interpretation (see Literature Review). Thus, it was decided to conduct additional analyses using individual family risk variables as predictors (see Table 17) for analyses using the total sample and (Table 22) for analyses with the subsamples at Time 1, and (Table 23) for analyses with the subsamples at Time 3, several of these variables produced statistically significant regression coefficients in given classification analyses and results using these predictors are reported in the Results section.

Finally, the disparate findings produced by the family risk composite, prompted additional regression analyses using individual child risk variables as predictors and these results are presented in the appendix.

**Interaction Analyses.** In order to assess interactions between and among measures of specific family risk factors, specific child characteristics, and child risk factors and to determine if the interactions would accurately classify children as high, average, and low academic achievers, five predictors were initially used in all analyses: the family risk composite, the social emotional measure, the language measure, the child risk composite, and gender (female=1, male=0). The family risk composite was considered and tested as a moderator variable. According to Jaccard (2001), a theorist must specify a moderator variable and a focal independent variable as this is a useful “heuristic” for thinking about interactions (p. 12). According to Baron and Kenny (1986), a moderator variable is one that affects the relationship between two variables, so that the nature of the impact of the predictor on the outcome varies according to the level or value of the moderator. In the current study, it was hypothesized that the family risk composite would affect the relationship between specific child characteristics and the child risk
composite, on the one hand and achievement on the other. Therefore, the family risk composite was used as the moderator variable in preliminary classification analyses.

One way to test for interactions is to begin with a main-effect model only, and use a forward-selection method to add interaction terms to the model. A main effects model enables a researcher to assess whether there are significant relationships between any of the focal predictors and outcome variable(s) as well as between the moderator and outcome variable(s). In the current study, preliminary analyses using the family risk composite were carried out and the analyses produced no main effects for the moderator (family risk composite) in any of the classification analyses, as already indicated. Accordingly, this variable would not be used and was not used as a predictor in any of the interaction analyses subsequently performed. Instead, only those individual family risk variables were used as predictors in subsequent analyses assessing interaction effects.

Stepwise logistic regression was used in the analyses of interaction effects. Stepwise logistic regression is useful in predictive and exploratory research (Menard, 2002). In predictive research, the purpose is to identify a set of predictors that provide accurate predictions of some phenomenon while in exploratory research; the purpose is for theory construction and development in order to explain a phenomenon that is new or based on hunches (Menard, 2002). Both backward elimination and forward inclusion were used in preliminary analyses. Backward elimination is used when there are a large number of explanatory variables relative to the number of cases. One advantage of backward elimination is that there is less risk of failing to find a relationship because of suppressor effects, which may occur when forward inclusion is used.

To test for two-way interactions (conceptualized as a relationship between an
independent variable and dependent variable, moderated by a third variable, a regression analysis was computed that included both a focal independent variable and a moderator, along with a “product term” representing the interaction between them. All possible two-way interactions between and among measures of specific family risk factors, specific child characteristics, and child risk factors were assessed by systematically adding product terms representing interactions between and among the family risk factors, specific child characteristics, and child risk factors (Jaccard & Turrisi, 2003).

In order to test for three-way interactions (conceptualized as a relationship between a variable X and dependent variable Y, moderated by variables Z and W), a regression analysis was computed that included all three independent variables, all three pairs of two-way interaction terms, and the three-way interaction term (Jaccard & Turrisi, 2003). Note however that three-way interactions were only computed when there were significant two-way interactions.

**Independent Samples “t” Tests.** Independent-samples “t” tests were used to test the hypothesis that differences between the means of the high and low achiever samples, on the measures evaluating the quality of the children’s home environments, are equal to zero (Utts & Heckard, 2004).
CHAPTER 4: RESULTS

This chapter presents results from analyses that were performed to address the three research questions motivating the present study and specified in chapter two. It was hypothesized that 1 (a) measures of specific child characteristics and child risk factors obtained from a representative sample of Head Start four-year-old children will accurately classify these children as high, average, and low academic achievers, conditional on controlling for Head Start experience differences, (b) a measure of family risk factors obtained from a representative sample of Head Start four-year-old children, will accurately classify these children as high, average, and low academic achievers, conditional on controlling for specific child characteristics, child risk factors, and Head Start experience differences, (c) a measure of family risk factors obtained from a representative sample of Head Start four-year-old children will moderate the effects of child risk factors in classifying children as high, average, and low academic achievers, conditional on controlling for specific child characteristics and Head Start experience differences; 2. The pattern of results using the same set of predictors in research question one (excluding the number of years in the program) to distinguish among high, average, and low achievers will be essentially the same in four-year-old children exposed to the Head Start program for one year compared with four-year-old children exposed to the Head Start program for two years; and 3. High and low achieving four-year-old children exposed to the Head Start program for two years will differ on measures assessing the quality of the home environment in facilitating the development of pre-academic readiness skills.

As discussed in the Methods section, children were assessed on measures of
progress in the acquisition of academic and social emotional skills three times a year: in October, February, and May. However, the analyses addressing the three research questions were performed only on measures obtained in October, shortly after the beginning of the academic year (Time 1) and May, at the end of the academic year (Time 3). It is important to note that the end of year or Time 3 analyses are of primary interest; however, analyses were also performed using the Time 1 measures for purposes of comparing results from both measuring periods.

**Research Question 1**

1. (a) Will measures of specific child characteristics and child risk factors obtained from a representative sample of Head Start four-year-old children, accurately classify these children as high, average, and low academic achievers, conditional on controlling for Head Start experience differences?

To assess whether specific child characteristics and child risk factors accurately classify Head Start four-year-old children as high, average, and low academic achievers, a binary logistic regression analysis was performed using the SPSS General Estimating Equations (GEE) procedure. The dependent variables were dichotomous variables representing achievement groups classified by the logistic regression analyses (high-low; high-average; low-average); the high-low achievement analysis is a comparison of the high achievers coded as 1 versus the low achievers coded as 0; the high-average achievement analysis is a comparison of the high achievers coded as 1 versus the average achievers coded as 0, while the low-average achievement analysis is a comparison of the low achievers coded as 1 versus the average achievers coded as 0. Binary logistic coefficients are difficult to interpret if not coded meaningfully. The convention for binary logistic regression is to code the dependent class of greatest interest (target group or the response group) as 1 and the other class as 0, since logistic regression is used to predict
the log odds of being in the class of greatest interest (Garson, 2010).

There were five predictors in the model, both at the beginning of the Head Start year (Time 1) and at the end of the Head Start year (Time 3); the three continuous predictor variables were the social emotional measure, the language measure, and the child risk composite. Recall that this measure represents the child’s health history in terms of risk-factors such as problems during pregnancy, problematic delivery and other concerns at birth such as low birth weight and premature delivery; significant illness or injury; whether the child has regular and prescribed medication for a pre-existing medical or psychiatric condition; whether the child has regular medical and dental care, and whether the child has a diagnosed disability and is receiving services such as language therapy, occupational therapy, and/or physical therapy. The two categorical predictor variables were gender (female=1, male=0) and number of years in the Head Start program (4-2s=1, 4-1s=0). The number of years in the program was entered as a control variable. The results from analyses performed with data generated by the total sample of Head Start children are presented in Table 15.

Summary of Findings for Logistic Regression Results for Specific Child Characteristics and Child Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3

The analyses involving the total sample at Time 1 produced statistically significant regression coefficients for the social emotional measure, the child risk measure, gender, and number of years in the program in classifying the high versus the low academic achievers. In classifications of these groups at Time 3, the coefficients for the social emotional, language, child risk, and number of years in the program measures were statistically significant.
Table 15

Logistic Regression Results for Specific Child Characteristics and Child Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3

<table>
<thead>
<tr>
<th>Panel A</th>
<th>High-Low</th>
<th>Time 1</th>
<th>B</th>
<th>SE</th>
<th>p</th>
<th>Exp(B)</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Intercept</td>
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<td>1.04</td>
<td>.00</td>
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</table>

<table>
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<th>High-Average</th>
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<th>SE</th>
<th>p</th>
<th>Exp(B)</th>
<th>%</th>
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<td>.00</td>
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Note: SEm = Social Emotional, CR = Child Risk, YIP = Years in the Program, N = 745, High-Low, n = 373, High-Average, n = 557, Low-Average, n = 560, Percent Change = (Exp B-1)*100, * p < .05.
In analyses classifying the high and average achievers, statistically significant regression coefficients were obtained for the social emotional and child risk measures at Time 1. At Time 3, coefficients for the social emotional, language, and child risk measures were statistically significant.

In the analyses classifying the low-average achievers, statistically significant regression coefficients were obtained for the social emotional measure and gender at the beginning of the Head Start year (Time 1). At the end of the year (Time 3), coefficients for the social emotional measure, the language measure, and number of years in the program measures were statistically significant.

**Logistic Regression Results for Specific Child Characteristics and Child Risk Factors for Classification Analyses in the High-Low Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3 (see Table 15 Panel A)**

The results generated by this model produced statistically significant regression coefficients for the social emotional measure ($B = 0.04, p < .05$), the child risk composite ($B = -0.40, p < .05$), and gender ($B = 0.49, p < .05$) as well as for years in the program ($B =0.56, p < .05$) at the beginning of the year. Thus, the odds of a child being a high achiever compared to being a low achiever increases by 4% for each unit increase in the social emotional measure, controlling for other variables in the model. Similarly, the odds of a child being a high achiever compared to being a low achiever increases by 33% for each unit decrease in the child risk measure, controlling for other variables in the model. The odds of a child being a high achiever compared to being a low achiever increases by a factor of 1.64 for a male child as compared to a female child, controlling for other variables in the model. The odds of a child being a high achiever as compared to being a low achiever increases by a factor of 1.74 for a child in their first year in the program as
compared with a child in their second year in the program, controlling for other variables in the model.

At the end of the Head Start year (Time 3), the coefficients for the social emotional ($B = 0.11, p < .05$), language ($B = 0.09, p < .05$), child risk ($B = -0.38, p < .05$), and years in the program ($B= 0.99, p < .05$) measures were statistically significant. These results indicate that the odds of a child being a high achiever compared to being a low achiever increases by 11% for each unit increase in the social emotional measure, controlling for other variables in the model. Likewise, the odds of a child being a high achiever compared to being a low achiever increases by 10% for each unit increase in the language measure, controlling for other variables in the model. However, the odds of a child being a high achiever compared to being a low achiever increases by 32% for each unit decrease in the child risk measure, controlling for other variables in the model.

Similarly, the odds of a child being a high achiever as compared to being a low achiever increases by a factor of 2.69 for a child in their first year in the program as compared with a child in their second year in the program, controlling for other variables in the model.

**Logistic Regression Results for Specific Child Characteristics and Child Risk Factors for Classification Analyses in the High-Average Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3 (see Table 15 Panel B)**

The analyses for the high-average group produced statistically significant regression coefficients for the social emotional ($B = 0.01, p < .05$) and child risk measures ($B = -0.17, p < .05$) at the beginning of the year. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 1.3% for each unit increase in the social emotional measure, controlling for other variables in the model.
However, the odds of a child being a high achiever compared to being an average achiever increases by 15% for each unit decrease in the child risk measure, controlling for other variables in the model.

At the end of the Head Start year, coefficients for the social emotional \( (B = 0.06, p < .05) \), language \( (B = 0.05, p < .05) \), and child risk measures \( (B = -0.15, p < .05) \) were statistically significant. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 5.6% for each unit increase in the social emotional measure, controlling for other variables in the model. Similarly, the odds of being a high achiever compared to being an average achiever increases by 4.6% for each unit increase in the language measure, controlling for other variables in the model. In contrast, the odds of a child being a high achiever compared to being an average achiever increases by 13.5% for each unit decrease in the child risk measure, controlling for other variables in the model.

**Logistic Regression Results for Specific Child Characteristics and Child Risk Factors for Classification Analyses in the Low-Average Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3 (see Table 15 Panel C)**

The results generated by this model produced statistically significant regression coefficients for the social emotional measure \( (B = -0.02, p < .05) \) and gender \( (B = -0.49, p < .05) \) at the beginning of the year. The odds of a child being a low achiever compared to being an average achiever increases by 1.7% for each unit decrease in the social emotional measure, controlling for other variables in the model. The odds of a child being a low achiever as compared to being an average achiever decreases by a factor of 0.62 for a male child rather than for a female child.

At the end of the Head Start year, coefficients for the social emotional measure \( (B = 0.06, p < .05) \), language \( (B = 0.05, p < .05) \), and child risk measures \( (B = -0.15, p < .05) \) were statistically significant. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 5.6% for each unit increase in the social emotional measure, controlling for other variables in the model. Similarly, the odds of being a high achiever compared to being an average achiever increases by 4.6% for each unit increase in the language measure, controlling for other variables in the model. In contrast, the odds of a child being a high achiever compared to being an average achiever increases by 13.5% for each unit decrease in the child risk measure, controlling for other variables in the model.
= -0.04, \( p < .05 \)), the language measure \( (B = -0.08, \ p < .05) \), and the number of years in the program year \( (B = 0.59, \ p < .05) \) were statistically significant. The odds of a child being a low achiever compared to being an average achiever increases by 4.3\% for each unit decrease in the social emotional measure, controlling for other variables in the model. The odds of being a low achiever compared to being an average achiever increases by 7.4 \% for each unit decrease in the language measure, controlling for other variables in the model. However, the odds of a child being a low achiever as compared to being an average achiever decreases by a factor of 0.55 for a male child compared to a female child.

**Research Question 1b**

1 (b) Will a measure of family risk factors obtained from a representative sample of Head Start four-year-old children, accurately classify these children as high, average, and low academic achievers, conditional on controlling for specific child characteristics, child risk factors, and Head Start experience differences in classifying achievement groups?

To assess whether a measure of family risk factors accurately classifies Head Start four-year-old children as high, average, and low academic achievers, a binary logistic regression analysis was performed using the SPSS GEE procedure. The dependent variables were dichotomous variables representing achievement groups classified by the logistic regression analyses (high-low; high-average; low-average).

There were six predictors in the model, both at the beginning of the Head Start year (Time 1) and at the end of the Head Start year (Time 3). The family risk measure was the focal predictor. As indicated in a previous section, the family risk measure is a composite that includes family information such as the income of working members of the family, number of children in a household, number of adults in the household, and the
educational level of the primary caregiver. The composite also contains information about whether a parent has been incarcerated, whether a family member has been diagnosed with a disability, adequacy of housing, and the number of times the family has sought service from the social welfare system during the year before the child entered the Head Start program. The social emotional measure, the language measure, the child risk composite, gender (female=1, male =0), and the number of years in the Head Start program (4-2s=1,4-1s=0) were entered as control variables (see Table 16).

**Summary of Logistic Regression Results from a Measure of Family Risk Factors for Classification Analyses for the Total Sample of Head Start Children at Time 1 and 3**

The analyses did not produce statistically significant regression coefficients for the family risk composite for any of the three achievement groups, both at the beginning and at the end of year. A comparison of the results between the models that did not include the family risk composite (Table 15) and those that did include the family risk composite (Table 16), reveals that the family risk composite contributes very little variance to the model. The pattern of results that includes the family risk composite is similar to the analyses that exclude the family risk composite.

**Logistic Regression Results for the Main-Effects Model for a Measure of Specific Family Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample at Time 1 and Time 3 (see Table 17).**

In order to further evaluate the finding that the family risk composite was not an important variable in distinguishing among high, average, and low achievers, subsequent analyses were performed using individual family risk variables as predictors for Time 1 and Time 3. Three continuous variables and six categorical variables were used as predictors. The three continuous variables were the number of children in the family, the number of adults in the family, and the years of schooling of the primary caregiver. The
Table 16

Logistic Regression Results for a Measure of the Family Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample of Head Start Children at Time 1 and 3

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*Note: SEm = Social Emotional, CR = Child Risk, FR = Family Risk, YIP = Years in the Program, High-Low, n = 373, High-Average, n = 557, Low-Average, n = 560, N = 745, (Exp B-1)*100 * p < .05.*
six categorical variables were the primary language spoken in the home (English=1, other=0), income (Head Start mean=1 below Head Start mean=0), whether or not the family had adequate housing (adequate housing=1 inadequate housing=0), whether or not the primary caregiver had a disability (without disability=1, with disability=0), whether or not one or both parents had been incarcerated (not incarcerated=1, incarcerated=0), and whether or not the mother was the primary caregiver (mother=1, other=0). Foster care and the number of times that the family had sought service the previous year were excluded from the analysis because of zero cell count problems (Menard, 1995; 2002). The control variables were the social emotional measure, language, the child risk composite, and gender (female=1, male=0).

**Summary of Findings for Logistic Regression Results for the Main-Effects Model for a Measure of Specific Family Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample at Time 1 and Time 3**

The analyses for the model assessing the main effects of individual family risk variables on the outcome measure for the three achievement groups did not produce any statistically significant results for the Time 1 period. Similarly, during Time 3, there were no significant main-effects for the high-low achievement group. However, the analyses produced statistically significant main effects for family disability ($B = -0.61, p < .05$) among the high-average group, and for number of children in the family ($B = -0.21, p < .05$) among the low-average group. Thus, the odds of being a high achiever as compared to being an average achiever decreases by a factor of 0.54 for a child that comes from a family with a disability as compared with a child who comes from a family with no disability, controlling for other variables in the model. Similarly, the odds of a child being a low achiever compared to being an average achiever increases by 121% for each
Table 17

*Logistic Regression for the Main-Effects Model for a Measure of Specific Family Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample at Time 3*

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</tr>
<tr>
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Table 17 (continued)

Logistic Regression for the Main-Effects Model for a Measure of Specific Family Risk Factors for Classification Analyses in the Achievement Groups for the Total Sample at Time 3

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</tr>
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<tr>
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<td>0.07</td>
</tr>
<tr>
<td>CR</td>
<td>-0.14</td>
</tr>
<tr>
<td>Gender</td>
<td>0.38</td>
</tr>
<tr>
<td>YIP</td>
<td>0.67</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>SE</th>
<th>p</th>
<th>Exp(B)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1.42</td>
<td>.00</td>
<td>0.81</td>
<td>-121.1</td>
</tr>
<tr>
<td>Number of Children</td>
<td>0.08</td>
<td>.01</td>
<td>0.81</td>
<td>-121.1</td>
</tr>
<tr>
<td>Number of Adults</td>
<td>0.12</td>
<td>.73</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>Primary Language</td>
<td>0.37</td>
<td>.98</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Income</td>
<td>0.25</td>
<td>.57</td>
<td>1.15</td>
<td></td>
</tr>
<tr>
<td>Housing Adequacy</td>
<td>0.44</td>
<td>.09</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>Family Disability</td>
<td>0.30</td>
<td>.52</td>
<td>1.22</td>
<td></td>
</tr>
<tr>
<td>Parent Incarceration</td>
<td>0.41</td>
<td>.17</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Primary Caregiver</td>
<td>0.32</td>
<td>.56</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>Education Level</td>
<td>0.04</td>
<td>.23</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>SEm</td>
<td>0.01</td>
<td>.00</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>Language</td>
<td>0.02</td>
<td>.00</td>
<td>1.07</td>
<td></td>
</tr>
<tr>
<td>CR</td>
<td>0.08</td>
<td>.09</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.22</td>
<td>.09</td>
<td>1.46</td>
<td></td>
</tr>
<tr>
<td>YIP</td>
<td>0.23</td>
<td>.00</td>
<td>1.95</td>
<td></td>
</tr>
</tbody>
</table>

Note: SEm = Social Emotional, CR = Child Risk, FR = Family Risk, YIP = Years in Program, High-Low, n = 373, High-Average, n = 557, Low-Average, n = 560, Percent Change = (Exp(B)-1)*100, *p < .05.

unit decrease in the number of children in the family, controlling for other variables in the model (see Table 17).

Research Question 1c

1 (c) Will a measure of family risk factors obtained from a representative sample of four-year old Head Star children moderate the effects of child risk factors on academic achievement and accurately classify these children as high, average, and low academic achievers?

In order to assess whether family risk affects the relationship between child risk and academic achievement and to determine whether interactions between these measures would accurately classify children as high, average, and low academic achievers, two
predictors were used; the family risk composite was entered as the moderator variable while the child risk composite was the focal predictor (Jaccard, 2001).

**Summary of Findings from Interaction Analyses for the Total Sample**

The analyses did not produce any significant interactions between the family risk composite and the child risk composite for any of the three achievement groups (high-)

Table 18

*Logistic Regression for Interactions between the Family Risk Composite and the Child Risk Composite*

<table>
<thead>
<tr>
<th>Panel A</th>
<th>High-Low</th>
<th>( B )</th>
<th>SE</th>
<th>( p )</th>
<th>( \text{Exp}(B) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.76</td>
<td>0.32</td>
<td>.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Risk</td>
<td>-0.29</td>
<td>0.23</td>
<td>.20</td>
<td>0.75</td>
<td></td>
</tr>
<tr>
<td>Family Risk</td>
<td>-0.09</td>
<td>0.05</td>
<td>.05</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>CR * FR</td>
<td>-0.01</td>
<td>0.04</td>
<td>.88</td>
<td>0.99</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B</th>
<th>High-Average</th>
<th>( B )</th>
<th>SE</th>
<th>( p )</th>
<th>( \text{Exp}(B) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.22</td>
<td>0.30</td>
<td>.46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Risk</td>
<td>-0.02</td>
<td>0.19</td>
<td>.90</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>Family Risk</td>
<td>-0.06</td>
<td>0.05</td>
<td>.19</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>CR * FR</td>
<td>-0.03</td>
<td>0.03</td>
<td>.43</td>
<td>0.97</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel C</th>
<th>Low-Average</th>
<th>( B )</th>
<th>SE</th>
<th>( p )</th>
<th>( \text{Exp}(B) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-0.82</td>
<td>0.29</td>
<td>.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Risk</td>
<td>0.16</td>
<td>0.16</td>
<td>.30</td>
<td>1.18</td>
<td></td>
</tr>
<tr>
<td>Family Risk</td>
<td>0.01</td>
<td>0.04</td>
<td>.91</td>
<td>1.01</td>
<td></td>
</tr>
<tr>
<td>CR * FR</td>
<td>-0.01</td>
<td>0.02</td>
<td>.79</td>
<td>0.99</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* CR = Child Risk, FR = Family Risk, High-Low, \( n = 373 \), High-Average, \( n = 557 \), Low-Average, \( n = 560 \), * \( p < .05 \).
low, high-average, and low-average). Neither did the model produce any significant main effects for any of the predictors for the three achievement groups (see Table 18).

Because the analyses produced no statistically significant interactions between the child and family risk composites, and given the importance of the family in facilitating a child’s academic achievement and general welfare, it was decided to further evaluate whether specific family risk variables would moderate the effects of the child risk composite on achievement and classify children into high-low, high-average, and low-average achievement groups. The specific family risk variables that comprised the family risk composite were entered into each equation as moderator variables while the child risk composite was entered as the focal predictor variable. Each analysis included four continuous variables and six categorical variables as predictors. The four continuous variables were the number of children in the family, the number of adults in the family, the years of schooling of the primary caregiver, and the child risk factor. The six categorical variables were the primary language spoken in the home (English=1, other=0), income (Head Start mean=1, below Head Start mean=0), whether or not the family had adequate housing (adequate housing=1, inadequate housing=0), whether or not the primary caregiver had a disability (without disability=1, with disability=0), whether or not one or both parents had been incarcerated (not incarcerated=1, incarcerated=0), and whether or not the mother was the primary caregiver (mother=1, other=0). Although the foster care variable and the number of times the family sought service from the social welfare system during the year before the child entered the Head Start program are components of the family risk composite, these measures were excluded from the analyses because of zero cell count problem (Menard, 1995; 2002).
Summary of Findings from the Interaction Analyses for Specific Family Risk Variables for the Total Sample

The regression analyses produced a statistically significant regression coefficient only for the interaction between the child risk composite and the primary language spoken at home in classifying the low-average achievers ($B = -0.40, p < .05$). Thus, the estimate of the odds of being a low achiever compared to being an average achiever will be different for a child who comes from a home where the primary language is English as compared with a child who comes from a home where English is not the primary language (see Table 19).

Table 19

*Logistic Regression Results for Interactions between Individual Measures of Family Risk and the Child Risk Composite for the Total Sample*

<table>
<thead>
<tr>
<th></th>
<th>Panel A: High-Low</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>B</strong></td>
<td><strong>SE</strong></td>
<td><strong>p</strong></td>
<td><strong>Exp(B)</strong></td>
</tr>
<tr>
<td>CR *Number of Children</td>
<td>0.02</td>
<td>0.07</td>
<td>.81</td>
<td>1.02</td>
</tr>
<tr>
<td>CR *Number of Adults</td>
<td>-0.10</td>
<td>0.18</td>
<td>.58</td>
<td>0.90</td>
</tr>
<tr>
<td>CR *Education level</td>
<td>0.02</td>
<td>0.04</td>
<td>.59</td>
<td>1.02</td>
</tr>
<tr>
<td>CR *Primary Language</td>
<td>0.39</td>
<td>0.20</td>
<td>.06</td>
<td>1.47</td>
</tr>
<tr>
<td>CR *Income</td>
<td>0.22</td>
<td>0.16</td>
<td>.15</td>
<td>1.25</td>
</tr>
<tr>
<td>CR *Housing</td>
<td>-0.37</td>
<td>0.29</td>
<td>.20</td>
<td>0.69</td>
</tr>
<tr>
<td>CR *FR</td>
<td>0.05</td>
<td>0.03</td>
<td>.10</td>
<td>1.05</td>
</tr>
<tr>
<td>CR *Incarceration</td>
<td>0.01</td>
<td>0.29</td>
<td>.96</td>
<td>1.01</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Panel B: High-Average</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>B</strong></td>
<td><strong>SE</strong></td>
<td><strong>p</strong></td>
<td><strong>Exp(B)</strong></td>
</tr>
<tr>
<td>CR *Number of Children</td>
<td>0.02</td>
<td>0.04</td>
<td>.62</td>
<td>1.02</td>
</tr>
<tr>
<td>CR *Number of Adults</td>
<td>-0.13</td>
<td>0.13</td>
<td>.32</td>
<td>0.88</td>
</tr>
<tr>
<td>CR *Education level</td>
<td>0.03</td>
<td>0.03</td>
<td>.43</td>
<td>1.03</td>
</tr>
<tr>
<td>CR *Primary Language</td>
<td>-0.08</td>
<td>0.23</td>
<td>.73</td>
<td>0.93</td>
</tr>
<tr>
<td>CR *Income</td>
<td>0.07</td>
<td>0.15</td>
<td>.62</td>
<td>1.08</td>
</tr>
<tr>
<td>CR *Housing</td>
<td>-0.31</td>
<td>0.30</td>
<td>.30</td>
<td>0.73</td>
</tr>
<tr>
<td>CR *FR</td>
<td>0.03</td>
<td>0.03</td>
<td>.23</td>
<td>1.03</td>
</tr>
<tr>
<td>CR *Incarceration</td>
<td>0.19</td>
<td>0.25</td>
<td>.44</td>
<td>1.21</td>
</tr>
</tbody>
</table>

*table continued*
Table 19 (continued)

Logistic Regression Results for Interactions between Individual Measures of Family Risk and the Child Risk Composite for the Total Sample

<table>
<thead>
<tr>
<th>Panel C: Low-Average</th>
<th>B</th>
<th>SE</th>
<th>p</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR * Number of Children</td>
<td>0.01</td>
<td>0.05</td>
<td>.77</td>
<td>1.01</td>
</tr>
<tr>
<td>CR * Number of Adults</td>
<td>0.03</td>
<td>0.11</td>
<td>.78</td>
<td>1.03</td>
</tr>
<tr>
<td>CR*Education level</td>
<td>0.03</td>
<td>0.03</td>
<td>.41</td>
<td>1.03</td>
</tr>
<tr>
<td>CR*Primary Language</td>
<td>-0.40</td>
<td>0.20</td>
<td>.04</td>
<td>0.67</td>
</tr>
<tr>
<td>CR*Income</td>
<td>-0.06</td>
<td>0.12</td>
<td>.63</td>
<td>0.94</td>
</tr>
<tr>
<td>CR*Housing</td>
<td>0.05</td>
<td>0.19</td>
<td>.78</td>
<td>1.05</td>
</tr>
<tr>
<td>CR*FR</td>
<td>-0.02</td>
<td>0.02</td>
<td>.21</td>
<td>0.98</td>
</tr>
<tr>
<td>CR*Incarceration</td>
<td>0.16</td>
<td>0.30</td>
<td>.58</td>
<td>1.18</td>
</tr>
</tbody>
</table>

Note: Number of children in the family, number of adults in the family, educational level of primary caretaker, primary language, income, housing family risk and parental incarceration were included in the regression, High-Low, n = 373, High-Average, n = 557, Low-Average, n = 560, * p < .05.

Research Question 2

2. Will the pattern of results on measures of specific child characteristics, child risk factors, and family risk factors obtained from a representative sample of Head Start four-year-old children to distinguish among high, average, and low achievers be essentially the same in four-year-old children exposed to the Head Start program for one year (4-1s) compared with four-year-old children exposed to the Head Start program for two years (4-2s)?

Comparison of 4-1s and 4-2s on all academic measures. In the analyses presented in the preceding section using the total sample, the results generated to answer the first research question produced statistically significant regression coefficients for number of years in the program for the High-low achievement group at the beginning (B = 0.56, p < .05) and end of the year (B = 0.99, p < .05) and among the low-average achievement group at the end of the year (B = -0.59, p < .05; see Table 13). Additional analyses were conducted to further explore how children differed on various academic measures based on the number of years of Head Start program. The results that emerged
from these analyses indicated that 4-2s had higher scores in all of the achievement measures compared to 4-1s, both at the beginning and the end of the year. In accord with this finding, it was decided to report separate regression analyses by number of years in the program in addressing the research questions. This decision is in line with large scale studies that have conducted research on early childhood education programs. Researchers have commonly investigated separately the characteristics of children who have one year versus two years of programming (i.e. ACF, 1998; 2010).

Sample Composition by Number of Years in the Program. As stated in a previous section, the total sample for this study consists of 472, 4-year-old children who were in the program for one year (4-1s) and 273, 4-year-old children who were in the program for two years (4-2s). The 4-1s consist of the children who were admitted to the program when they were 4 years old. Although these children meet the SCAP Head Start criteria for admission into the program, they are considered less needy when compared to those who are in the Head Start for two years. The 4-2s children were, by definition, the most needy among the Head Start children and are admitted on a need based competitive basis (see selection criteria in the Appendix) since there are very few spots available for early entry to the program. These children were admitted to the program as three year-olds and were therefore in their second year of the program as four year-olds.

Academic achievement Measures among 4-1 and 4-2 children for the Total Sample of Head Start Children at Time 1 and 3. A comparison of the means for the scores between the children who were in the program for two versus one academic year show that the children who were in the program for two years had higher mean scores on all the academic achievement and social emotional measures compared to children who
Table 20

*Descriptive Statistics for the Academic Achievement Measures for 4-1s and 4-2s Head Start Children at Time 1 and 3*

### Panel A
**Total Sample**

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th></th>
<th></th>
<th>Time 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>745</td>
<td>48.0</td>
<td>28.3</td>
<td>102.1</td>
<td>38.9</td>
</tr>
<tr>
<td>Math</td>
<td>745</td>
<td>42.0</td>
<td>16.1</td>
<td>64.4</td>
<td>14.8</td>
</tr>
<tr>
<td>Science</td>
<td>745</td>
<td>7.06</td>
<td>2.8</td>
<td>9.4</td>
<td>1.38</td>
</tr>
<tr>
<td>Arts</td>
<td>745</td>
<td>13.9</td>
<td>2.7</td>
<td>15.8</td>
<td>0.8</td>
</tr>
<tr>
<td>SEm</td>
<td>745</td>
<td>89.8</td>
<td>25.5</td>
<td>118.1</td>
<td>18.6</td>
</tr>
<tr>
<td>Language</td>
<td>745</td>
<td>38.0</td>
<td>10.0</td>
<td>47.4</td>
<td>5.7</td>
</tr>
<tr>
<td>Achievement</td>
<td>745</td>
<td>150.0</td>
<td>21.20</td>
<td>166.64</td>
<td>51.0</td>
</tr>
</tbody>
</table>

### Panel A
**4-1s**

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th></th>
<th></th>
<th>Time 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>472</td>
<td>42.5</td>
<td>26.4</td>
<td>99.5</td>
<td>39.3</td>
</tr>
<tr>
<td>Math</td>
<td>472</td>
<td>39.5</td>
<td>15.8</td>
<td>62.9</td>
<td>14.7</td>
</tr>
<tr>
<td>Science</td>
<td>472</td>
<td>6.8</td>
<td>3.0</td>
<td>9.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Arts</td>
<td>472</td>
<td>13.8</td>
<td>2.8</td>
<td>15.8</td>
<td>0.8</td>
</tr>
<tr>
<td>SEm</td>
<td>472</td>
<td>87.7</td>
<td>25.6</td>
<td>117.9</td>
<td>18.9</td>
</tr>
<tr>
<td>Language</td>
<td>472</td>
<td>37.2</td>
<td>10.5</td>
<td>47.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Achievement</td>
<td>472</td>
<td>146.16</td>
<td>20.38</td>
<td>162.4</td>
<td>51.3</td>
</tr>
</tbody>
</table>

### Panel C
**4-2s**

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th></th>
<th></th>
<th>Time 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Reading</td>
<td>273</td>
<td>57.4</td>
<td>28.9</td>
<td>106.8</td>
<td>37.9</td>
</tr>
<tr>
<td>Math</td>
<td>273</td>
<td>46.2</td>
<td>15.7</td>
<td>67.1</td>
<td>14.7</td>
</tr>
<tr>
<td>Science</td>
<td>273</td>
<td>7.5</td>
<td>2.5</td>
<td>9.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Arts</td>
<td>273</td>
<td>14.2</td>
<td>2.5</td>
<td>15.8</td>
<td>0.8</td>
</tr>
<tr>
<td>SEm</td>
<td>273</td>
<td>93.3</td>
<td>25.0</td>
<td>118.5</td>
<td>18.1</td>
</tr>
<tr>
<td>Language</td>
<td>273</td>
<td>39.5</td>
<td>9.0</td>
<td>47.8</td>
<td>5.4</td>
</tr>
<tr>
<td>Achievement</td>
<td>273</td>
<td>156.5</td>
<td>21.0</td>
<td>173.9</td>
<td>49.9</td>
</tr>
</tbody>
</table>

*Note: SEm = Social Emotional Measure.*
were in the program for only one year (see Table 20).

**Child Characteristics and Child Risk Factors.** To assess whether specific child characteristics and the child risk composite would produce the same pattern of results in distinguishing among high, average, and low achieving four-year-old children exposed to the Head Start program for one year compared with four-year-old children exposed to the Head Start program for two years, several binary logistic regression analyses were performed. The dependent variables were dichotomous variables representing achievement groups classified by the logistic regression analyses (high-low, high-average, and low-average).

There were five predictors in the model, both at the beginning of the year (Time 1) and at the end of the Head Start year (Time 3); the four continuous predictor variables were the social emotional measure, the language measure, the family risk composite, and the child risk composite, while the categorical predictor was gender (female =1, male = 0). The family risk composite was used as a control variable in these analyses.

**Summary of Results from Logistic Regression Analyses for Specific Child Characteristics and the Child Risk Composite for Classification Analyses among 4-1s and 4-2s at Time 1 and Time 3 (see Table 20).**

The results generated by this model at Time 1 produced statistically significant regression coefficients for the social emotional measure for both 4-1s and 4-2s among the high-low achievers. At Time 3, the results generated by the model produced statistically significant regression coefficients for the social emotional measure for both 4-1s and 4-2s among all the three achievement groups. In addition, the regression coefficient for the language measure was significant for both 4-1s and 4-2s among the high-low achievement groups.
The results generated by the model for the 4-1s produced statistically significant regression coefficients for the language measure in the low-average classification at both Time 1 and Time 3. Gender was also significant in the low average classification at Time 1.

Table 21

*Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 1 and Time 3*

<table>
<thead>
<tr>
<th>Panel A</th>
<th>High-Low</th>
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<tbody>
<tr>
<td><strong>4-1s Time 1</strong></td>
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Table continues
Table 21 (continued)

Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 1 and Time 3

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<td>Variable</td>
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<td>Variable</td>
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</tr>
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</tr>
<tr>
<td>Language</td>
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<tr>
<td>CR</td>
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</tr>
<tr>
<td>FR</td>
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</tr>
<tr>
<td>Gender</td>
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Table continues
Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 1 and Time 3

Panel F

<table>
<thead>
<tr>
<th>Variable</th>
<th>4-1s Time 3</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>B 8.00, SE 1.34, p .00, Exp(B) 6.27, % 4.9</td>
<td>B 6.27, SE 2.29, p .01, Exp(B) 0.95, % -4.9</td>
</tr>
<tr>
<td>SEm</td>
<td>B -0.04, SE 0.01, p .00, Exp(B) 0.96, % -4</td>
<td>B -0.05, SE 0.01, p .00, Exp(B) 0.95, % -4.9</td>
</tr>
<tr>
<td>Language</td>
<td>B -0.08, SE 0.02, p .00, Exp(B) 0.92, % -8</td>
<td>B -0.04, SE 0.04, p .24, Exp(B) 0.96, %</td>
</tr>
<tr>
<td>CR</td>
<td>B 0.09, SE 0.11, p .42, Exp(B) 1.09</td>
<td>B 0.16, SE 0.12, p .19, Exp(B) 1.18</td>
</tr>
<tr>
<td>FR</td>
<td>B -0.03, SE 0.05, p .53, Exp(B) 0.97</td>
<td>B 0.06, SE 0.08, p .48, Exp(B) 1.06</td>
</tr>
<tr>
<td>Gender</td>
<td>B -0.36, SE 0.24, p .12, Exp(B) 0.69</td>
<td>B -0.27, SE 0.34, p .42, Exp(B) 0.76</td>
</tr>
</tbody>
</table>

Note: SEm = Social Emotional, CR = Child Risk, 4-1s; High-Low, n = 136, High-Average, n = 336, Low-Average, n = 367; 4-2s; High-Low, n = 132, High-Average, n =221, Low-Average, n = 273, (Exp B-1)*100, *p < .05.

Among the 4-2s, the child risk composite was significant for analyses involving the high-low achievement group at both Time 1 and Time 3, and also in the analysis involving the high-average groups at Time 3. In addition, the language measure was significant in the analysis involving the high-average group at Time 3, while the social emotional measure was significant for the low-average group contrast at Time 1.

Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses among High-Low Achievement 4-1s and 4-2s at Time 1 (see Table 21, Panel A)

The results generated by this model produced statistically significant regression coefficients for the social emotional measure (B = 0.03, p < .05) for the high-low achievement classification at the beginning of year for the 4-1s. The odds of a child being a high achiever compared to being a low achiever increases by 3.3% for each unit
increase in the social emotional measure for a child who has one year of the Head Start program, controlling for other variables in the model. The results generated by the model for the 4-2s produced a statistically significant regression coefficient for the social emotional measure \((B = 0.06, p < .05)\) in distinguishing between the high-low achievement groups. The odds of being a high achiever compared to being a low achiever increases by 6.2% for each unit increase in the social emotional measure for a child in the second year of Head Start program, controlling for other variables in the model.

The analysis also produced statistically a significant regression coefficient for the child risk composite \((B = 0.52, p < .05)\) at Time 1 for the 4-2s in distinguishing between the high-low achievement groups. The odds of a child being a high achiever compared to being a low achiever increases by 41% for each unit decrease in the child risk measure for a child in the 4-2s group, controlling for other variables in the model.

**Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses among High-Low Achievement 4-1s and 4-2s at Time 3 (see Table 21, Panel B)**

At the end of the Head Start year, coefficients for the social emotional measure for the high-low achievement classification for 4-1s was \((B = 0.09, p < .05)\) and for 4-2s was \((B = 0.12, p < .05)\). Thus, the odds of a child being a high achiever compared to being a low achiever increases by 10% for each unit increase in the social emotional measure for a child in the 4-1s group, controlling for other variables in the model. However, the odds of a child being a high achiever compared to being a low achiever increases by 13% for each unit increase in the social emotional measure for a child in the 4-2s group, controlling for other variables in the model.

The analyses also produced significant regression coefficients for the language
measure for the high-low achievement contrast for 4-1s ($B = 0.08, p < .05$) and for 4-2s ($B = 0.15, p < .05$) at Time 3. Thus, the odds of a child being a high achiever compared to being a low achiever increases by 10% for each unit increase in the language measure for a child in the 4-1s group, controlling for other variables in the model. However, the odds of a child being a high achiever compared to being a low achiever increases by 16% for each unit increase in the language measure for a child in the 4-2s group, controlling for other variables in the model. The analyses involving the high-low achievers also produced statistically significant regression coefficients for the child risk composite among the 4-2s, but not among the 4-1s groups. Thus, the odds of a child being a high achiever compared to being a low achiever increases by 45% for each unit decrease in the child risk measure for a child in the 4-2s group, controlling for other variables in the model.

**Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses among High-Average Achievement 4-1s and 4-2s at Time 1 (see Table 21, Panel C)**

The results generated by the model at Time 1 did not produced statistically significant regression coefficients for any of the measures for either the 4-1s or the 4-2s.

**Logistic Regression Results for Specific Child Characteristics and the Child Risk Composite for Classification Analyses among High-Average Achievement 4-1s and 4-2s at Time 3 (see Table 21, Panel D)**

The results generated from the analyses at Time 3 produced statistically significant coefficients for the social emotional measure for the high-average achievement classification in the 4-1s ($B = 0.06, p < .05$) and the 4-2s ($B = 0.05, p < .05$). The odds of a child being a high achiever compared to being an average achiever increases by 6% for each unit increase in the social emotional measure for a child in the
4-1s group, controlling for other variables in the model. However, the odds of being a high achiever compared to being an average achiever increases by 5.4% for each unit decrease in the social emotional measure for a child in the 4-2s group, controlling for other variables in the model.

The analyses for the high-average classification at Time 3 also produced statistically significant coefficients for the language measure \((B = -0.06, p < .05)\) and for the child risk composite \((B = -0.30, p < .05)\) among the 4-2s but not among the 4-1s groups. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 6.2% for each unit increase in the language measure for a child in the 4-2s group, controlling for other variables in the model, while the odds of a child being a high achiever compared to being an average achiever increases by 25% for each unit decrease in the child risk measure for a child in the 4-2s group, controlling for other variables in the model.

**Logistic Regression Results for Specific Child Characteristics and the Child Risk Factors for Classification Analyses among Low-Average Achievement 4-1s and 4-2s at Time 1 (see Table 21, Panel E)**

As can be seen from Table 21, results generated at Time 1 by the model for the 4-1s produced statistically significant regression coefficients for the language measure \((B = -0.04, p < .05)\) for the low-average achievers, but not for the 4-2s low-average achievers. Thus, the odds of a child being a low achiever compared to being an average achiever increases by 4% for each unit decrease in the language measure for a child in the 4-1s group, controlling for other variables in the model. A statistically significant regression coefficient emerged for gender \((B = -0.53, p < .05)\) for the 4-1s low-average classification at Time 1, but this was not the case not for the 4-2s. The odds of a child being a low
achiever as compared to being an average achiever decreases by a factor of 0.59 for a male child rather than female child for a child in the 4-1s group.

The results generated by this model at Time 1 for the 4-2s produced statistically significant regression coefficients for the social emotional measure ($B = -0.03, p < .05$). Thus, the odds of child being a low achiever compared to being an average achiever increases by 2.5% for each unit decrease in the social emotional measure for a child in the 4-2s group, controlling for other variables in the model.

Logistic Regression Results for Specific Child Characteristics and the Child Risk Factors for Classification Analyses among Low-Average Achievement 4-1s and 4-2s at Time 3 (See Table 21, Panel F)

This model produced a statistically significant regression coefficient for the social emotional measure in the low-average achiever classification at Time 3 with the 4-1s group ($B = -0.04, p < .05$) as well as with the 4-2s group ($B = -0.05, p < .05$). The odds of child being a low achiever compared to being an average achiever increases by 4% for each unit decrease in the social emotional measure for a child from the 4-1s group, controlling for other variables in the model, while the odds of a child being a low achiever compared to being an average achiever increases by 5% for each unit decrease in the social emotional measure for a child from the 4-2s group, controlling for other variables in the model.

The coefficient for the language measure was statistically significant ($B = -0.08, p < .05$) for the 4-1s, low-average classification but not for the 4-2s low-average classification. The odds of a child being a low achiever compared to being an average achiever increases by 7.7% for each unit decrease in the language measure for a child from the 4-1s group, controlling for other variables in the model.
Specific Family Risk Factors. A binary logistic regression analysis in the GEE module in SPSS was used to predict group membership based on specific family risk factors both for Time 1 and Time 3. The dependent variables were binary measures comparing the three achievement groups, as in the previous analysis (high-low, high-average, and low-average). The three continuous predictor variables were number of children in the family, number of adults in the family, and years of schooling for the primary caregiver. The categorical predictor variables were the primary language spoken in the home (English=1, other=0), income (Head Start mean=1, below Head Start mean=0), whether or not the family had adequate housing (adequate housing=1, inadequate =0), whether or not the primary caregiver had a disability (without disability=1, with disability=0), whether or not one or both parents had been incarcerated (not incarcerated=1, incarcerated=0), and whether or not the mother was the primary caregiver (mother=1, other=0). Two sets of analyses were performed, one for the children who were in the program for one year and a second for the children who were in the program for two years. The control variables were the social emotional measure, the language measure, the child risk composite and gender (female =1, male=0; see Table 22).

Summary of Results from Logistic Regression Analyses for Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 1

The results generated by this model produced two statistically significant regression coefficients in the high versus low achiever classifications analyses, but only for the 4-2s: primary language \( (B = 1.60, p < .05) \) and income \( (B = -1.25, p < .05) \). In the analyses classifying the high and average achievers, the regression coefficient was
Table 22

Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s versus 4-2s at Time 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>4-1s Time 1</th>
<th></th>
<th></th>
<th>4-2s Time 1</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>1.66</td>
<td>.00</td>
<td>6.05</td>
<td>3.42</td>
<td>.08</td>
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<tr>
<td>NOC</td>
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<td>0</td>
<td>0.17</td>
<td>.98</td>
</tr>
<tr>
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<td>0.23</td>
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</tr>
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<td>.89</td>
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<td>.03</td>
</tr>
<tr>
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<td>.04</td>
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<tr>
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<td>.97</td>
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High-Average

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<td>.92</td>
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<td>.47</td>
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<td>.88</td>
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<td>0.46</td>
<td>.97</td>
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<tr>
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<td>.35</td>
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<td>.09</td>
<td>-0.01</td>
<td>0.01</td>
<td>.14</td>
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<tr>
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<td>.39</td>
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<td>0.14</td>
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Table 22 (continued)

Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s versus 4-2s at Time 1

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<tr>
<th>Variable</th>
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<th></th>
<th></th>
<th>4-2s Time 1</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>p</td>
<td>Exp(B)</td>
<td>B</td>
<td>SE</td>
<td>p</td>
<td>Exp(B)</td>
</tr>
<tr>
<td>Intercept</td>
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<td>.59</td>
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<td>1.96</td>
<td>.69</td>
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<tr>
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<td>.00</td>
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<td>1.45</td>
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<td>.01</td>
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<tr>
<td>Language</td>
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<td>.26</td>
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<td>.53</td>
<td>1.25</td>
</tr>
</tbody>
</table>

Note: NOC = Number of children, NOA = Number of Adults, PL = Primary Language, FD = Family Disability, SEM = Social Emotional Measure, CR = Child Risk, 4-1s: High-Low, n = 136, High-Average, n = 336, Low-Average, n = 367, 4-2s: High-Low, n = 132, High-Average, n = 221, Low-Average, n = 273, p < .05.

statistically significant for number of adults in the family 4-1s (B = -0.55, p < .05) and for income (B = -0.89, p < .05) among the 4-2s. In the analyses classifying the low and average achievers, regression coefficients were statistically significant among the 4-1s for the number of children in the family (B = -0.26, p < .05) and for family disability (B = 0.84, p < .054) among the 4-2s.

Logistic Regression Results for Specific Family Risk Factors for Classification Analyses for the High-Low Achievement Groups among 4-1s and 4-2s at Time 1 (see Table 22 Panel A)

The results generated by the high-low achievement analysis produced statistically
significant regression coefficients for primary language ($B = 1.60, p < .05$) and income ($B = -1.25, p < .05$) only among the 4-2s. Thus, the odds of a child being a high achiever compared to being a low achiever increases by a factor of 4.93 for a child from a family whose members speak more than one language as compared to a child from a family whose members speak only English, controlling for other variables in the model.

However, the odds of a child being a high achiever compared to being a low achiever decreases by a factor of 0.29 for a child from a family having an income that is less than the Head Start average as compared to a child from a family having an income that is more than the Head Start average, controlling for other variables in the model.

**Logistic Regression Results for Specific Family Risk Factors for Classification Analyses for the High-Average Achievement Groups among 4-1s versus 4-2s at Time 1 (see Table 22 Panel B)**

The high-average achievement analyses produced a statistically significant regression coefficient for the number of adults in the family among the 4-1s ($B = -0.55, p < .05$) and for income ($B = -0.89, p < .05$) among the 4-2s. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 156% for each unit increase in the number of adults in the family for the 4-1s children, controlling for other variables in the model. However, the odds of a child being a high achiever as compared to being an average achiever decreases by a factor of 0.41 for a child from a family with an income that is below the Head Start average, relative to a child from a family with an income that is above the Head Start average, controlling for other variables in the model.

**Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses for the Low-Average Achievement Groups among 4-1s and 4-2s at Time 1 (see Table 22 Panel C)**

Results generated by the low-average achievement analyses produced statistically
significant regression coefficients for the number of children in the family among the 4-1s \((B = -0.26, p < .05)\) and for family disability \((B = 0.84, p < .054)\) among the 4-2s. Thus, the odds of a child being a low achiever compared to being an average achiever in the 4-1s group increases by 127\% for each unit decrease in the number of children in the family, controlling for other variables in the model. In the 4-2s group, the odds of a child being a low achiever rather than an average achiever increases by a factor of 2.32 for a child who comes from a family with a family disability as compared to a child who comes from a family without a family disability, controlling for other variables in the model.

**Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 3**

As in the previous analyses, binary logistic regression analysis in the GEE module in SPSS was used to predict group membership based on specific family risk factors. The dependent variable was a binary measure comparing the same three achievement groups, as in the previous analysis (high-low, high-average, and low-average).

The three continuous predictor variables were number of children in the family, number of adults in the family, and years of schooling for the primary caregiver. The categorical predictor variables were the primary language spoken in the home (English=1, other=0), income (Head Start mean=1, below Head Start mean=0), whether or not the family had adequate housing (adequate housing=1, inadequate =0), whether or not the primary caregiver had a disability (without disability=1, with disability=0), whether or not one or both parents had been incarcerated (not incarcerated=1, incarcerated=0), and whether or not the mother was the primary caregiver (mother=1, other=0). Two sets of analyses were performed, one for the children who were in the
program for one year and a second for the children who were in the program for two years. The control variables were the social emotional measure, the language measure, the child risk factor, and gender (female =1, male=0). See Table 23.

Summary of Results from Logistic Regression Analyses for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 3

The results generated by this model produced a statistically significant regression coefficient in the high versus low achiever classification analyses only in the 4-2s group for the parent incarceration measure ($B = 3.08, p < .05$). In the analyses classifying the high and average achievers, the regression coefficient was statistically significant for number of adults in the family for the 4-1s ($B =- 0.53, p < .05$) and income ($B = -0.88, p < .05$) for the 4-2s. In analyses classifying the low and average achievers, regression coefficients were statistically significant only in the 4-1s group for the number of children in the family.

Logistic Regression Results for Measures of Specific Family Factors for Classification Analyses in the High-Low Achievement Groups among 4-1s and 4-2s at Time 3 (see Table 23 Panel A)

The results generated by the high-low achievement analysis at Time 3 produced a statistically significant regression coefficient for parent incarceration ($B = 3.08, p < .05$) only among the 4-2s. The odds of a child being a high achiever compared to being a low achiever increases by a factor of 21.84 for a child from a family whose parent(s) have been incarcerated as compared with a child from a family whose parents have not been incarcerated, controlling for other variables in the model.
Table 23

Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 3

<table>
<thead>
<tr>
<th>Variable</th>
<th>4-1s Time 3</th>
<th>4-2s Time 3</th>
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</thead>
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<tr>
<td></td>
<td>B</td>
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<tr>
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<td>Housing</td>
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<td>Incarceration</td>
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<td>0.05</td>
</tr>
<tr>
<td>SEm</td>
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</tr>
<tr>
<td>Language</td>
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<td>0.02</td>
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<tr>
<td>CR</td>
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</tr>
<tr>
<td>Gender</td>
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<table>
<thead>
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<th>4-2s Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Intercept</td>
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<td>1.75</td>
</tr>
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<td>NOC</td>
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<tr>
<td>NOA</td>
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<td>0.18</td>
</tr>
<tr>
<td>PL</td>
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<td>0.37</td>
</tr>
<tr>
<td>Income</td>
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<td>0.29</td>
</tr>
<tr>
<td>Housing</td>
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<td>0.57</td>
</tr>
<tr>
<td>FD</td>
<td>-0.58</td>
<td>0.36</td>
</tr>
<tr>
<td>Incarceration</td>
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<td>0.45</td>
</tr>
<tr>
<td>Caregiver</td>
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<td>0.53</td>
</tr>
<tr>
<td>Education</td>
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<td>0.05</td>
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<td>SEm</td>
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<td>0.01</td>
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<tr>
<td>Language</td>
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<td>0.02</td>
</tr>
<tr>
<td>CR</td>
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<td>0.11</td>
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<tr>
<td>Gender</td>
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Logistic Regression Results for Measures of Specific Family Risk Factors for Classification Analyses in the Achievement Groups among 4-1s and 4-2s at Time 3

Panel C

<table>
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<th>Variable</th>
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<td>NOA</td>
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<td>Income</td>
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<td>Housing</td>
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<td>Language</td>
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<tr>
<td>Gender</td>
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Note: NOC = Number of children, NOA = Number of Adults, PL = Primary Language, FD = Family Disability, SEm = Social Emotional, CR = Child Risk 4-1s:High-Low, n = 136, High-Average, n = 336, Low-Average, n = 367, 4-2s:High-Low, n =132, High-Average, n = 221, Low-Average, n = 273, p < .05.

Logistic Regression Results for Measures of Specific Family Factors for Classification Analyses in the High-Average Achievement Groups among 4-1s and 4-2s at Time 3 (see Table 23 Panel B)

The high-average achievement analyses produced a statistically significant regression coefficients for number of adults in the family for the 4-1s ($B = -0.53$, $p < .05$) and income ($B = -0.88$, $p < .05$) for the 4-2s. Thus, the odds of a child being a high achiever compared to being an average achiever increases by 153% for each unit decrease in the number of adults in the family for children in the 4-1s group, controlling for other variables in the model. The odds of a child being a high achiever as compared to
being an average achiever decreases by a factor of 0.41 for a child from a family with an income that is below the Head Start average as compared with a child from a family with an income that is above the Head Start average, controlling for other variables in the model among the 4-2s.

Logistic Regression Results for Measures of Specific Family Factors for Classification Analyses in the Low-Average Achievement Groups among 4-1s versus 4-2s at Time 3 (see Table 23 Panel C)

Results generated by the low-average achievement analyses produced statistically significant regression coefficients for the number of children in the family for only the 4-1s ($B = -0.33, p < .05$). The odds of a child being a low achiever compared to being an average achiever in the 4-1s group increases by 133% for each unit decrease in the number of children in the family, controlling for other variables in the model.

Interaction Analyses. In order to assess interactions for 4-1s and 4-2s between and among measures of specific family risk factors, specific child characteristics, and child risk factors and to determine if the interactions would accurately classify children as high, average, and low academic achievers, five predictors were used: the family risk composite, the social emotional measure, the language measure, the child risk composite, and gender (female=1, male=0). It was hypothesized that the family risk measure would affect the relationship between specific child characteristics, child risk factors and achievement and was therefore analyzed as a moderator variable.

Summary of Findings for Logistic Regression Results for Interactions between and among Measures of Specific Family Risk Factors, Specific Child Characteristics, and Child Risk Factors for Classification among 4-1s and 4-2s for Time 1 and 3

Binary logistic regression analyses were performed to determine a main-effects model before using a forward-selection method to add interaction terms to the model.
Preliminary analyses using the family risk composite as a moderator were carried out and the analyses did not produce main effects for this measure in any of the three achievement group classification analyses. Follow-up analyses assessing the effects of individual family risk variables on the outcome measure for the three achievement groups for both 4-1s and 4-2s were conducted; these analyses did not produced statistically significant main effects for any of the family risk variables for Time 1. Similarly, the analysis at Time 3 for the 4-1s among the high-low achievement groups did not produced statistically significant main effects for any of the family risk variables. However, the model produced statistically significant regression coefficients in the high versus low achievement classifications analyses for the 4-2s for number of children in the family ($B = 0.26, p < .05$), income ($B = 1.43, p < .05$), and family disability ($B = 1.52, p < .05$).

In the analyses classifying the high and average achievers, the coefficient was statistically significant for number of children in the family for the 4-1s ($B = .05, p < .05$) and for income ($B = 1.05, p < .05$) for the 4-2s.

In analyses classifying the low and average achievers, regression coefficients were statistically significant in both the 4-1s and 4-2s groups for the number of adults in the family. The coefficient for number of children in the family was statistically significant for the 4-1s only. Finally, the coefficient for family disability was statistically significant for children in the 4-2s group.

Subsequent interaction analyses were performed using only the individual family risk variables that produced main effects in given classifications to assess possible interactions as stated above. In the follow up analyses, the dependent variables were the same achievement groups as in the preliminary analyses. A binary logistic regression
interaction analysis was performed by systematically adding one product term at a time for all the two way interactions (Jaccard & Turrisi, 2003). The results from the analyses did not produce statistically significant two-way interactions for any of the analyses conducted.

Research Question 3

3. Will high and low achieving four-year-old children exposed to the Head Start program for two years differ on measures assessing the quality of the home environment in facilitating the development of pre-academic readiness skills?

Quality of the Home Environment

To determine whether high and low achieving children differ on measures of the home environment, a structured interview was conducted both with the teachers and the family workers. Most teachers visit the homes of the children and sometimes meet with their parents/caretakers on a daily basis during school days if the child is not transported to the program by bus provided by Head Start. Parents are encouraged to visit the classroom and even in the case of “transported” children, there is a fair amount of parent contact. The family workers usually have scheduled home visits throughout the year and are familiar with the households and the structure of the home environment. In order to determine whether or not the home environments of the high achieving (top 25%) and low achieving (bottom 25%) children differed on the measures used to assess the quality of these (respective) environments, independent sample t-tests were conducted to assess whether the means of these two groups were statistically different from each other on each of the following measures: (a) the child’s home literacy environment, (b) the amount of time the caretaker spends with the child (c) the family support system, and (d) family stability.
Utts and Heckard (2004) outline necessary conditions that need to be fulfilled for a t-test to be performed, including the following: first the samples must be independent of each other. In this analysis, the two samples are independent because cases of children that were subjects of the interview and measurements of the home environment are mutually exclusive. Secondly the analysis should have a minimum sample size of 30 cases. The qualitative sample has a total of 32 children; there are 17 cases in the low achievement group and 15 cases in the high achievement group. The third condition requires that the variance of the two groups be the same as the dependent variable, and finally, the two populations should generate a normal distribution. It is worth noting that the current sample is part of the total sample used for this research and meets all the conditions for the current analyses. Results from these analyses are presented in Table 24.

Table 24

<table>
<thead>
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<th>Home Factors</th>
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<th>p</th>
<th>SE</th>
</tr>
</thead>
<tbody>
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</tr>
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<td>-15.74</td>
<td>.00**</td>
<td>0.56</td>
</tr>
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<td>Family Support</td>
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<td>-4.35</td>
<td>.00**</td>
<td>0.53</td>
</tr>
<tr>
<td>Family Stability</td>
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<td>-2.24</td>
<td>.03*</td>
<td>0.42</td>
</tr>
<tr>
<td>Total Score</td>
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<td>-12.66</td>
<td>.00**</td>
<td>1.67</td>
</tr>
</tbody>
</table>

Note: $n = 32$, *$p < .05$, **$p < .001$.

Summary of Findings for Mean Differences for the Home Environment Characteristics

The results from the t-tests indicate that there are statistically significant differences between the high and low achieving groups on all the measures of the home environment that were examined. Results from the literacy environment measure indicate that the high and low achievement groups differed on the measure assessing the child’s home literacy environment ($M = 12.88, SD = 2.03$ for high achievers; $M = 3.86, SD =$
2.66 for low achievers; \( t (29) = 10.45, p < .001 \). An independent-samples t-test was also performed to compare mean scores for the amount of time the caretaker spends with the child for the high and low achieving children. There was a statistically significant difference between the means of the two groups on time spent with the child (\( M = 10.59, SD = 1.06 \) for high achievers; \( M = 1.21, SD = 2.01 \) for low achievers \( t (29) = 15.74, p < .001 \)). Additionally, an independent-samples t-test was also performed to compare group means on the interview measure assessing the family support system. There was a significant difference favoring the high achievers on the measure assessing community resources (\( M = 4.06, SD = 1.44 \) for high achievers; \( M = 1.71, SD = 1.54 \) for low achievers; \( t (29) = 4.349, p < .001 \)). These results suggest that the family support system significantly affects the child’s academic achievement.

An independent-samples t-test was also performed to compare the mean scores of the high and low achieving children on the measure assessing the stability of the family. There was a statistically significant difference between the means of these two groups on this measure (\( M = 2.41, SD = .939 \) for the high achievers; \( M = 1.43, SD = 1.40; t (27) = 2.24, p < .001 \)).

Lastly, an independent-samples t-test was performed to compare the overall mean scores for the home environments of the high and low achieving children. There was a statistically significant difference between the means of the two groups on this measure (\( M = 4.19, SD = 1.87 \) for the high achievers; \( M = 6.31, SD = 2.60 \) for the low achievers; \( t (29) = 12.66, p < .001 \)). These results suggest that home environment risk factors significantly affect the child’s academic achievement.

**Supplementary Qualitative Information**
The interest in exploring the home environment arose from results produced by preliminary analyses which showed that high achieving children entered the program with statistically significant higher academic scores when compared with their low achieving peers. Accordingly, it was hypothesized that if the home environments of these two groups were similar, then there should be no differences in academic achievement measures at the beginning of the program. The description below is based on results from a structured interview with the family workers and teachers at the SCAP Head Start program. The same structured interview was conducted both with the teachers and the family workers. Most teachers visit the homes of the children and sometimes meet with their parents/caretakers on a daily basis during school days if the child is not transported to the program by bus provided by Head Start. Parents are encouraged to visit the classroom and even in the case of “transported” children, there is a fair amount of parent contact. The family workers usually have scheduled home visits throughout the year and are familiar with the households and the structure of the home environment.

**Child’s Home Literacy Environment.** The family workers reported that there were differences in the home literacy environment of the children. Whereas some homes had literacy material such as books, magazines, and newspapers, others had very few or no such materials available to the children in their homes. The Head Start program has available resources that the families they serve can use to enhance both the children and caretakers’ literacy development. The families can also obtain reading materials from the local library as well as from the program. Yet, many caretakers do not take advantage of such resources. In addition, the family workers reported that there were differences in the parents’ involvement in terms of reading of books. For example, whereas some
caregivers regularly read to their children, others rarely read to their children. Also, caregivers who were attending an educational program such as a community college or a vocational program were viewed as more likely to encourage literacy development in their children. A teacher describes the difference among the children as follows:

Some children almost always do not read the books we send them home with; the letters and other memos we send home with the children come back unsigned, and some parents never show up for any of the events.

Some parents had expressed the importance of education for themselves and their children while others did not. A teacher describes a parent as follows:

Mom just got her GED and wants more for her son; her older sister is a straight A student. Mom has frequently come to the program and volunteered for the program; she wants to learn as much as she can for her child, Mom is very vocal for the son’s services.

A teacher describes a parent who is not interested in education as follows:

Mom says she has other things to do and sends the child to the program for babysitting; attendance is a problem; mom and dad are divorced; dad came into school one day to see his child to find the child was not in the program.

Another family is described as follows:

Toward the end of the semester, attendance was once a week for two months. Mom is pregnant and she is not involved at all. The grandma is very involved; the child has three older siblings.

**Amount of Time the Parent Spends with the Child.** In order to provide some insight into the nature of family activities and the amount of time the parents spend with their children, the interview included questions about such important activities as whether the caregivers taught the child about letters and numbers, whether they play games with the child (board games, video games, outdoor games, or educational games), and so forth.

The interview also included questions regarding whether or not someone in the family talks to the child about their school day or plans family activities; whether
caregivers attend school conferences; whether the child receives help with homework from either the caregivers or older siblings in the family, and how many hours the parents/caregivers worked outside of home.

Some of the responses indicate very little involvement on the part of the parent/caregiver in these activities and others report active participation and involvement in the children’s daily lives, as exemplified in the following quotes:

Mom is always in the classroom volunteering, she is dedicated and supportive of the child. This is a two parent household with both parents working. The child has three older siblings, mom knows a little bit of English but dad does not, he only speaks Spanish. The parents do not help him with homework; he is trying to do adult things to catch up with the older siblings. All three older siblings are in high school.

**Family Support System.** The purpose of this section of the structured interview was to find out if community resources were available to the family. The resources included extended family members on whom the family can rely and lean, with whom they are in regular contact, and whether the extended family can provide child care and other services to the target family. It was also important to know whether some members of the extended family resided in the same household as the target family; there were situations where the mother lived in the same house with her parents and siblings. The family support system also included community support services such as religious groups or cultural connections. In addition, questions were asked to determine whether the family uses community resources such as the library, summer programs, health and nutrition programs, and so forth. This part of the survey required a yes/no response, a number of families indicated that they had a strong family support system with a majority citing the grandmother of the child as the primary source of support.

**Family Stability.** The questions included in this component of the interview were
designed to obtain information about the number of times during the past year the family
moved, changed jobs, and experienced a crisis (health, financial or legal). The following
quotes exemplify scenarios that were provided by the family workers during interviews
with three different families; a family worker describes:

The child has poor attendance, does not know why-the family has moved twice in
the past year. She has a legal battle. A lot of behavioral and educational
difficulties; mom says the boy will be in jail in 10 years; both parents are in
rehabilitation for addiction, the child was in foster care.

Family workers describe four different families as follows;

The child has major attendance issues and the family has been evicted twice; the
family has a new-born baby; the child attending the program is sometimes absent
from the program for weeks. Mom is illiterate and does not work. Dad was put in
jail because of domestic abuse, mom is more interested in looking cute and
education is not important to her. Dad in jail for domestic violence issues; mom
makes no effort to assist the child currently attending the program. Mom is on
medication for bipolar; the family lives in a chaotic home environment and the
older sister has been identified as autistic. Parents have a Child protective services
case pending, the family usually goes to the city mission for free dinners – mom
has mental health issues.

Mom seems overwhelmed; it is survival for the fittest in the home. It is a
dysfunctional home with about seven children; the older kids have problems with
the law. Mom is depressed and overwhelmed and has mental health issues; drug
use is suspected in the family, mom does not return phone calls.
Mom is from Puerto Rico and she has refused to learn English. They speak
Spanish only at home; mom very protective sits in class for hours.
This family is stable, the family owns a home and dad has been working at the
same job for years.

Open Ended Question

In addition to specific questions about the home environment, the survey had an
open-ended question that inquired about family workers’ and teachers’ views of the home
environment factors that may contribute to the child’s academic performance. Below is a
summary of their responses to this question:

‘What Home Environment and Child Characteristics in Your Opinion
Contribute to a Child’s Performance?’

In general, two parent families or families with extended family members either living in the same household or available as a support system to the family were regarded by the family workers and teachers as more stable, and this was thought to be a likely factor affecting the child’s academic achievement. In addition, the mother’s mental health status was another factor that was identified as influencing the child’s achievement. Teachers indicated that caretakers with mental health issues had to be reminded about school events and homework help for their children with such reminders requiring numerous communications. The teachers also indicated that parents with mental health issues rarely volunteered to participate in classroom activities and often missed parent conferences. In addition, they reported that a number of caretakers were taking anti-depressant medication, or had been using illegal drugs that impaired their ability to effectively support their children’s academic achievement.

Both physical and sexual abuse was reported to have occurred in some families. The physical abuse was often directed at the mother and witnessed by the child. Sexual abuse of some children was also reported and was being investigated by the Child Protective Services (CPS) at the time of this study. The children affected were said to have been receiving therapy and those who had been physically and sexually abused were found to be more likely to have social-emotional problems than the children that had not experienced such abuse.

In contrast, families reported by family workers and teachers to have a higher value placed on their children’s education were more likely to have been involved in most school activities and visited the school a number of times to ask for literacy
activities for their children. Such parents were found to be more likely to attend center-based literacy and parental involvement training sessions. On the other hand, families that did not value education more often viewed Head Start as a baby-sitting service rather than an educational service. The teachers and family workers both reported that there was a higher interest among immigrant parents as compared with non-immigrant parents in having their children obtain a high quality education. Such parents more often appeared ready to do all that was needed to help their children do well in school, including the use of educational television programs to help their children gain fluency in literacy and oral language. The family workers also indicated that during their visits to immigrant homes, it was common for family workers to observe older siblings assisting their younger siblings with homework.

Finally, teachers and family workers also reported that children who had well-developed social-emotional skills were better able to interact well with both their teachers and peers than children who had poorly developed social-emotional skills. Some teachers indicated that, in rare cases, they were unable to explain why some children had adequate or better academic achievement, given the dysfunctional home environments in which such children lived.

**Summary of Research Findings**

**Specific Child Characteristics and Child Risk Factors.** The analyses to assess whether the measures of specific child characteristics and child risk accurately classified Head Start four-year-old children as high, average, and low academic achievers for the total sample at Time 1 and 3 produced statistically significant regression coefficients for some of the variables in different achievement groups. A summary of the variables is
discussed below.

**Social Emotional Measure.** This measure was the most significant variable for all the three achievement groups in analyses that included the total sample. Similarly in analyses comparing the classifications of children in the three achievement groups based on the number of years in the program, the social emotional measure produced statistically significant regression coefficients among the 4-1s and 4-2s at Time 3 for the three achievement groups.

**Language Measure.** In analyses involving the total sample, regression coefficients for the language measure were found to be statistically significant in classifying all three achievement groups for Time 3, but not for time 1. However, in analyses comparing classifications of children in the three achievement groups based on the number of years in the program at Time 3, analyses involving the 4-1s and 4-2s produced statistically significant coefficients for the language measure only for the high-low achievement group at Time 3. In addition, the language measure produced statistically significant regression coefficients among the 4-2s for the high-average group at Time 3. Similarly, the coefficients for the language measure were statistically significant for the 4-1s among the low-average group for both Time 1 and Time 3.

**Child Risk Measure.** The child risk measure produced statistically significant regression coefficients for the high-low and high-average achievement groups for the total sample both at Time 1 and Time 3. In analyses comparing the classifications of children in the three achievement groups based on the number of years in the program, the regression coefficient for the child risk measure was statistically significant only for the 4-2s among the high-low and high-average achievement groups for both Time 1 and
Gender. In analyses for the total sample, the regression coefficient for gender was statistically significant in the case of the high-low achievement classification at Time 1 and the low-average classification at Time 1. In analyses comparing the classifications of children in the three achievement groups based on the number of years in the program, gender was statistically significant only in the 4-1s group at Time 1.

Family Risk Measure. The analyses performed to assess whether family risk accurately classified Head Start four-year-old children as high, average, and low academic achievers for the total sample did not produce statistically significant regression coefficients for the family risk composite for any of the three achievement groups.

Interactions. The analyses to assess interactions between the child and family risk measures among the total sample for the three achievement groups did not produce any statistically significant interactions between measures that produced statistically significant regression coefficients in the main effects analyses. However, when further analyses were performed for the total sample using specific measures of the family risk factors and a measure of the child risk factors, a significant interaction was found between the child risk composite and the primary language spoken at home in classifying the low-average achievers. Results from interaction analyses between measures that produced statistically significant regression coefficients in the main effects analyses for the 4-1s and 4-2s subsamples at both Time 1 and Time 3 did not produce any significant interaction.

Home Environment Measures. The analyses to assess mean differences among the home environment measures produced statistically significant results for all the
variables assessed; (a) the child’s home literacy environment, (b) the amount of time the caretaker spends with the child (c) the family support system, and (d) family stability.

Two parent families, mothers’ mental health status, and social emotional skills are among the characteristics that family workers and teachers cited as protective factors that enabled the children do well in the program.
CHAPTER 5: DISCUSSION

In the sections that follow, the theoretical and practical implications of the results from the present study will be discussed, the limitations of the study are acknowledged, and suggestions are made for future research.

Study Design

Psychologists consider the period before age five as a critical time for children’s development of social emotional, physical, and cognitive skills that are required for success in schools. Bronfenbrenner’s bio-ecological theory (Bronfenbrenner & Morris, 1998) offers an informative way to help understand the basis of risk and resiliency among children. This theory emphasizes a child’s own biology as a primary feature that stimulates her development, while acknowledging the impacts of interactions between processes within the child and the family and school environments. An examination of individual and family risk factors is particularly useful, in view of the age and level of development of the Head Start children who were participants in the present study. Additionally, the design of the study is consistent with longitudinal studies that have found strong correlations between early childhood achievement measures and later school performance (e.g. Snow, Tabors, & Dickinson, 2001).

The present study was based on analyses of archival data from 745 children who attended the Schenectady Community Action Program (SCAP) Head Start, which is located in upstate New York. The data were collected during the period of time encompassing the 2005-2010 academic years. The primary focus of the study was the classification of Head Start four-year-old children into high, average, and low achievement groups and the study used measures of child and family risk as well as
individual child characteristics as predictors. Binary logistic regression procedures were used for purposes of group classification and separate analyses were performed for both the total sample and for subsamples of children exposed to the Head Start program for one or two years (4-1s versus 4-2s). Results from these analyses were complemented by assessment of the nature of the home environments of selected subsamples of high and low achievers (top and bottom quartiles, respectively) for purposes of addressing the question of whether differences in a child’s home environment are related to differences in level of academic achievement. A qualitative survey was used to accomplish this objective and independent samples t-tests were performed to assess group mean differences on the components of this measure.

The specific hypotheses assessed were as follows: 1 (a) measures of specific child characteristics and child risk factors obtained from a representative sample of Head Start four-year-old children will accurately classify these children as high, average, and low academic achievers, conditional on controlling for Head Start experience differences, (b) a measure of family risk factors obtained from a representative sample of Head Start four-year-old children, will accurately classify these children as high, average, and low academic achievers, conditional on controlling for specific child characteristics, child risk factors, and Head Start experience differences, (c) a measure of family risk factors obtained from a representative sample of Head Start four-year-old children will moderate the effects of child risk factors in classifying children as high, average, and low academic achievers, conditional on controlling for specific child characteristics and Head Start experience differences; 2. The pattern of results using the same set of predictors in research question one (excluding the number of years in the program) to distinguish
among high, average, and low achievers will be essentially the same in four-year-old children exposed to the Head Start program for one year compared with four-year-old children exposed to the Head Start program for two years; and 3. High and low achieving four-year-old children exposed to the Head Start program for two years will differ on measures assessing the quality of the home environment in facilitating the development of pre-academic readiness skills.

**Summary of Findings**

Among the measures of specific child characteristics and child risk factors, the social emotional measure was found to be the single best predictor in classifying children into high, average and low achievement groups for both the total sample and the subsamples of children exposed to the Head Start program for one or two years (4-1s and 4-2s). This pattern of results was obtained in analyses involving predictors administered at both the beginning and end of the academic year. Moreover, the measure of social skills administered at the end of the academic year was a stronger predictor of group membership than that administered at the beginning of the academic year.

Other variables such as the language measure, the child risk composite, and gender were only predictive of membership in some of the achievement groups. Surprisingly, a measure of family risk, the family risk composite, was not a significant predictor in classifying children in any of the achievement groups, neither in the total sample nor the 4-1 4-2 subsamples. Thus, it was not surprising to find that in the case of both the total sample and the 4-1/4-2 subsamples, interactions between the child and family risk composites did not predict membership in any of the achievement groups. However, when the analyses were conducted using individual components of the family
risk factor for the total sample, a significant interaction was found between the child risk composite and the primary language spoken in the home in classifications involving only the low versus the high achieving children. Interaction analyses involving the subsamples did not produce any statistically significant product terms among the achievement groups in any of the classification analyses.

Finally, the independent sample t-tests produced statistically significant differences between the selected subsamples of high and low achieving children on the subscales of the Home Survey. The key findings regarding the three research questions are summarized and discussed in the following sections.

**Research Hypothesis 1**

1 (a) **Measures of specific child characteristics and child risk factors obtained from a representative sample of Head Start four-year-old children will accurately classify these children as high, average, and low academic achievers, conditional on controlling for Head Start experience differences**

**Social Emotional Measure.** The social emotional measure evaluates the child’s ability to form positive social relationships both with peers and adults. It encompasses sub-skills such as self-concept, independence, pride, self-control, co-operation, social relationships, initiative, persistence, and problem solving. A high score on the social emotional measure implies that a child has developed good social skills, good participation in prosocial interactions with peers and adults and a capacity for self-regulation, as indicated by their initiative, persistence, and problem solving ability. All of these skills, together, facilitate optimal learning. In contrast, a low score on this measure implies that a child presents challenging behaviors that prevent optimal learning (Smith & Fox, 2003).

As regards results on the social emotional measure, first note that preliminary
bivariate analysis produced a significant positive correlation \((r = 0.48, p < .05)\) between this measure and the composite measure of academic achievement (see Table 14), suggesting that social emotional development and academic achievement may be causally related (note once again that all correlations involved the total sample). Even stronger support for this possibility is provided by results from the classification analyses. As indicated in a previous section, the social emotional measure was the single best predictor in classifying children into the three different achievement groups, compared with all other predictors in the regression equations. Moreover, when this measure was administered at the end of the Head Start year, it was a stronger predictor than when it was administered at the beginning of the year in all of the classification analyses. In addition, there were marked increases on the social emotional measure during the course of the academic year and these increases were accompanied by marked increases on the achievement measure (see Table 20). Moreover, high achieving children were found to have higher scores on the social emotional measure than low achieving children at the beginning as well as at the end of the academic year (see Table 2). Finally, children who were in the program for two years had higher scores on the social emotional measure than children who were in the program for only one year (see Table 20). Given this pattern of results, it was not surprising to find that the social emotional measure proved to be stronger than any other predictor in distinguishing among achievement groups in all of the classification analyses performed.

The finding that entry-level social emotional skills strongly predicted group membership in most classification analyses (all of which were performed at the end of the Head Start year) is important for two reasons. First, it suggests that social emotional skills
are initially fostered by the home environment and that they may, in turn, help to facilitate the acquisition of academic readiness skills during the course of the Head Start year. Secondly, it implies that the social emotional skills acquired in the home environment had enduring effects over time and continued to facilitate academic achievement during the school year. Thus, it seems reasonable to conclude that the acquisition of social emotional skills begins to occur in early childhood and that such skills have a critically important influence on other important aspects of child’s development including academic achievement.

Similarly, the finding that the social emotional measure administered at the end of the Head Start year, was an even stronger predictor in distinguishing among high, average, and low academic achievers than the measure of social emotional skills administered at the beginning of the Head Start year is also an important finding, not only because it speaks for the enduring effects of entry-level social skills on academic achievement, but also because it strongly suggests that these skills, along with academic readiness skills, were further developed and enhanced by the Head Start curriculum and the instructional program. Support for this possibility is provided by the finding that correlations between the social emotional and academic achievement measures were stronger at the end than at the beginning of the Head Start year as well as by the finding that children who were exposed to the Head Start program for two years had higher scores on the social emotional and academic measures at both the beginning and end of the year than children who were exposed to the program for only one year (see Table 20).

Still more support for the enhanced effects of the program on social emotional and academic development is provided by another finding, specifically that the scores on
both the social emotional and academic measures were significantly higher at the end of the academic year than at the beginning of the year (see Table 20). Moreover, as noted in the literature review, children enrolled in the SCAP Head Start program have consistently performed at or above national normative standards on a standardized measure of emergent literacy skills (see Table 1). Thus, it seems clear from this collection of findings that the SCAP Head Start program has had very strong and positive effects on both the social emotional development and the academic achievement of the children it serves.

The finding of a positive relationship between the measure of social emotional development and the measures of academic achievement is consistent with results from previous studies that have found similar relationships between such measures. For example, a study conducted by Al Otaiba & Fuchs (2006), found that children from disadvantaged families are often faced with a combination of problems associated with both low achievement and deficiencies in the acquisition of social emotional skills. Lane et al. (2002) report similar findings. Other studies have found positive relationships among measures of social emotional development, children’s cognitive development, and preparedness for school (e.g. Arnold et al., 1999; Espinosa, 2002). Finally, Qi & Kaiser (2003) assert, in accord with such findings, that poor social emotional development and poor academic achievement result from a combination of individual, family, community, and school risk factors. These results are consistent with the present findings and together provide strong support for a causal relationship between social emotional development and academic achievement in disadvantaged preschool age children.

**Language Measure.** The language measure is a composite derived from several subtests such as listening and understanding, following directions, communication skills,
and spontaneous language. A high score on the language measure places a child at an advantage for acquiring literacy skills, which is a prerequisite for academic achievement.

Preliminary analyses produced significant positive correlations between the language measure and measures of academic achievement ($r = 0.29, p < .05$; see Table 14), indicating that children with high scores on the language measure also tended to have high scores on the academic achievement measures. Moreover, the high achieving children had higher scores on the language measure than low achieving children at both the beginning and end of the academic year. At the same time, scores on the language measure obtained at the end of the year were significantly higher, on average, than scores obtained on this measure at the beginning of the year (see Table 2).

Finally, results from the classification analyses indicate that the language measure distinguished among high, average, and low academic achievers in all analyses using predictors administered at the end of the academic year, but only among low-average achievers in analyses using predictors administered at the beginning of the academic year. These results are similar to those obtained for the social emotional measure. Taken together, they provide reasonably strong support for a causal relationship between language skills and academic achievement in pre-school age disadvantaged children; although the results in general suggest that causal relationships between language and academic skills may tend to be somewhat weaker than causal relationships between social emotional and academic skills in this population.

The finding that high achieving children enter the Head Start program with higher scores on the language measure than low achieving children is important because it again points to the quality of the home environment as an important influence on
language development and on child growth and achievement in general (Piaget, 1936; Vygotsky, 1991). The finding that the language measure predicted group membership using end-of-year predictors is also important because it suggests that the SCAP Head Start site provides a high quality educational program that is able to offset deficiencies in language development caused by a less than optimal home environment. However, the program can only do this by taking advantage of the language skills that have already been acquired within the context of the home environment.

The research findings discussed thus far are consistent with results from previous studies that have found strong relationships between language development, social emotional development, and academic achievement. For example, Lane, Gresham, and O’Shaughnessy (2002) found that children with normal and healthy social emotional skills tend to have reasonably well-developed language and literacy skills. Conversely, children who experience social emotional problems often have deficiencies in language skills and academic achievement (Kaiser, Hancock, Cai, Foster, & Hester, 2000; Qi & Kaiser, 2003). Moreover, literacy researchers (e.g. Snow, Burns, & Griffin, 1998) have often cited early literacy as the most important academic readiness skill because school learning depends very heavily on the ability to read. Indeed, children with deficiencies in pre-reading, literacy, and language skills have been found to be at risk for early and long-term reading difficulties (Vellutino, Fletcher, Snowling, & Scanlon, 2004). Thus, it seems reasonable to conclude from the results discussed thus far that adequate language development along with adequate social emotional development are critically important determinants of the child’s cognitive development and achievement and that the quality of the home environment is a critically important determinant of the acquisition of both.
sets of skills.

**Child Risk Factors.** Child risk factors consist of variables that predispose the child to abnormal physical, social emotional and cognitive development. Such variables are defined by the child’s health history. They include problems during pregnancy, problematic delivery, and other concerns at birth such as low birth weight and premature delivery, in addition to other risk factors such as significant illness or injury, whether the child has regular and prescribed medication for a pre-existing medical or psychiatric condition, whether the child has regular medical and dental care, and whether the child has a diagnosed disability and is receiving services such as language therapy, occupational therapy, and/or physical therapy. A high score on the child risk composite is an indication of the likelihood of a negative trajectory and places a child at a disadvantage for optimum achievement.

Bivariate correlational analysis found a significant negative correlation between the child risk composite and the composite measure of academic achievement \((r = -0.14, p < .05)\). This finding implies that children with high scores on the child risk composite had lower scores on the academic achievement measure. Results from the binary logistic regression analyses for the total sample showed that the child risk composite distinguished among the high-low and high-average achievers at both Time 1 and Time 3. In analyses classifying the 4-1 and 4-2 subsamples, the child risk composite distinguished among the high-low and high-average groups in the 4-2 analyses at Time 3 and only among the high-low groups in the 4-1 analyses at Time 3. Thus, despite some degree of inconsistency, the child risk composite was found to be a reasonably strong predictor of academic achievement when all other variables in the model were held constant,
suggesting that child risk variables of the types described above can be and may often be significant barriers to academic achievement.

The finding that in the total sample, the child risk composite contributed unique variance in distinguishing between children in the high-low and high-average achievement groups is important because it suggests that higher achieving children enter Head Start with significantly less child risk than do lower achieving children. However, the finding that the child risk composite distinguished between the high and average achievers only in the 4-2 subsample is also important because it suggests that more fine grained distinctions among achievement groups using this measure may be dependent on amount of exposure to the Head Start program. The finding that this measure distinguished between these groups in the 4-2s and between the high and low groups in both the 4-1s and 4-2s only in assessments using predictors administered at the end of the Head Start year is consistent with this assertion. These findings also underscore, once again, the likely utility of the Head Start program in ameliorating possible deleterious effects of child risk variables in ways that could help to make increasingly fine grained distinctions among such variables, in the interest of identifying those that may put the child at greatest risk for low academic achievement.

Finally, the finding that the child risk composite was not successful in distinguishing between average and low achievers and the finding that it successfully distinguished between high and average achievers only in the 4-2 subsample together suggest that one can have greater faith in its utility and reliability in distinguishing between Head Start children at the extreme ends of the child risk and achievement distributions. Moreover, when compared to the language measure, the child risk
composite seemed to be a less powerful predictor in predicting group membership (language, $r = 0.29, p < .05$; child risk, $r = -0.14, p < .05$).

The results discussed above are consistent with those obtained in previous research that has investigated the impacts of children’s biological and psychosocial risk factors on physical, psychosocial, cognitive, and various other aspects of development. For example, a longitudinal study by Werner and Smith (1982) found that a majority of children who had experienced four or more risk factors by age 2 developed learning or problematic behaviors by age 10, or were delinquent and/or had mental health issues by age 18.

**Gender.** Bivariate analysis found a weak positive correlation between gender and academic achievement ($r = 0.14, p < .05$). Similarly, binary logistic regression analyses for the total sample found statistically significant regression coefficients for gender in the high-low and low-average classifications at Time 1 but not at Time 3. In classification analyses using gender as a predictor in the 4-1 and 4-2 groups, significant regression coefficients were obtained in those analyses involving low-average classifications for children in the 4-1 group at Time 1, but not in any of the analyses using gender as a predictor in the 4-2 group. These results suggest that there are gender differences in achievement with boys predicted to be more likely to be low achievers and girls predicted to be more likely to be average achievers. The finding of significant relationships between gender and academic achievement is consistent with studies that examined this variable. For example, a study by Stokes (1990) examined relationships among pupil characteristics such as income, gender, chronological age, and level of cognitive development, and found that gender explained small and non-significant amounts of
variance on the cognitive development variable. The participants in this study were 41 male and 33 female African American children between the ages of five years to seven years.

It is important to note that other studies conducted in Head Start settings have also found that girls earn higher scores from teachers than boys and their results suggest that such gender differences are partly related to differences in social skills. For example, a study conducted by Shonkoff & Phillips (2000) that assessed parent and teacher ratings of social emotional skills in Head Start children found that boys were more often rated as presenting more problem behaviors than girls. More specifically, boys more often than girls were rated as presenting more hyperactive, more aggressive, and more withdrawn behaviors, with consequent negative effects on academic achievement, relative to girls.

1(b) A measure of family risk factors obtained from a representative sample of Head Start four-year-old children, will accurately classify these children as high, average, and low academic achievers, conditional on controlling for specific child characteristics, child risk factor, and Head Start experience differences

As discussed earlier, the family risk composite consists of family characteristics that have potential to put a child at risk for normal development. This measure includes family characteristics such as the income of working members of the family, number of children in a household, number of adults in the household, educational level of the primary caregiver, whether a parent has been incarcerated, whether a family member has been diagnosed with a disability, adequacy of housing, and the number of times the family has sought services from the social welfare system during the year before the child entered the Head Start program.

Bivariate analysis produced a weak negative correlation between the family risk composite and academic achievement ($r = -0.08, p < .05$). Similarly, results from binary
logistic regression analyses found that the family risk composite did not distinguish among high, average, and low academic achievers in the program, neither among children in the total sample nor among children in the 4-1, and 4-2 subsamples. Follow-up analyses using individual family risk variables as predictors produced significant regression coefficients for some of these variables and these results are discussed in the sections that follow.

**Family Disability.** Family disability in this sample includes physical and mental conditions that affect the primary caregiver or other members of the immediate family that may hinder members of that family from performing some or all of the tasks of daily life such as mental health conditions, drug addictions, and chronic physical health conditions. Bivariate analysis resulted in a negative correlation between family disability and academic achievement ($r = -0.101$, $p < .05$). Results from binary logistic regression analyses showed that family disability distinguished among high, average, and low academic achievers for both the first year and second year children in the program, indicating that children of parents who reported that they did not have any form of disability generally performed better than children of parents who reported that they did have a disability.

Family disability is considered a risk factor in assessing the academic achievement of a child and may influence the resource availability as well as the structure and organization of the child’s home environment (Sameroff, Seifer, Zax, & Barocas, 1987). Moreover, the home environments of families may differ depending on the type of disability and the intensity of the disability in question. For example, mental health problems and addictions to drugs have been found to have long lasting effects on
children, including the risk of developing the same addictions as the parents (Sameroff, Seifer, & Zax, 1982). In a study designed to examine the effects of the family environment on early emotional behavior and later mental health (Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1999), a group of children from birth to 18 years were assessed and the researchers found that the effects of individual characteristics of mental health do not overcome the effects of high environmental risk. The analyses also found that groups of low-resilient children in high-risk environments had lower mental health and cognitive competence later in life (Sameroff, Seifer, & Zax, 1982; Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1999).

**Number of Adults in the Family.** First note that in this context, the number of adults in the family includes the extended family members present in the home such as the grandparents, aunts, and uncles, in addition to parents and other members of the child’s immediate family. Preliminary bivariate analysis found that there was a negligible correlation between the number of adults in the family and academic achievement ($r = 0.017, p > .05$). However, results from binary logistic regression indicated that the number of adults in the family distinguished low-average achievers, but not high-low and high-average achievers, in the analyses involving both the first and second year children in the program.

A meta-analysis that reviewed family size effects conducted by Wagner, Schubert, & Schubert (2001) linked the number of adults in the home with positive child outcomes such as higher income, IQ, and academic achievement, in contrast to single parent families where child rearing was found to be more rule ridden, less individualized, and characterized by frequent use of corporal punishment and less investment of
resources (Bukatko & Daehler, 2004). Moreover, results from a qualitative analysis found that more adults in the home was correlated with more quality time in the home environment and more financial support for the child. However, in contrast to results obtained in the present study, the number of adults in the family often implies two parent families when compared to single parent families. Nevertheless, results from the home environment survey used in the present study indicate that families that spent more quality time with their children and provided additional family support tended to have higher achieving children than families that did not do so.

Studies assessing the effects of the family structure on the well-being of children in the U.S. have found that having two biological parents is the optimum situation for developing children (i.e. Lee, Burkham, Zimiles, & Ledewski, 1994; Scott, 2004). Research assessing the developmental outcomes of children of single mothers has found that such children are twice as likely to drop out of school and to have a child before the age of 20, when compared to children of two biological parents (McLanahan & Sandefur, 1994). Most single-parent families are likely to be poor and the parents in such families tend to work long hours in low-paying jobs in order to provide for their families. As a consequence, these parents often lack sufficient quality time to spend with their children (U.S. Census Bureau, 2008).

**Number of Children.** Preliminary bivariate analysis produced a positive but non-significant correlation between the number of children in the family and academic achievement\( (r= 0.057, p > .05) \). Results from binary logistic regression analyses found that the number of children in the family distinguished only among low-average achievers for the total sample in Time 3 classifications and only among low-average 4-1
achievers in Time 1 and Time 3 classifications. Thus, the results are difficult to interpret. Previous studies that have investigated the effects of the number of children in the family have concluded that more children put a strain on the available resources in a family and therefore larger size families tend to negatively affect the quality of a child’s life and academic achievement (i.e. Wagner, Schubert & Schubert, 1995). It should be noted, however, that the latter study was conducted using data from the general population whose demographics are different from those of participants in the current study.

**Income.** Bivariate analysis revealed a positive and non-significant correlation between income and academic achievement ($r = 0.031, p > .05$). Results from logistic regression analyses revealed that income distinguished among high-average achievers in the program. Thus, results from these analyses are also difficult to interpret. Note, however, that there was very little variance in the income among the Head Start families assessed in this study. In contrast, research with the general population has consistently produced a positive and significant correlation between income and academic achievement. For example, Wagner, Schubert, and Schubert (1995) found that higher income families in the general population are much better able to provide healthy food, health care, educational materials, quality time, and leisure activities for their children than low income families. Similarly, Teachman (1987) found that parents from low income families tend to have lower educational expectations for their children, less monitoring of their children’s school work, and less overall supervision of social activities compared to parents from high income families. Thus, results generated by the family income variable in this study are inconclusive.

1(c) A measure of family risk factors obtained from a representative sample of Head Start four-year-old children will moderate the effects of child risk factors in
classifying children as high, average, and low academic achievers, conditional on controlling for specific child characteristics and Head Start experience differences.

The interaction analyses did not produce any statistically significant product terms between the family risk composite and the child risk composite for the total sample and the sub-samples in any of the analyses performed. However, when interaction analyses were performed between the individual family risk variables and the child risk composite, there was a significant interaction between the child risk composite and the primary language spoken at home.

The failure of the family risk composite to distinguish among any of achievement groups in any of the analyses performed merits further discussion. In view of the well-established role of the family in facilitating academic achievement and child growth and development in general, this was an unexpected finding. Moreover, it contrasts with the finding that the child risk composite was a reasonably successful predictor in most of the classification analyses performed. And, although follow-up analyses using individual family risk variables as predictors indicated that a few of these variables successfully classified some of the achievement groups in given analyses, these results were sporadic and inconsistent. Thus, it cannot be denied that the family variables proved to be weak predictors in this study.

In considering various explanations for this failure, the one that seems most likely is that the Head Start instructional program was able to compensate for and ameliorate the deleterious effects of most of the family variables, thereby reducing the variability generated by the family risk measures, and perhaps to some extent, the variability generated by academic achievement measures as well. As documented earlier, the SCAP Head Start program is a very high quality instructional program that has had a great deal
of success over the years in educating disadvantaged children and bringing them up to
established normative standards on measures of academic achievement. Further, the
family intervention component of this SCAP Head Start program cannot be discounted.
Unfortunately, no one monitors their work and it is therefore difficult to quantify the
family workers’ impact in mitigating the negative effects of the home environment of
families who do benefit from their help. Family workers become involved in assisting
families to find better housing, nutritional programs, and medical assistance, and to
further their own education. Moreover, as indicated earlier, this program has been given
the highest ratings by officials from Health and Human Services, the federal agency
which sponsors and funds Head Start programs. And, unlike many of the variables
included in the child risk composite, (e.g. problematic pregnancy, problematic delivery,
birth injuries), the effects of which cannot be easily rectified through classroom
instruction, many if not most of the variables included in the family risk composite are
more readily rectified through classroom instruction. Thus, this difference in the two
measures (child risk and family risk) is a likely explanation for the disparity between the
two, in distinguishing among achievement groups. The hypothesized role of the
instructional program in compensating for and ameliorating the likely negative effects of
family risk variables is worth further consideration and further study, as is the impact of
family assistance provided by the family workers in this program.

Research Hypothesis 2

2. The pattern of results using the same set of predictors in question one (excluding
the number of years in the program) to distinguish among high, average, and low
achievers will be essentially the same in four-year-old children exposed to the Head
Start program for one year compared with four-year-old children exposed to the
Head Start program for two years
The analyses initially performed for this study used data from the total sample; however results from these analyses indicated that regression coefficients for the number of years in the program were often statistically significant, suggesting that the amount of exposure to the Head Start program may be an important determinant of academic achievement. Based on this finding, subsequent analyses were performed separately for the 4-1 and 4-2 subsamples.

**Group Differences.** Descriptive statistics revealed that at the beginning of the Head Start year, the two groups of children differed on all academic and social emotional measures, with the 4-2s scoring higher than the 4-1s on all of the measures assessed, despite that the fact that these children were a more needy group at greater risk than the 4-1 children admitted to the program. The 4-2 children had even higher scores at the end of the program year than the 4-1 children. As discussed above, this finding speaks to the quality of the SCAP Head Start program in ameliorating the negative effects of the child’s risk status.

This pattern of results is similar to results obtained in large scale studies that have compared child characteristics such as social emotional and language skills among children who have had one versus two years of Head Start. The general finding in these studies is that children who have had two years exposure to the Head Start program are found, on average, to have better social emotional and language skills, as compared to children who have had only one year of exposure to the Head Start program (ACF, 2003; 2006; 2010).

**Specific Child Characteristics and Child Risk Factors.** Results generated by classification analyses involving child characteristic and child risk variables as predictors
produced more similarities than differences. For example, analyses performed at the beginning of the year produced statistically significant regression coefficients for the social emotional measure for both the 4-1s and 4-2s in classifying the high-low and low-average achievers. Similarly, the coefficient for the child risk variable was statistically significant for the high-low achievement classification in both the 4-1 and 4-2 groups. Results generated by the classification analyses performed at the end of the year produced statistically significant regression coefficients for the social emotional measure in both the 4-1 and 4-2 children in classifying all three achievement groups. The coefficient for the language measure was significant in both the 4-1 and 4-2 groups in the high-low achievement analyses.

The finding of more similarities than differences in the analyses performed in the two subsamples is interesting because it suggests that classification of achievement groups was more complexly determined than might have been expected. Given that the 4-1 and 4-2 groups had different amounts of exposure to the Head Start programs at both the beginning and end of the Head Start year, one might have expected distinctly different patterns of results in the classification analyses, especially in distinguishing the high versus the low achievement groups. Yet, this was not the case. It is possible that the similarities observed at the beginning of the year were due, in part, to the fact that greater exposure to the Head Start program in the 4-2 group had the effect of reducing variability on the predictors, thereby making them closer to those in the 4-1 group, but this explanation, by itself, would not account for similarities in the pattern of results observed at the end of the year. Another possible explanation, in addition to the latter, is that some of the child variables used as predictors in the classification analyses were more
important determinants of achievement than others. This possibility is suggested in the finding that the degree of success enjoyed by each of the predictors in achievement group classification was ordered in roughly the same way in the two subsamples: the social emotional measures was the strongest and most reliable predictor, followed by the language and child risk measures, with gender as the least reliable predictor. This pattern of results suggests that individual child variables are important determinants of academic achievement, in addition to the quality of instructional program and have important effects above and beyond the effects of the instructional program.

**Family Risk Factors.** As indicated earlier, the results generated by the family risk composite produced no statistically significant regression coefficients in any of the achievement group classifications involving the 4-1 and 4-2 subsamples. Similarly, individual family variables produced no consistent pattern of results in classifying achievement groups in these subsamples. Thus, although some of these variables were successful in distinguishing between given groups, the absence of any degree of consistency in doing so precludes any coherent interpretations regarding their significance in achievement group classification. And, as suggested in previous discussion of similar findings in analyses involving the total sample, it is likely that the deleterious effects of family risk factors observed in previous research evaluating such effects (Sameroff, Seifer, Zax, & Barocas, 1987; Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1999) were distilled if not nullified by the compensatory effects of the Head Start educational program and the assistance provided to some of the families.

**Research Hypothesis 3**

*High and low achieving four-year-old children exposed to the Head Start program for two years will differ on measures assessing the quality of the home environment*
in facilitating the development of pre-academic readiness skills

Independent t-test results indicated that there were statistically significant differences in the scores for all the home environmental factors for the selected samples of high and low achieving children compared namely: (a) the child’s home literacy environment, (b) the amount of time the caretaker spends with the child (c) the family support system, and (d) family stability. The high achieving children were found to come from home environments that provided more literacy enrichment materials as compared to the home environments of low achieving children. Similarly, parents of high achieving children tended to spend more time with their children as compared to the parents of low achieving children. In addition, the high achieving children had greater family support systems and their families were found to have greater stability than those of the low achieving children.

It appears that among the high achieving children in the SCAP Head Start program as compared with the low achieving children, literacy acquisition and educational enrichment in general begin long before children enter the program and observed differences between these groups on the measures of the quality of the home environment clearly indicate that experiences occurring in the home strongly impact the children's academic achievement. Thus, parents play an important role in helping children acquire the academic readiness skills that lay the foundation for subsequent academic achievement.

Theoretical Contributions and Educational Implications

Results obtained in the present study are important for parents, educators, researchers, and policy makers alike. They highlight the importance of the child’s social
emotional development, language development, and early exposure to and additional experience in the Head Start program for children who are at very high risk for significant difficulties in academic achievement and other important aspects of development. But, of special importance are results documenting the importance of the quality of the home environment in affecting academic achievement among preschool disadvantaged children.

The importance of social emotional and language skills have been documented in previous research as indicated earlier (Al Otaiba & Fuchs, 2006; Lane et al., 2002) and the present findings provide additional support for the importance of these skills as determinants of academic readiness and achievement in disadvantaged children. Similarly, the finding that very high risk children who had been exposed to the Head Start program for two years performed consistently better on measures of academic achievement as well as on measures of both social emotional and language development has theoretical as well as practical significance. These findings have practical significance because they provide strong evidence for the importance of early identification and early intervention for disadvantaged children who may be at greatest risk for problematic behaviors, poor language development, inadequate development of academic readiness skills, and inadequate development in other important areas. They have theoretical significance insofar as they provide strong documentation for the views of those scholars who suggest that exposure to a comprehensive educational program, such as the enhanced literacy program employed in the SCAP Head Start site and described earlier, is not only developmentally appropriate, but critically important for ensuring that disadvantaged children are provided with the type and amount of
enrichment they need to compensate for the deficits in background knowledge they inevitably have when they enter the Head Start program (see Whitehurst, 2001; Whitehurst & Massetti, 2004 for excellent discussions of this issue). This perspective contrasts with the views of scholars influenced by Piaget’s theory of cognitive development (Piaget, 1959; Piaget & Inhelder, 1969) who suggest that exposure to a comprehensive educational program is developmentally inappropriate and may even have deleterious effects on the child’s social emotional and cognitive development (e.g. Elkind, 1987; 2001; Shepard & Smith, 1988).

Finally, as already indicated, results documenting the importance of an enriching home environment in facilitating academic readiness are of special importance because they should serve to motivate policy makers to consider investing additional resources in early childhood programs such as Head Start, in the interest of improving the quality of the home environment as one promising alternative for improving educational outcomes. These results may also help policy makers think more critically and deeply about the overlooked population of high achieving Head Start students who defy the typical stereotypes and excel in school. Indeed, most studies concerned with the effects of poverty on growth and development in disadvantaged children have focused primarily on low performing children and not on their high achieving counterparts from poor backgrounds. Our failure to help disadvantaged children fulfill their demonstrated potential has significant implications for the strength of our economy and society as a whole. Thus, positive and forward looking reforms in educational policies and systems should advance the life prospects of all students, including those disadvantaged students who have great potential to make significant contributions to society.
Finally, the present findings should also motivate Head Start administrative and teaching personnel to develop increasingly more effective procedures, materials, and training programs that, together, would assist parents in becoming more deliberate in their interactions with their children and in more effectively organizing their home environment in ways that would facilitate enrichment of the types supported by research, in the interest of producing strong positive effects on social emotional development, language development, and academic readiness and achievement. The results should also motivate additional research efforts that relate to the home environment and parental responsibilities.

**Limitations of the Current Study**

Although the demographics of the current study are similar to other Head Start large scale studies, this study was confined to one geographical area in upstate New York and, as a consequence, was not representative of a nation-wide population of Head Start children. Therefore, the external validity of the results is limited by this aspect of the study to similar local populations.

In addition, the study primarily used archival data rather than data collected using experimental or quasi-experimental designs, which, of course, makes it difficult to ascribe causal relationships to given findings. Thus, important (albeit suggestive) findings such as the likely role of the instructional program in enhancing social emotional and language development or in distilling the effects of family and child risk variables should more directly be evaluated in studies making use of experimental and quasi-experimental designs to do so.

Another limitation of the present study is that information about the nature of the
home environment, for purposes of comparing the home environments of high and low achieving children, was obtained by family workers and teachers, rather than by professionals having direct contact with caregivers in the home environments. Accordingly, future research should be geared towards the use of direct parental interviews and observations of children’s home environments to facilitate a more informative perspective of such environments, not only to insure more valid results, but also for purposes of theory building. In this study, the family workers were interviewed as proxies to the parents. Thus, there is the distinct possibility of loss of important information because there was no face to face interaction with members of a child’s family.

Another limitation of the present study is that it was a cross-sectional study rather than a longitudinal study. There is little disagreement among child development scholars that for all intents and purposes, studies such as the present one that are concerned with developmental changes in cognitive skills and related academic skills should be longitudinal studies that assess changes over time in the acquisition of such skills. For logical and technical reasons, the assessments undertaken for purposes of addressing the research questions of interest in this study were necessarily cross-sectional in nature. And, despite the fact that some assessments evaluated changes in given test scores from the beginning to the end of the Head Start year, this procedure did not allow assessment of continuous changes over longer periods of time. A related limitation was the use of the General Estimating Equations regression procedures for data analysis rather than hierarchically linear modeling (HLM) procedures. Although the availability of at least three assessments for each of the measures used in the present study would have allowed
the use of the HLM procedures for data analysis, they were not used for this purpose, again for logistical and technical reasons. Thus, future research should consider using HLM procedures for analyzing longitudinal data because such procedures facilitate evaluation of continuous change over time.

Finally, there is little doubt that a longitudinal study would have illuminated more clearly the relationship between individual and family factors in predicting academic achievement and in classifying disadvantaged children as high, average, and low achievers. Thus, additional research should be directed towards the use of longitudinal designs that examine the effects of early childhood education on lower-income students’ emergence as high achievers in preschool and beyond.

**Summary and Conclusions**

The goal of the Head Start program has been that of improving educational and developmental outcomes for children from disadvantaged families. The program, at large, has been shown to have a positive impact on children’s preschool experiences (ACF, 2005; ACF, 2010). However, the present study has shown that perhaps greater efforts need to be directed towards improving the home environments of disadvantaged children. Recent calls by various researchers for a study of the home environment seemed a question worthy of further exploration, given the life-long implications of variability in a child’s early home environment. The study serves to confirm the importance of an enriching home environment and parenting practices in four areas: (1) educational supports, (2) community outreach and support system, (3) stability and safety practices, and (4) parenting styles. The present findings should serve to encourage additional and confirmatory research along with shifts in federal, state, and local policies in ways that
would emphasize the importance of the disadvantaged child’s early home environment. A
good quality preschool program alone may not be enough to alleviate the many risk
factors that pose significant threats to growth and development in disadvantaged children.
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Appendix A - IRB Letter of Approval

The Research Foundation
The State University of New York

Institutional Review Board: DHHS FWA00001970
Notice of Approval
IRB Protocol Number: 08-055

Date: February 25, 2008
Principal Investigator: Millah Musungu
Title: Demographic Correlates of High Achieving Students in Head Start
Review Type: Exempt Category # 4 Approval Type: ☒ New ☐ Modification

Approval Date: February 22, 2008 Expiration Date: None

1. Provisions of Approval: n/a
2. Summary of Modification: n/a
3. Informed Consent: An adequate standard of informed consent has been met when required.
4. Principal Investigator Responsibilities: It is the responsibility of the PI to ensure that all investigators and staff associated with this study meet the training requirements for conducting research involving human subjects, follow the approved protocol, use only the approved forms, keep appropriate research records, and comply with all University at Albany Policies, federal, state and local laws, Declaration of Helsinki and the Belmont Report.
5. Research Records: Accurate and detailed research records must be maintained. All research records (including all IRB correspondence) must be kept for a minimum of 3 years after the completion of the research. This research is subject to an audit under the terms of the IRB’s Quality Improvement Program.
6. Changes: Any changes in the above referenced study may not be initiated without prior IRB review and approval. Changes include (but are not limited to) study personnel, consent forms, protocol, procedures, addition of funding source.
7. Funded Research: If your research is funded, you must also submit sponsor information and two copies of the grant/funding application for IRB review with the human subjects section(s) highlighted. This is true whether the source of funding is internal or external.
8. University Permissions: A.) Institutional Research, Planning and Effectiveness (IRPE) permission may be required if your research participants are recruited from the UAlbany campus. It is the responsibility of the investigator to contact IRPE at (518) 437-4791 for a determination. B.) All UAlbany permissions (e.g., classroom, team or organization permissions) must be kept on file with your research records.
9. Posters or Flyers: If posters or flyers are to be posted on the UAlbany campus, they must be registered with the Office of Student Involvement and Leadership in Campus Center 130 prior to posting on the academic podium.
10. External Permissions: All external permissions (e.g., schools, businesses, organizations, etc.) must be kept on file with your research records.

The IRB wishes you success with your research.

Adrienne D. Bonilla
Adrienne D. Bonilla, Esq.
Director/Research Compliance Officer
Office of Research Compliance
On behalf of the Institutional Review Board

Cc: Kevin Quinn
Appendix B - Head Start Demographic Form (HSDF)

1. Identification Number
   (This number is assigned by Ann Haywood and then given to the Family Workers)

2. Gender
   0=Male
   1=Female

3. Classroom
   1=Oakwood 103 9=Draper 110
   2=Oakwood 102 10=Draper 106
   3=Oakwood 104 11=Draper 107
   4=Girl’s Inc. 12=Draper 101
   5=Draper 119 13=Draper 104
   6=Draper 118 14=Draper 108
   7=Draper 117 15=Draper 109
   8=Draper 116 16=Draper 103
   17=Home base

4. Family Worker
   1=Caryn
   2=Sandra
   3=Stephanie
   4=Allison
   5=Barbara
   6=Louise
   7=Debbie
   8=DeMaris

5. Date of Entry into Program
6. Date of Birth
7. Birth Weight

8. Concern during Pregnancy
   0=No concern during pregnancy 8=Overdue
   1=Placenta Previa 9=Asthma
   2=Bleeding Reaction 10=Incompetent Cervix
   3=Bleeding 11=Ovarian Cyst
   4=Toxemia 12=Unspecified
   5=High Risk 13=Infection
   6=Diabetic 14=no prenatal care
   7=Blood Pressure 15=Fluid loss
9. Drugs or Medication During Pregnancy
   0=No Drugs or Medication during Pregnancy
   1=Drugs or Medication during Pregnancy

10. Smoke during Pregnancy
    0=No Smoke during Pregnancy
    1=Smoked During Pregnancy

11. Delivery
    0=Vaginal
    1=C-Section

12. Premature Birth
    0=Full Term Pregnancy
    1=Premature Birth

13. Concerns at Birth
    0=No Concerns at Birth
    11=Premie
    1=Underdeveloped Lungs
    12=Seizures
    2=Jaundice
    13=Acid Reflux
    3=Blue at Birth
    14=Hypotuno Tremor
    4=Fetal Distress
    15=Addiction
    5=Failure to Thrive
    16=Heart obstruction
    6=Temperature Regulation
    7=Blood Thickness
    8=Heart Murmur
    9=Nutrition Retention
    10=Cord

14. Significant Injury or Illness in Early Childhood
    0=No Particular Problem
    11=Tonsillectomy
    1=Asthma
    12=Seizures
    2=C Trait Sickle Cell
    13=Viral Meningitis
    3=Dehydration
    14=Lymph Nodes
    4=Head Injury
    15=Ear Infection
    5=Burns
    16=Allergies
    6=Kidney Surgery
    17=Heart Murmur
    7=Hernia
    18=Heart Surgery
    8=Virus
    9=Headaches
    10=Unspecified

15. Regular Medication
    0=No Meds
    1=Ventalin
    2=Asthma Medication
3=Calanoden
4=Adrerol
5=Zurtec
6=Albuterol
7=Ritalin
8=Allergy Meds
9=Xeperex

16. Regular Medical Care
0=Regular Medical Care
1=Not Regular Medical Care

17. Regular Dental Care
0=Regular Dental Care
1=Not Regular Dental Care

18. Vision Problems
0=No Vision Problem
1=Vision Problem Noted

19. Hearing Problems
0=No Hearing Problem
1=Hearing Problem

20. Late Walking
0=Normal Walking Milestone
1=Late Walking

21. Late Talking
0=Normal Talking Milestone
1=Late Talking

22. Diagnosed Disability
0=No Disability
1=Diagnosed Disability
2=Attention Deficit Disorder
3=Visually Impaired

23. Receives Speech Therapy
0=No Speech Therapy
1=Receives Speech Therapy

24. Receives Occupational Therapy
0=No Occupational Therapy
1=Receives Occupational Therapy
25. Receives Physical Therapy
0=No Physical Therapy
1=Receives Physical Therapy

26. Number of Children in Household

27. Number of Adults in Household

28. Family Ethnicity
1=Sudan
12=Guyanese
2=African American
13=Iran
3=Hispanic
4=Caucasian
5=Biracial
6=Indian
7=Afghanistan
8=Pakistan
9=American Indian
10=Egyptian
11=Chinese

29. Primary Language of Home
1=English
7=Cantonese
2=Arabic
8=Mandarin
3=Spanish
9=Farsi
4=Punjabi
10=Dari
5=Pashto
6=Urdu

30. Primary Caregiver
1=Mother
5=Aunt
2=Father
6=Great Aunt
3=Grandmother
7=Foster Care
4=Guardian
8=Grandfather

31. Years of Schooling for Primary Caregiver

32. Family Income

33. Adequacy of Housing
0=No Problem with Housing
1=Housing a Problem

34. Family Diagnosed Disability
0=No Disability
7=Downs Syndrome
1=Asthma
8=Hearing Impaired
2=Attention Deficit Disorder  9=Mental Health
3=Undefined or Unspecified Disability  10=Arthritis
4=Autism
5=Diabetes
6=Thyroid

35. Either Parent Ever Incarcerated
0=No Parent Incarcerated
1=Father Incarcerated
2=Mother Incarcerated
APPENDIX C - Phonological Awareness Literacy Screening (Pals-Prek)

Literacy Variables
Upper Case Alpha Recognition (0-26)
Lower Case Alpha Recognition (0-26)
Letter Sounds (0-26)
Beginning Sound Awareness (0-10)
Print and Word Awareness (0-10)
Rhyme Awareness (0-10)
Nursery Rhyme Awareness (0-10)
Name Writing (0-7)

PALS Total (sum of 42 through 49)
HEAD START CHILD
OUTCOMES FRAMEWORK


◆ The Domains, Elements, and Indicators are presented as a framework of building blocks that are important for school success. The Framework is not an exhaustive list of everything a child should know or be able to do by the end of preschool. The Framework is intended to guide assessment of three- to five-year-old children—not infants, toddlers, and pregnant women enrolled in Early Head Start or Migrant Head Start programs.
◆ The Framework should guide agencies in selecting, developing, or adapting an instrument or set of tools for ongoing assessment of children’s progress. It is not intended to be used directly as a checklist for assessing children.
◆ Every Head Start program implements an appropriate child assessment system that aligns with their curriculum and gathers data on children’s progress in each of the 8 Domains of learning and development. At a minimum, because they are legislatively mandated, programs analyze data on 4 specific Domain Elements and 9 Indicators in various language, literacy, and numeracy skills, as indicated with a star ★ in the chart.
◆ Information on children’s progress on the Domains, Domain Elements, and Indicators is obtained from multiple sources, such as teacher and home visitor observations, analysis of samples of children’s work and performance, parent reports, or direct assessment of children. Head Start assessment practices should reflect the assumption that children demonstrate progress over time in development and learning on a developmental continuum, in forms such as increasing frequency of a behavior or ability, increasing breadth or depth of knowledge and understanding, or increasing proficiency or independence in exercising a skill or ability.
<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>DOMAIN ELEMENT</th>
<th>INDICATORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANGUAGE</td>
<td>Listening &amp; Understanding</td>
<td>+ Demonstrates increasing ability to attend to and understand conversations, stories, songs, and poems.</td>
</tr>
<tr>
<td>DEVELOPMENT</td>
<td></td>
<td>+ Shows progress in understanding and following simple and multiple-step directions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Understands an increasingly complex and varied vocabulary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ For non-English-speaking children, progresses in listening to and understanding English.</td>
</tr>
<tr>
<td>SPEAKING</td>
<td>Speaking &amp; Communicating</td>
<td>+ Develops increasing abilities to understand and use language to communicate information, experiences, ideas, feelings, opinions, needs, questions and for other varied purposes.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Progresses in abilities to initiate and respond appropriately in conversation and discussions with peers and adults.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Uses an increasingly complex and varied spoken vocabulary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Progresses in clarity of pronunciation and towards speaking in sentences of increasing length and grammatical complexity.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ For non-English-speaking children, progresses in speaking English.</td>
</tr>
<tr>
<td>LITERACY</td>
<td>Phonological Awareness</td>
<td>+ Shows increasing ability to discriminate and identify sounds in spoken language.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Shows growing awareness of beginning and ending sounds of words.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Progresses in recognizing matching sounds and rhymes in familiar words, games, songs, stories and poems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Shows growing ability to hear and discriminate separate syllables in words.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Associates sounds with written words, such as awareness that different words begin with the same sound.</td>
</tr>
<tr>
<td>LITERACY</td>
<td>Book Knowledge &amp; Appreciation</td>
<td>+ Shows growing interest and involvement in listening to and discussing a variety of fiction and non-fiction books and poetry.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Shows growing interest in reading-related activities, such as asking to have a favorite book read; choosing to look at books; drawing pictures based on stories; asking to take books home; going to the library; and engaging in pretend-reading with other children.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Demonstrates progress in abilities to retell and dictate stories from books and experiences; to act out stories in dramatic play; and to predict what will happen next in a story.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Progresses in learning how to handle and care for books; knowing to view one page at a time in sequence from front to back; and understanding that a book has a title, author and illustrator.</td>
</tr>
<tr>
<td>LITERACY</td>
<td>Print Awareness &amp; Concepts</td>
<td>+ Shows increasing awareness of print in classroom, home and community settings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Develops growing understanding of the different forms of print such as signs, streets, newspapers, lists, messages, and menus.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Demonstrates increasing awareness of concepts of print, such as that reading in English moves from top to bottom and from left to right, that speech can be written down, and that print conveys a message.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Shows progress in recognizing the association between spoken and written words by following print as it is read aloud.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ Recognizes a word as a unit of print, or awareness that letters are grouped to form words, and that words are separated by spaces.</td>
</tr>
</tbody>
</table>

☆ Indicates the 4 specific Domain Elements and 9 Indicators that are legislatively mandated.
### HEAD START CHILD OUTCOMES FRAMEWORK

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>DOMAIN ELEMENT</th>
<th>INDICATORS</th>
</tr>
</thead>
</table>
| **LITERACY (CONT.)** | Early Writing | ✩ Develops understanding that writing is a way of communicating for a variety of purposes.  
✩ Begins to represent stories and experiences through pictures, dictation, and in play.  
✩ Experiments with a growing variety of writing tools and materials, such as pencils, crayons, and computers.  
✩ Progresses from using scribbles, shapes, or pictures to represent ideas, to using letter-like symbols to copying or writing familiar words such as their own name. |
| | Alphabet Knowledge | ✩ Shows progress in associating the names of letters with their shapes and sounds.  
✩ Increases in ability to notice the beginning letters in familiar words.  
✩ Identifies at least 10 letters of the alphabet, especially those in their own name.  
✩ Knows that letters of the alphabet are a special category of visual graphics that can be individually named. |
| **SOCIAL & EMOTIONAL DEVELOPMENT** | Self Concept | ✩ Begins to develop and express awareness of self in terms of specific abilities, characteristics and preferences.  
✩ Develops growing capacity for independence in a range of activities, routines, and tasks.  
✩ Demonstrates growing confidence in a range of abilities and expresses pride in accomplishments. |
| | Self Control | ✩ Shows progress in expressing feelings, needs and opinions in difficult situations and conflicts without harming themselves, others, or property.  
✩ Develops growing understanding of how their actions affect others and begins to accept the consequences of their actions.  
✩ Demonstrates increasing capacity to follow rules and routines and use materials purposefully, safely, and respectfully. |
| | Cooperation | ✩ Increases abilities to sustain interactions with peers by helping, sharing and discussion.  
✩ Shows increasing abilities to use compromise and discussion in working, playing and resolving conflicts with peers.  
✩ Develops increasing abilities to give and take in interactions; to take turns in games or using materials; and to interact without being overly submissive or directive. |
| **SOCIAL & EMOTIONAL DEVELOPMENT (CONT.)** | Social Relationships | ✩ Demonstrates increasing comfort in talking with and accepting guidance and directions from a range of familiar adults.  
✩ Shows progress in developing friendships with peers.  
✩ Progresses in responding sympathetically to peers who are in need, upset, hurt, or angry; and in expressing empathy or caring for others. |
| | Knowledge of Families & Communities | ✩ Develops ability to identify personal characteristics including gender, and family composition.  
✩ Progresses in understanding similarities and respecting differences among people, such as gender, race, special needs, culture, language, and family structures.  
✩ Develops growing awareness of jobs and what is required to perform them.  
✩ Begins to express and understand concepts and language of geography in the contexts of their classroom, home and community. |
APPENDIX E - Head Start Income Eligibility

2003 Poverty Guidelines for the 48 Contiguous States and the District of Columbia

Poverty
Size of family unit guideline

<table>
<thead>
<tr>
<th>Size of Family Unit</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$8,980</td>
</tr>
<tr>
<td>2</td>
<td>12,120</td>
</tr>
<tr>
<td>3</td>
<td>15,260</td>
</tr>
<tr>
<td>4</td>
<td>18,400</td>
</tr>
<tr>
<td>5</td>
<td>21,540</td>
</tr>
<tr>
<td>6</td>
<td>24,680</td>
</tr>
<tr>
<td>7</td>
<td>27,820</td>
</tr>
<tr>
<td>8</td>
<td>30,960</td>
</tr>
</tbody>
</table>

For family units with more than 8 members, add $3,140 for each additional member. (The same increment applies to smaller family sizes also, as can be seen in the figures above.)

2003 Poverty Guidelines for Alaska

Poverty
Size of family unit guideline

<table>
<thead>
<tr>
<th>Size of Family Unit</th>
<th>Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$11,210</td>
</tr>
<tr>
<td>2</td>
<td>15,140</td>
</tr>
<tr>
<td>3</td>
<td>19,070</td>
</tr>
<tr>
<td>Size of family unit</td>
<td>Guideline</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>1</td>
<td>$10,330</td>
</tr>
<tr>
<td>2</td>
<td>13,940</td>
</tr>
<tr>
<td>3</td>
<td>17,550</td>
</tr>
<tr>
<td>4</td>
<td>21,160</td>
</tr>
<tr>
<td>5</td>
<td>24,770</td>
</tr>
<tr>
<td>6</td>
<td>28,380</td>
</tr>
<tr>
<td>7</td>
<td>31,990</td>
</tr>
<tr>
<td>8</td>
<td>35,600</td>
</tr>
</tbody>
</table>

For family units with more than 8 members, add $3,930 for each additional member. (The same increment applies to smaller family sizes also, as can be seen in the figures above.)
APPENDIX F - Risk Composite

Composition of risk factor is based on addition of selected family variables recoded as necessary, each attributing 1 or more points if risk applies.

List of family variables and their contribution to risk composite.

<table>
<thead>
<tr>
<th>Variables name</th>
<th>Contribution to Risk composite</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concern during</td>
<td>0</td>
<td>No concern</td>
</tr>
<tr>
<td>Pregnancy (pregcon)</td>
<td>+1</td>
<td>Any concern</td>
</tr>
<tr>
<td>Premature birth</td>
<td>0</td>
<td>Full-term</td>
</tr>
<tr>
<td>(prematur)</td>
<td>+2</td>
<td>Premature</td>
</tr>
<tr>
<td>Concerns at Birth</td>
<td>0</td>
<td>No concerns</td>
</tr>
<tr>
<td>(birthcon)</td>
<td>+1</td>
<td>Any concern(s)</td>
</tr>
<tr>
<td>Significant injury (injill)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>Any injury(ies)</td>
</tr>
<tr>
<td>Regular medications (meds)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>Any meds</td>
</tr>
<tr>
<td>Regular Medical Care (medcare)</td>
<td>+1</td>
<td>No regular medical care</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Regular medical care</td>
</tr>
<tr>
<td>Regular Dental Care (dencare)</td>
<td>+1</td>
<td>No regular dental care</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>Regular dental care</td>
</tr>
<tr>
<td>Diagnosed Disability (disab)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>Disability</td>
</tr>
<tr>
<td>Receives Speech &amp; Lang. (ST)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>ST</td>
</tr>
<tr>
<td>Receives OT (OT)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>OT</td>
</tr>
<tr>
<td>Receives PT (PT)</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>PT</td>
</tr>
<tr>
<td>Number of children in Family (chilfam)*</td>
<td>+1</td>
<td>1,2</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>&gt;2</td>
</tr>
<tr>
<td>Number of Adults*</td>
<td>0</td>
<td>2+ adults</td>
</tr>
<tr>
<td></td>
<td>+3</td>
<td>1 Adult (Single Parent) This is HS assignment for single parent.</td>
</tr>
<tr>
<td>Language</td>
<td>0</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td>+3</td>
<td>Head Start assigns 3 points if</td>
</tr>
<tr>
<td>Variable</td>
<td>Value</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Foster Care</td>
<td>+3</td>
<td>Head Start assigns 3 points if child is in foster care.</td>
</tr>
<tr>
<td>Education Level of Primary Caregiver (educat)*</td>
<td>0</td>
<td>Greater than 10</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>Less than 11</td>
</tr>
<tr>
<td>Income* (educat)*</td>
<td>0</td>
<td>Greater than $11,500.</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>Less than $11,500.</td>
</tr>
<tr>
<td>Adequate housing</td>
<td>0</td>
<td>Adequate</td>
</tr>
<tr>
<td></td>
<td>+1</td>
<td>Problem</td>
</tr>
<tr>
<td>Disability in family</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>Disability</td>
</tr>
<tr>
<td>Parent incarcerated</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>Either parent</td>
</tr>
<tr>
<td>Time family sought service in past year</td>
<td>0,1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>+2</td>
<td>3 or more times</td>
</tr>
</tbody>
</table>

- These determinations are made based on SCAP Head Start averages for these variables, i.e. $11,500 is the average income and 11.5 is average educational level of primary caregiver.

Other determinations are based on HS Selection Criteria. i.e. single parent. Foster placement, and other language are considered by HHS to be high risk.
Appendix G - Home Survey

To All Family Workers,

Thank you for helping us with this project. As you know, Millah Musungu, a doctoral student at the University, wishes to study those children who perform very well academically in spite of the difficulties that they face as children growing up in poverty. We have met with some family workers and received really valuable insight about these youngsters and their families. We are trying to develop a questionnaire that you could respond to about some of your families. We are hoping to tap into your records from last year and hope you could complete the questionnaire that follows. We welcome any feedback you can give us. Melinda T.

Family Worker Questionnaire

Home Environment- Education/Literacy
1) Is there reading material in the home?
   Magazines ____ Newspapers____ Books_____

2) Does the family read, keep, or post letters and notes from school (Head Start or Public school program)
   Always____ Sometimes_____ Never_____.

3) Is there a computer in the home? _____ Internet Access?_____

4) Does the child have his/her own books?
   Many books____ a few books______ no books_____

5) Is parent/caregiver attending an educational program? GED_____ Community College_____ Vocational Program_____

6) Is education important to this family? Very Important___Somewhat_____ Not important_____

7) Does the child attend program regularly?_______ If not why_________
Family Worker Observation about Home Environment/Literacy section. Something we should add or something you couldn’t possibly answer:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Family Activities/Time with Children
8) Does someone in the family read to the child?____every day?____a few times a week?____, a few times a month?____seldom?____
9) Does someone in the family teach the child about letters and numbers?____
10) Does someone in the family play games with the child?____
   If yes, what kind of games – ex., board games____, video games____outdoor games____educational games____.
11) Does someone in the family talk to the child about their school day?____
12) Do parents/caregivers plan family activities? Frequently_____Sometimes_____Never_______
13) Do parents/caregivers regularly attend school conferences? Always____
   Sometimes______ Never________
14) Does someone in family help children with homework? ____

15) How many hours does parent/caregiver work outside of home?
   Mother_____Father_____Grandparent/Caregiver_____

Family Worker Observation about Family Activities. Something we should add or something you couldn’t possibly answer:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Family and Community Resources
16) Does the family have extended family with whom they are in regular contact? ___
   Grandparent____Aunt____Uncle____Sister____Brother

17) Does the extended family help with child care? ______

18) Does the extended family live in the home? ______

19) Does the family belong to community organizations?
   Religious group_____ Cultural Connection____

20) Does the family use community resources? Library____, Summer programs____Health and nutrition programs_____

Family Worker Observation about Community Resources. Something we should add or something you couldn’t possibly answer:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Stability of Family
21) How many times in the past year has the family moved? ______

22) How many times in the past year have parents/caregivers changed jobs? ______

23) How many times in the past year has the family experienced crisis? ______
   Health______Financial______Legal______

Family Worker Observation about Stability of Family. Something we should add or something you couldn’t possibly answer:
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
APPENDIX H - How To Perform Binary Logistic Regression

To perform logistic regression in Generalized Estimating Equations (GEE) using SPSS 18, go to Analyze, Generalized Linear Models, and Generalized Estimating Equations. There are ten tabs across the box that opens (Repeated, Type of Model, Response, Predictors, Model, Estimation, Statistics, EM Means, Save, and Export).

The repeated tab has two options; subject variables and within-subject variables, the variable class would be entered in the subject variables box so that classroom effects can be controlled. The sort cases by subject and within-subject variables box should be checked. Next select a covariance matrix based on a robust estimator, rather than the model-based estimator. Also selected is the working correlation matrix based on a structure that is exchangeable (instead of the other choices available), and select to adjust estimator by number of non-redundant parameters.

The second tab is the type of model for logistic regression; the binary logistic option is selected. The next tab is the response tab; the binary response dependent variable is specified here. The default setting for a GEE binary dependent variable is to code the reference category as the highest value, therefore for dummy variables coded as 1 and 0, by default 1 is the reference category. It is important for the reader to be aware that other logistic regression procedures in SPSS have 0 as the reference category and this step is important in interpreting the logistic coefficients and odds ratios. For example, Garson (2009) reports, “binary logistic regression predicts the "1" value of the dependent variable, using "0" level as the reference value.”

The fourth tab is the predictors tab; all the predictors to be modeled are transferred into the appropriate boxes. If the predictor is categorical but only with two
values (like gender, which is coded as 0 for male and 1 for female), that can go in the covariates box. Otherwise if there are more than two values, the variable needs to be entered in the factors tab, all continuous predictors go into the covariates box.

The fifth tab is the model tab where the model effects are specified. This can be done by highlighting all of the variables in the factors and covariates box on the left and clicking on the arrow in the build term(s) box to move them over into the model box on the right. For interactions, one needs to build the terms in using either the stepwise builder given by the program or by highlighting all of the predictors to bring them into the model as individual items and then highlight the predictors in the box to the left that you are interested in and change the type of model to interaction and move them into the model box.

Next is the estimation tab, under parameter estimation, hybrid should be selected and Pearson chi-square option should be selected under the scale parameter method. The default settings should be maintained for other options in the estimation tab.

The statistics tab, gives the following options; the analysis type which should be set as type III, Wald should be selected under the Chi-square statistics, and the log quasi-likelihood function to be selected is full. The rest of the choices under print depend on what one is interested to see printed. The rest of the tabs; the EM means tab, save tab, and export tab are not very useful for the current analysis.