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Resilience to Poverty in Children's Social-Emotional and Academic Development

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Resilience to Poverty in Children's Social-Emotional and Academic Development

by

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Abstract

Resilience to Poverty in Children's Social-Emotional and Academic Development

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Living in poverty places children at an increased risk of negative behavioral, cognitive, and health outcomes. Yet, some children are able to overcome the obstacles associated with poverty to display positive outcomes and are considered resilient. The current study used the Early Childhood Longitudinal Study- Birth Cohort to investigate how different benchmarks of resilience influence children's social, behavioral, and academic outcomes after the transition to kindergarten and how modelling protective factors in three different ways (i.e. an individual factor model, a cumulative index, and a latent profile analysis) at age 2 related to preschool resilience. "High-threshold resilience" was classified as one standard deviation above the mean of children not in poverty (based on social skills, mathematics, or literacy), whereas "low-threshold resilience" was operationalized as one half of a standard deviation above the mean of children in poverty. Results showed that few differences emerged between the different thresholds of resilience, however social skills resilience at preschool was related to higher kindergarten social skills, mathematics resilience was related to lower behavior problems

and higher mathematics and literacy in kindergarten, and literacy resilience was related to higher mathematics and literacy. Vocabulary, self-regulation, and parent responsiveness were consistent predictors of later resilience in multiple domains and a higher cumulative index of protective factors was related to a higher likelihood of displaying preschool resilience. Four latent profiles of protective factors emerged (i.e. low protection and religious, low protection, moderate protection and unreligious, and high protection). “Moderate protection and unreligious” and “high protection” profile membership was linked to a higher likelihood of preschool resilience. Although further research is needed to clarify how to operationalize resilience to promote long-term positive development, it seems certain developmental domains (i.e. mathematics) are more influential for better overall development and modeling protective factors in multiple ways can provide a more nuanced understanding of how to promote resilience.

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Chapter 1: Introduction

Living in poverty poses significant risks to child development. In 2013, 14.7 million children or about 20% of all children under 18 years old in America lived in poverty (DeNavas-Walt et al., 2013). Children living in poverty are at risk of worse behavioral, cognitive, and health outcomes as compared with their more affluent peers (Berger et al., 2009; Brooks-Gunn & Duncan, 1997; Conger et al., 2010; Edin & Kissane, 2010; McLoyd, 1998; Yoshikawa et al., 2012). Some children are still able to thrive despite growing up in adverse conditions. These children are considered to be resilient. While the concept of resilience is widely accepted in the field of psychology, how to operationalize it is not. Currently, there are several competing definitions of resilience; resilience has been defined as successful adaptation (Masten, 2014), as doing relatively well in comparison to others in similar risky situations (Rutter, 2006), and as avoiding psychopathology (Tiet et al., 1998). One of the leading experts in the field of resilience, Ann Masten, recently (2014) emphasized the need for research on how resilience is defined, how protective factors may operate differently, and how resilience may be dependent on context. This project responds to this call by comparing several methods for operationalizing resilience and the implications of each for understanding successful child adjustment. This study will investigate the standards future research should set for defining resilience, how different benchmarks of preschool resilience influence children's social, behavioral, and academic outcomes after the transition to kindergarten.

Furthermore, this study focused on the context of poverty and whether key factors in children's lives, such as parenting behaviors or neighborhood safety, serve as

protective factors. Masten (2014) argued resilience is not an individual trait because the protective effects of different variables are context-specific. Within the context of poverty, protective factors have been identified at the individual-, family-, and community-levels (Garmezy, 1993; Masten, 2014; Werner, 1989; Zolkowski & Bullock, 2012). In the current study, protective factors at the individual level include: self-regulation, attachment, and vocabulary; at the family-level include: parental responsiveness, investment, and discipline and positive marital interactions; at the community-level include: religious involvement and neighborhood quality. Each of these factors have been associated with resilience among children in poverty (Abelev, 2009; Garmezy, 1993; Masten & Obradovic, 2006; Orthner et al., 2004; Rak & Patterson, 1996; Werner, 1989; Zolkowski & Bullock, 2012).

This study investigated whether the number of protective factors (i.e. an index model) or specific protective factors (i.e. an individual factor model) were better at predicting resilience. Finally, we explored how protective factors co-occur among children in poverty and whether different profiles of protective factors were predictive of resilience. Rutter (1979) found that it was not any one risk, but the accumulation of multiple risks, that forecast negative development. Thus, one way of measuring adversity is through a cumulative risk index (i.e. a summation of dichotomized risk variables) (Gutman et al., 2003; Roy & Raver, 2014). However, a recent study highlighted the notion that certain risks may frequently co-occur and may be more predictive of negative development in certain domains (e.g. cognitive or social-emotional development) (Roy & Raver, 2014). Through the use of latent class analysis (LCA), Roy and Raver (2014)

illustrated how different risk profiles of children in poverty differentially related to cognitive and behavior outcomes. However, a study has not been conducted on whether similar results occur among protective factors for predicting children's outcomes. Therefore, the current study used a cumulative index of protective factors, an individual factor model, and latent profile analysis (e.g. LPA) to predict resilience.

Chapter 2: Background Information

THE IMPACTS OF POVERTY ON CHILD DEVELOPMENT

Poverty during childhood has been linked with a wide variety of negative outcomes. Children in poverty are more likely to exhibit negative social-emotional and academic development (Berger et al., 2009; Brooks-Gunn & Duncan, 1997; Guo & Harris, 2000; McLoyd, 1998; Wadsworth, 2013). Each of these outcomes may be differentially susceptible to resilience and susceptible through different processes.

Behavioral problems are commonly broken down into two categories: externalizing and internalizing behaviors (Achenbach et al., 1991). Externalizing behaviors are characterized by aggression and fighting, while internalizing behaviors include social withdrawal, depression, and anxiety (Achenbach et al., 1991). Research has demonstrated that the longer a child remains in poverty, the more internalizing and externalizing behaviors they exhibit (Brooks-Gunn & Duncan, 1997; McLoyd, 1998). Furthermore, poverty has been linked to an increase in antisocial behaviors among children (Brooks-Gunn & Duncan, 1997; Wadsworth, 2013; Yoshikawa et al., 2012).

Poverty also has a negative impact on children's cognitive outcomes and later academic achievement (Berger et al., 2009; Brooks-Gunn & Duncan, 1997; Gershoff et al., 2007; Guo & Harris, 2000; McLoyd, 1998). Specifically, poverty has been associated with lower IQ, cognitive abilities, and academic achievement (Berger et al., 2009; Brooks-Gunn & Duncan, 1997; McLoyd, 1998). Several studies have found that poverty indirectly influences cognitive abilities by limiting the amount of cognitively stimulating material or parental investments (Gershoff et al., 2007; Guo & Harris, 2000). While there

seems to be significant empirical support of the negative association between poverty and children's social-emotional outcomes, there have only been a few studies exploring the mechanisms through which poverty impacts development. This study will focus on processes that promote positive development despite experiencing poverty.

RESILIENCE

Some children are able to overcome the adverse conditions associated with poverty and display social, emotional, and cognitive competence. These children are characterized as resilient. Although the concept of resilience has been studied for over forty years, there is still a lack of agreement about how to operationalize it (Masten 2014; Zolkoski & Bullock, 2012). Resilience has been defined as thriving (Masten, 2014), as doing better than peers in similar risky environments (Rutter, 2006), or as the mere absence of psychopathology (Tiet et al., 1998). While the absence of psychopathology is not commonly used in conceptualizing resilience, there is still debate about what criteria constitute positive adaptation (Masten, 2014). One definition of resilience is based upon fulfilling "major expectations of a given society or culture in historical context for the behavior of the children of that age and situation" despite exposure to serious risks (Masten, 2001, p. 229). In other words, resilience is based upon a comparison with children not at risk (i.e. children not in poverty) and thus will be called "high-threshold resilience". The term "high-threshold" was selected because children who are not experiencing risk should be exhibiting higher levels of functioning in comparison to children at risk and thus resilient children would have a higher threshold to cross to display similar outcomes. Another definition of resilience is conceptualized as relatively

positive outcomes despite experiencing serious risk (Rutter, 2006). It can be implied that a relatively good outcome is in comparison to other children who have experienced the same risk, and will be termed "low-threshold resilience". The third way of defining resilience is based on the absence of psychopathology, such as not having schizophrenia or not abusing substances (Tiet et al., 1998). However, since this definition is usually used in regard to psychological disorders or substance abuse, I will not be using this definition in the current study because I am focusing on positive development.

These different definitions use separate comparison groups in conceptualizing resilience, which allows for children of varying competence to be classified as resilient and can have a variety of implications for child's current functioning and long-term outcomes. For example, if resilience is defined as merely doing better than others in similar risky environments, i.e. low-threshold resilience, these children are likely to have lower levels of functioning in comparison to resilient children who are thriving, or displaying high-threshold resilience. Indeed, this is what data from the 2013 National Assessment of Educational Progress demonstrate in regards to children's 4th grade math scores. Figure 1 illustrates math score distributions of both poor and non-poor children, with the shaded regions being one standard deviation above each subgroup's mean. This figure clearly shows that the number of children who demonstrate low-threshold resilience is much larger than the number children who display high-threshold resilience. Although a larger number of children might reach the threshold for low-threshold resilience than high-threshold resilience, this does not guarantee that those children will have the skills necessary to succeed socially or academically. Indeed, if children

displaying low-threshold resilience have significantly lower skills than children displaying high-threshold resilience then they could still be at risk for future negative outcomes. Thus, studies that use low-threshold resilience have a lower bar for low-income children. Children who reach low-threshold resilience may exhibit similar levels of functioning as children with high-threshold resilience. This would mean that children who are displaying positive outcomes in comparison to children in similar risky environments are functioning on the same level as children not experiencing risk and are likely to have future positive development. An investigation of this topic will illuminate who should be used as the comparison group in defining resilience to promote long-term functioning in children experiencing poverty.

My first goal is to operationalize resilience, in other words, to decide what comparison group to use in defining resilience. To do so, I will contrast two ways of defining resilience. First, I will define resilience as positive adaptation in comparison to the children not experiencing poverty (i.e. half of a standard deviation above the entire mean) and I will call this "high-threshold resilience." The second way I will define resilience is positive adaptation in comparison to other children at-risk (i.e., half of a standard deviation above other children at-risk) and I will call this "low-threshold resilience." To determine which threshold is a better way of defining resilience I will link preschool resilience to later kindergarten outcomes. At preschool, resilience will be based on displaying either high social skills or math abilities or literacy abilities (i.e. half of a standard deviation above the mean). In other words, children will be classified as resilient or not for each of their social and cognitive abilities. Kindergarten outcomes will be

operationalized as social skills, behavior problems, math abilities, and literacy. I hypothesize that high-threshold resilience during preschool will relate to significantly higher levels of achievement and social-emotional functioning in kindergarten than will low-threshold resilience.

PROTECTIVE FACTORS AS SOURCES OF RESILIENCE

Poverty is associated with many risks, as mentioned earlier, and these risks are not mutually exclusive. This accumulation of risks has been significantly correlated to negative child outcomes and can have lasting negative effects on development (Abelev, 2009; Yoshikawa et al., 2012). The current study focuses on the risk of experiencing poverty because poverty has negative impacts on children's development and is a marker for the likelihood of experiencing multiple risks. Children who display positive development amidst these hazardous environments tended to have protective factors at the individual-, family-, and community-level that buffered some of the risks (Garmezy, 1993; Gutman & Midgley, 2000; Luthar et al, 2000; Rak & Patterson, 1996; Werner, 1989).

Protective factors increase resilience in children in high-risk environments, and moderate risk effects (Cooper et al., 2013; Li et al., 2007; Luthar et al., 2000; Masten, 2014). A protective factor is positively correlated with positive outcomes only among high-risk groups (Gutman et al., 2003; Masten, 2014). It is important to distinguish these variables because protective factors would be uniquely beneficial to children from high-risk environments, such as poverty, and therefore would be important to target for intervention programs. Protective factors occur at multiple socio-ecological levels and

resilience is optimized when several variables are present (Zolkoski & Bullock, 2012). Thus, this study will investigate protective factors at the individual-, family-, and community-level in an attempt to identify which are most beneficial to children in poverty.

Individual-level protective factors

Researchers have identified a wide variety of personal characteristics that promote resilience. These include social competence or sociability, problem-solving, self-regulation, autonomy or independence, optimism, self-efficacy, high self-esteem, at least average IQ, and good temperament (Abelev, 2009; Fluori et al., 2014; Garmezy, 1993; Horning & Gordon Rouse, 2002; Masten & Coatsworth, 1998; Masten & Obradovic, 2006; Rak & Patterson, 1996; Zolkoski & Bullock, 2012). Within the current study, I will focus on children's socio-emotional (self-regulation and attachment) and cognitive (vocabulary) resources for individual-level protective factors.

Self-regulation refers to the processes that manage one's emotional and behavioral responses to an event (Eisenberg et al., 2010). Thus, if a child has high self-regulation then when faced with adversity, in theory, the child should be able to control their emotions and behaviors to display an appropriate response. Indeed, self-regulation has been cited as a key protective factor in promoting resilience, and is linked to both positive social and academic outcomes (Eisenberg et al., 2010; Fluori et al., 2014; Zolkowski & Bullock, 2012).

Attachment refers to the bond created between an infant and their caregiver and secure attachment is symbolized by a child who freely explores their environment but

will turn to their caregiver for comfort and security when distressed (Sroufe et al., 2005). Additionally, children with secure attachment develop an internal working model that their caregiver will reliably and appropriately assist them in stressful situations and in turn, they are more confident in their own regulation capabilities (Sroufe et al., 2005). These internal working models should apply to other situations, such that children with secure attachment are better able to regulate themselves and bounce back after a stressful situation. Also, children with secure attachment should be more willing to explore new social interactions and appropriately navigate those interactions. Indeed, secure attachment has most commonly been correlated to social competence and self-regulation; however there is some evidence that attachment can be protective in regards to language skills (Belsky & Pasco Fearon, 2002; Sroufe et al., 2005; Zolkowski & Bullock, 2012).

Lastly, a child's verbal ability would be helpful in a variety of situations. In regards to academic outcomes, better verbal ability should mean the child is able to better understand what is required of them and to communicate if they need assistance. For social outcomes, better verbal abilities should allow children to more easily navigate social situations. Indeed, verbal cognitive ability has been found to be protective among children in poverty in regards to later emotional and behavioral outcomes (Fluori et al., 2014).

Family-level protective factors

A range of family-level characteristics have been found to promote resilience in economically disadvantaged children. Within the ECLS-B data set, I will focus on two commonly studied parenting variables, responsiveness and parental investment, for

family-level protective factors. Parental responsiveness is characterized by parental sensitivity, acceptance, cooperation, and accessibility (Ainsworth et al., 1971). Parents who are highly responsiveness provide more consistent and warm responses to their children, which promote positive development. Indeed, children who are resilient tend to have authoritative parents who exhibit supportive, sensitive, warm, and nurturing parenting behaviors (Abelev, 2009; Horning and Gordon Rousee, 2002; Masten & Coatsworth, 1998; Myers & Taylor, 1998; McLoyd, 1998; Zolkoski & Bullock, 2012). Additionally, parents who are highly responsive are more likely to foster a secure attachment style with their children, thereby increasing the likelihood of positive social development (Sroufe et al., 2005). Parental investment is the ability of the parent to provide a cognitively stimulating environment for their child, such as purchasing books or reading to their child (Gershoff et al., 2007). Parental investment has more commonly been related to children's cognitive development than social-emotional outcomes, with higher investment being associated with more positive outcomes (Gershoff et al., 2007; Guo & Harris, 2000).

Community-level protective factors

Several community-level protective factors have been shown to support children and families in poverty, such as religious organizations and neighborhood quality (Anthony, 2008; Garmezy, 1993; Orthner et al., 2004; Werner, 1989; Zolkoski & Bullock, 2012). Werner (1989) found that resilient adolescents tended to have a religious connection, and Garmezy (1993) suggested institutions, such as churches, could act as an external support figure. Similarly, maternal religious involvement could be proxy for an

external support network for parents. Indeed, mothers with higher religious participation tended to have lower parenting stress and likelihood of using corporal punishment while also being more involved (Petts, 2012). Neighborhood factors, such as cohesion and connection, can also offer support to families in poverty and contribute to a sense of neighborhood safety (Orthner et al., 2004). Neighborhood quality could also be an indicator of the number of resources offered to children to promote positive development. In this line of thought, a higher quality neighborhood would provide greater support and could have more resources. This study will explore maternal religious involvement and neighborhood quality to reflect community-level protective factors.

Previous research on resilience has not distinguished which individual-, family-, or community-level protective factors are most important for promoting positive social, emotional, and cognitive development in the context of growing up in poverty or how protective factors co-occur. Thus my final two research questions will investigate different ways of modeling resilience.

MODELING RESILIENCE

Although previous research has identified protective factors various levels, we do not know whether the quantity or quality of protective factors is more important for promoting resilience (Sameroff et al., 1987; Luthar et al, 2000). In other words, we do not know if it is more beneficial to have a lot of any protective factors or if it is more beneficial to have specific protective factors in order to promote resilience. This study will investigate several ways of characterizing protective factors. First, there is a cumulative index model. Rutter (1979) found that the number of risk factors, instead of

any particular risk, was more predictive of negative outcomes (Brooks-Gunn & Duncan, 1997; Garmezy, 1993; Sameroff et al., 1987). A cumulative risk index, which counts the number of risk factors, has been predictive of children's negative outcomes (Roy & Raver, 2014; Gutman, Sameroff, & Eccles, 2002, Sameroff et al., 1987). Similarly, a cumulative index model of protective factors would count the number of protective factors present. However, a cumulative index model does not illuminate which protective factors might be most important in promoting resilience or how protective factors might co-occur.

A second way of characterizing protective factors is to use an individual factor model, which includes each protective factor as continuous variables. In using an individual factor model, we are able to investigate which protective factors might be the driving force in promoting resilience. In comparison to a cumulative index model, an individual factor model is able to provide the relative influence of each protective factor when they are all present. Yet an individual factor model still does not provide information on how protective factors naturally co-occur.

Lastly, latent profile analysis (LPA) takes a person-centered approach to modeling resilience. A person-centered approach identifies different groups of children who experience similar patterns of protective factors, thereby illustrating how protective factors naturally co-occur to promote resilience. In a similar methodological approach, Roy and Raver (2014) used LCA to model different poverty-related risks and found that different configurations of co-occurring risks were related to different levels of

functioning. Thus the current study will use LPA to model different profiles of protective factors among children in poverty.

My second and third research questions will focus on the different approaches to modeling protective factors. The second research question compares a cumulative index model to an individual factor model in predicting whether a child will display low-threshold resilience or high-threshold resilience (i.e. Figure 1). Specifically, what protective factors boost children above the low-threshold and what protective factors further boost children above the high-threshold? Drawing upon research, I hypothesize that vocabulary, self-regulation, attachment, parental responsiveness, and maternal religious attendance will be related to social-emotional resilience and vocabulary, parental investment, and neighborhood quality will be associated with academic resilience whereas a cumulative model will just show more protective factors are better. I do not have a hypothesis on whether a cumulative index model or individual factor model will differentially predict displaying low-threshold or high-threshold resilience. My third research question is how do protective factors co-occur among children in poverty and how do profiles of protective factors relate to children's resilience? This question is more exploratory in nature and therefore I do not have a hypothesis.

THE CURRENT STUDY

This study examined how different protective factors can promote resilience and what standards should be used in classifying resilience in order to increase the likelihood of continual positive development. Data were drawn from a nationally representative sample from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B). Risk and

protective factors were assessed at 2 years, resilience was defined based on social-emotional skills at 4 years, and outcomes were assessed at kindergarten. I examined associations between preschool resilience and kindergarten outcomes to assess the utility of having different thresholds of resilience before investigating relationships between protective factors and preschool resilience. The current study investigated three research questions:

1. How does using different comparison groups (i.e. children at-risk or the entire sample) to operationalize resilience at preschool relate to later kindergarten outcomes? I hypothesized that high-threshold resilience at preschool would predict significantly higher levels of achievement and social-emotional skills in kindergarten than low-threshold resilience.
2. What information is gained on children's likelihood of displaying resilience from using an individual factor model (i.e. a model of each protective factor) versus a cumulative index model of protective factors?
    a. Does a cumulative index model of protective factors discriminately predict whether children reach low-threshold or high-threshold resilience? I do not have a hypothesis regarding whether a cumulative index model or individual factor model will differentially predict displaying low-threshold or high-threshold resilience; this question is exploratory.
    b. Which protective factors, at the individual-, family-, and community-level, differentially predict whether a child will display low-threshold resilience or high-threshold resilience? Specifically, what protective factors boost

children above the low threshold and what protective factors further boost children above the high threshold? I hypothesize that vocabulary, self-regulation, attachment, parental responsiveness, and maternal religious attendance will be related to social-emotional resilience and vocabulary, parental investment, and neighborhood quality will be associated with academic resilience. In comparing the two models, I hypothesize that different protective factors will predict different categorizations of resilience (i.e. social skills, mathematics, literacy) whereas that a cumulative model will just show more protective factors are better.

3. How do protective factors co-occur among children in poverty and how do profiles of protective factors relate to children's resilience? Due to the exploratory nature of the third research question I do not have a hypothesis.

Chapter 3: Method

DATA SOURCE

The Early Childhood Longitudinal Study-Birth Cohort (ECLS-B) is nationally representative sample of approximately 10,700 children born in 2001. Data were collected when the children were 9 months, 2 years, about 4 years, and during kindergarten, which included two waves. The ECLS-B oversampled for twins, low and very low birthweight children, American Indian and Alaskan Native children, Chinese children, and Asian and Pacific Islander children. The sample of children was selected from 96 core primary sampling units (PSUs), which represented all children born in 2001 in the United States. An additional 18 PSUs from areas with a higher percentage of American Indian and Alaskan Native births were selected to support the oversampling of these populations. Children were excluded if they had been adopted, had died, or had mothers less than 15 years when the child was born. (National Center for Education Statistics, 2009).

The ECLS-B collected direct and indirect assessments from primary caregivers, resident and nonresident fathers, childcare providers, teachers, and school administrators. The child's biological mother was the primary caregiver respondent when possible, however primary caregivers could be a father, grandparent, stepparent, foster parent, adoptive parent, another relative, or a guardian (National Center for Education Statistics, 2009). The current study uses the parent interview, the parent self-administered questionnaire, the child care provider interview, the teacher interview, child assessments, and parent-child observation.

SAMPLE

The current study utilized data from the 2 year (2003-04), 4 year (2005-06), and fall of 2006 kindergarten waves. Parent interviews from biological mothers were selected to maintain continuity in the respondent's relationship to the child and final wave 94% of primary caregivers were biological mothers (National Center for Education Statistics, 2009) (n = 9,550). The current study used the 185% income-to-needs ratio in specifying poverty because these children live in low-income households and qualify for some welfare programs, such as reduced-price lunch (n = 4,500). Children had to have a valid longitudinal sample weight to adjust for nonresponse and sampling techniques in order to maintain national representativeness (n = 2,750). Finally, children had to have been in kindergarten at the 2006 wave. The final sample used for analysis is n = 2,050. The descriptive statistics of the weighted sample can be found in Table 1.

Covariates

Certain variables at the child and family level were controlled for in order to decrease demographic variability. Specifically, at the child-level age, gender, and ethnicity and at the parent-level maternal age, marital status, education, depression, country of birth, and household size were used as covariates.

PROTECTIVE FACTORS

There are continuous and dichotomous versions of each protective factor to be used in the different methodological approaches. The latent profile analysis and individual factor model utilized the continuous version, whereas the cumulative index required the use of dichotomized variables. The weighted descriptive statistics of

protective factors can be found in Table 2. Correlations between protective factors, preschool resilience, and kindergarten outcomes are in Table 3.

Self-regulation

Interviewers used the Behavior Rating Scale-Research Edition to measure children's self-regulation during the Bayley Short Form- Research Edition (BSF-R) (Bayley, 1993). The BSF-R is a modified version of the Bayley Scales of Infant Development that assesses children's cognitive and psychomotor development (Bayley, 1993). The interviewer rated children on 11 items that were considered developmentally appropriate and representative of children at 2 years (Andreassen & Fletcher, 2007). Interviewers received comprehensive training on the full range of behaviors for each item (Nord et al., 2006). At 2 years, four items were used to form a composite of self-regulation ($\alpha = 0.87$). The items assessed attention to task, persistence, cooperation, and frustration on a five-point Likert scale. Similar constructs have been used to measure self-regulation (Morgan et al., 2009; Raikes et al., 2007). A dichotomous variable was created based on one standard deviation above the mean to signify high self-regulation.

Attachment style

Attachment security was measured by using the Toddler Attachment Sort-45(TAS-45), a shorted version of the Attachment Q-sort, and is completed by the interviewer during the home visit (Waters & Deane, 1985). In the TAS-45, interviewers sorted 45 items, consisting of descriptions of children's behaviors, into four about equally sized piles based on how characteristic the behavior was of the child (Nord et al., 2006). Additionally, this procedure was done on a laptop application after the 2 hour home visit

(Nord et al., 2006). Coders had to score at least 80% on quiz modules in order to pass training (for detailed information on training and laptop application creation see Andreassen & Fletcher, 2007). Toddlers were classified into four different attachment styles (i.e. secure, avoidant, ambivalent, and disorganized). Similar to other research, attachment styles were dichotomized into securely attached (1) and insecurely attached (0) (Zaslow et al., 2008).

Child vocabulary

At 2 years, primary caregivers were asked if children recognized 50 different vocabulary words. The vocabulary list was created from the MacArthur Communicative Development Inventory (M-CDI) according to the original author's suggestions (Nord et al., 2006). The number of words was available as a continuous score; a dichotomous variable was also created based on one standard deviation above the mean (1 = 40 or more words).

Parental responsiveness

Parent responsiveness was assessed at 2 years by direct observations during the Two Bags Task. Three parent behaviors, sensitivity, stimulation of cognitive development, and positive regard, were used to create a composite of parental responsiveness ($\alpha = 0.81$). Parental responsiveness was based on parent's responses to children's cues and how well the parent tuned-in to children's needs and behaviors (Nord et al., 2006). Parental stimulation of cognitive development reflected parent's teaching ability "to enhance perceptual, cognitive, and language development" by matching children's capabilities (Nord et al., 2006, p. 114). Lastly, parental positive regard

assessed parent's love and admiration for their child through the way they listen and attentively watch their child, use warm tones, and praise their child (Nord et al., 2006). Coder reliabilities ranged from 95.06 to 97.33, which exceeded the 90% agreement reliability (Nord et al., 2006). Additionally, a dichotomous variable was created to signify high responsiveness and was based on one standard deviation above the mean.

Parental investment

A composite of parental investment was created based on 15 items rated by caregivers ($\alpha = 0.72$). These items included questions relating to how parents used the library (read books, get parenting info), if parents talk to their child while working at home, how parents utilize TV programing to interact together (sing along, do activities), how often parents do home activities (sing or read), and how often parents do outside activities (go to the zoo or the library). Each item was rescored to a two-point scale, with 1 being more often. A dichotomous variable based on one standard deviation above the mean was created to reflect high parental investment.

Religious involvement

Primary caregivers were asked how often they attended religious services during the past year. Responses ranged from "never or almost never" (0) to "several times a week" (4). Additionally, a variable was created to measure high religious involvement (1 = "several times a month" to "several times a week") or lower involvement (0 = "never or several times a year").

Neighborhood quality

At 2 years, primary caregivers were asked "How would you rate your neighborhood as a place to raise children?" Responses were recoded on a five-point scale, from 1 = poor to 5 = excellent. Also, a dichotomous variable was created based on high quality (1 = good or excellent) or lower quality (0 = poor to average).

PRESCHOOL RESILIENCE

For each type of resilience, low-threshold was operationalized as one half of a standard deviation above the mean for children in poverty, whereas high-threshold was one half of a standard deviation above the mean for children not in poverty.

Social Skills

At the 4 year interview, preschool teachers and parents were asked often children engage in a variety of positive behaviors (e.g. child pays attention, comforts others,). Parent and teacher responses were coded on a 5-point Likert scale (1 = never to 5 = very often). Items either were directly from or modified from the Social Skills Rating System (SSRS) or the Preschool and Kindergarten Behavior Scales-Second Edition (PKBS-2) (Snow et al., 2007). A composite was generated from the averaged parent and teacher responses ($\alpha = 0.83$). Parent and teacher responses were averaged due to the limited number of preschool teacher responses on children's positive behaviors, and missing data were replaced with parent reports (Gershoff et al., 2007). The correlations between parent and teacher reports of specific behaviors were close to 0.2 per item. Although not strongly correlated, parent and teacher scores were averaged because about 35% of the

sample would be lost if only teacher reports were used. All models will control for whether an average score or only parent reports were used.

Mathematics Ability

A direct mathematics assessment was completed at 4 years, and included 28 items across five domains: number sense, geometry, counting, operations, and patterns (Snow et al., 2007). The mathematics assessment included a core set of items, and two alternative forms (easy and hard items), to match questions to children's ability (Snow et al., 2007). The overall reliability for the math IRT was 0.88.

Literacy

At 4 years, children completed a direct assessment on emergent literacy, which included 37 items from six domains: letter recognition, letter sounds, early reading, phonological awareness, knowledge of print conventions, and matching word (Snow et al., 2007). Literacy scores were based on item response theory (IRT), which allows comparisons between children's scores regardless of the assortment of items received (Snow et al., 2007). The overall reliability for the literacy IRT was 0.81.

KINDERGARTEN OUTCOME VARIABLES

Social skills

At the 2006 Kindergarten wave, teachers reported on how often children engaged in the same positive behaviors on a 5-point scale. Items were directly from or modified from the Social Skills Rating System (SSRS) or the Preschool and Kindergarten Behavior Scales-Second Edition (PKBS-2) (Snow et al., 2007). A composite was generated based on eight items ($\alpha = 0.89$).

Behavior Problems

Teachers reported on how often children engaged in the same negative behaviors on a 5-point scale at the 2006 Kindergarten wave. Items were directly from or modified from the Social Skills Rating System (SSRS) or the Preschool and Kindergarten Behavior Scales-Second Edition (PKBS-2) (Snow et al., 2007). A composite was generated based on seven items ($\alpha = 0.83$).

Mathematics Ability

At the 2006 Kindergarten wave, children were directly assessed on their mathematic abilities, based on five domains: (1) number sense, properties and operations, (2) measurement, (3) geometry and spatial sense, (4) data analysis, statistics, and probability, and (5) patterns, algebra, and functions (Snow et al., 2009). Again, children were assessed across two stages, a routing phase and a supplementary form based on their abilities. The overall reliability for math IRT was 0.92.

Literacy

A direct assessment was taken of children's early reading skills, based on language and literacy domains: basic skills, initial understanding, developing interpretation, demonstrating a critical stance, and vocabulary at the 2006 Kindergarten wave (Snow et al., 2009). Children were assessed in two stages, first a routing test and then a supplementary form based on their abilities. IRT scores were used to measure reading abilities and had an overall reliability of 0.92.

ANALYTIC STRATEGY

Data were weighted to account for oversampling and stratified clustering and therefore reflected a nationally representative group of children born in 2001. Additionally, I conducted analyses using Mplus 7.1 and used FIML to account for missing data (0.05% for parent investment or maternal religious involvement to 30% for kindergarten social skills) (Muthén & Muthén, 2013).

I defined resilience in two ways: "high-threshold resilience" is positive adaptation in comparison to children not experiencing poverty (i.e. half of a standard deviation above children whose families are not in poverty), whereas "low-threshold resilience" is positive adaptation in comparison to other children at-risk (i.e. half of a standard deviation above other children at-risk). Additionally, "low-threshold resilience" was limited to children who are exclusively in the lower threshold, in other words children below "high-threshold resilience". Resilience at preschool was defined as displaying either high social skills or math abilities or literacy abilities (i.e. half of a standard deviation above the mean). I examined how different thresholds of resilience predicted kindergarten outcomes first in order to investigate if high-threshold resilience was related to significantly better outcomes than low-threshold resilience. If there were differences between low-threshold and high-threshold resilience based on different classifications (i.e. social skills, mathematics, and literacy) in predicting kindergarten outcomes, then I did analyses of the extent to which different models of protective factors differentially predicted low or high thresholds of resilience.

Chapter 4: Results

Predicting Kindergarten Outcomes Based on Different Thresholds of Resilience

Linear regressions were conducted to test whether or not displaying different thresholds of resilience at preschool related to children's kindergarten outcomes (social skills, behavior problems, mathematics, and literacy). The number of children who displayed resilience varied by how it was measured. When measured by math skills, 200 children displayed high-threshold resilience and 400 displayed low-threshold resilience. For literacy, 150 children displayed high-threshold resilience and 350 displayed low-threshold resilience. Lastly, 500 children display high-threshold resilience when measured as social skills and 200 displayed low-threshold resilience.

Social Skills Resilience

For models in which resilience was classified based on preschool social skills, we controlled for behavior problems, mathematics, and literacy at preschool, in addition to previously listed control variables, in order to test the unique association of social skills resilience with kindergarten outcomes and how each variable changed from preschool to kindergarten. Low-threshold resilience at preschool was not significantly related to any kindergarten outcomes, but high-threshold resilience at preschool was significantly associated with an increase in social skills at kindergarten ($\beta = 0.09$, $p < 0.05$). Additionally, high-threshold resilience in comparison to low-threshold resilience was related to an increase in social skills ($\beta = 0.10$, $p < 0.05$; see Table 4).

Mathematics Resilience

For models in which resilience was based upon preschool mathematics, we controlled for social skills, behavior problems, and reading to assess how each variable changed from preschool to kindergarten and the distinct influence of academic-math resilience on kindergarten outcomes. Low-threshold resilience was significantly related to a decrease in behavior problems (β = -0.06, $p < 0.001$) and an increase in mathematics (β = 0.16, $p < 0.001$) and literacy (β = 0.13, $p < 0.001$) at kindergarten. High-threshold resilience was marginally associated with an increase in social skills ((β = 0.10, $p < 0.05$) and significantly related to an increase in mathematics (β = 0.10, $p < 0.05$) and literacy (β = 0.10, $p < 0.05$). In comparison to low-threshold resilience, high-threshold resilience was also significantly related to an increase in behavior problems (β = 0.10, $p < 0.05$) and mathematics (β = 0.08, $p < 0.05$) at kindergarten (see Table 5).

Literacy Resilience

For models examining literacy resilience, we controlled for social skills, behavior problems, and mathematics at preschool. Low-threshold resilience was significantly associated with an increase in mathematics (β = 0.08, $p < 0.001$) and literacy (β = 0.10=7, $p < 0.001$) from preschool to kindergarten, whereas high-threshold resilience was marginally related to an increase in mathematics (β = 0.05, p = 0.07) and significantly related to an increase in literacy (β = 0.07, $p < 0.05$). High-threshold resilience, when compared with low-threshold resilience, was significantly related with an increase in literacy (β = 0.10, $p < 0.05$; see Table 6).

PREDICTING PRESCHOOL RESILIENCE BASED ON A CUMULATIVE INDEX MODEL

To assess the relation between a cumulative protective index and children's resilience, two models were estimated using multinomial logistic regressions, one predicting high-threshold and the second predicting low-threshold resilience. A multinomial logistic regression was chosen over an ordinal logistic regression because the differences between a lack of resilience, low-threshold resilience, and high-threshold resilience might not necessarily be the same. Two models were run for each classification of resilience (i.e. social skills, mathematics, and literacy) in which one model used children who did not display resilience as the referent group, while the second model used low-threshold resilience as the referent group so comparisons could be made between low-threshold and high-threshold resilience. The number of children who had each specific protective factor varied substantially (see Table 2)

Social Skills Resilience

The cumulative protective factor index was significantly related to high-threshold preschool social skills resilience but not low-threshold resilience. For each additional protective factor, children were 26% more likely to display high-threshold resilience ($p < 0.01$), whereas children were only 2% more likely to display low-threshold resilience (NS). In comparison to low-threshold resilience, the cumulative index model was significantly associated with children displaying high-threshold resilience (OR = 1.23, $p < .01$).

Mathematics Resilience

In regard to resilience as defined by preschool mathematics, the cumulative protective factor index was significantly related to both low-threshold and high-threshold resilience. Children were 32% more likely to display low-threshold resilience ($p < 0.001$) and 34% more likely to display high-threshold resilience for each additional protective factor. The cumulative index model did not significantly differentiate whether a child would display low-threshold or high-threshold resilience (OR = 1.01, NS).

Literacy Resilience

The cumulative index model was significantly related to both low-threshold and high-threshold resilience when based on preschool literacy skills. For each additional protective factor, children were 18% more likely to display low-threshold resilience and 35% more likely to display high-threshold resilience. The cumulative index model did not significantly differentiate between low and high thresholds of resilience (OR = 1.15, NS).

Predicting Preschool Resilience Based on an Individual Factor Model

The next aim of this study was to examine how each protective factor (i.e. vocabulary, self-regulation, secure attachment, parenting sensitivity, parental investment, neighborhood quality, and religious involvement) relates to the likelihood children display high-threshold or low-threshold resilience. For each classification of resilience (i.e. social skills, mathematics, and literacy), I ran two multinomial logistic regressions, with either a lack of resilience or low-threshold resilience as the referent group. In the

multinomial regressions, protective factors at age 2 were used to predict resilience classification.

Social Skills Resilience

When resilience was classified based on preschool social skills, no factors were significantly associated with low-threshold resilience, however parent responsiveness (OR = 1.43, $p = 0.07$) and maternal religious attendance (OR = 1.17, $p = 0.08$) were marginally related to an increase in the likelihood of displaying low-threshold resilience (Table 7). Vocabulary was significantly related to an increase in displaying high-threshold resilience (OR = 1.05, $p < 0.001$) whereas parent responsiveness was marginally related to high-threshold resilience (OR = 1.20, $p = 0.09$). In comparison to low-threshold resilience as defined by social skills, high-threshold resilience was significantly predicted by vocabulary (OR = 1.05, $p < 0.001$) and significantly negatively predicted by religious attendance (OR = 0.80, $p < 0.05$). Hypotheses were only partially supported as vocabulary was the only significant predictor of high-threshold resilience.

Mathematics Resilience

In regards to classifying resilience based on preschool mathematics ability, vocabulary (OR = 1.02, $p < 0.05$), self-regulation (OR= 1.10, $p < 0.001$), and parent responsiveness (OR = 1.52, $p < 0.001$) were significantly predictive of low-threshold resilience (Table 8). Vocabulary (OR = 1.04, $p < 0.01$) and self-regulation (OR = 1.19, $p < 0.001$) were significantly related to high-threshold resilience. As compared to low-threshold resilience, no factors significantly predicted high-threshold resilience. In other words, no protective factors were significantly related to boosting children above the high

threshold after they had surpassed the lower threshold. Hypotheses were partially supported as vocabulary was related to preschool resilience, but no other predicted factors were significantly related to resilience.

Literacy Resilience

When resilience was classified based on preschool literacy, vocabulary (OR = 1.02, $p < 0.05$) and neighborhood quality (OR = 1.20, $p < 0.05$) were significantly related to low-threshold resilience (Table 9). For high-threshold resilience, self-regulation (OR = 1.16, $p < 0.001$), parent responsiveness (OR = 1.80, $p < 0.001$), and neighborhood quality (OR = 1.26, $p < 0.01$) were significant predictors. In comparison to low-threshold resilience, self-regulation (OR = 1.12, $p < 0.05$) was significantly associated with high-threshold resilience, whereas parent responsiveness was marginally related (OR = 1.49, $p = 0.08$). Hypotheses were somewhat supported as vocabulary and neighborhood quality were related to resilience, however parental investment was not.

IDENTIFYING LATENT PROFILES OF PROTECTIVE FACTORS

In order to identify patterns of protective factors at age 2, the 7 protective factors were included in a latent profile analysis (LPA) in Mplus. LPA proceeds by comparing each model with successively more complex models. The Bayesian Information Criterion (BIC), adjusted BIC (ABIC) and the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMR-LRT) are used to determine the number of classes that best fit of the model to the data (Nylund et al., 2007). Additionally, classes need to contain at least 1% of the sample (Jung & Wickrama, 2008). A better fitting model would result in a decreased BIC and ABIC and an LMR-LRT below 0.05 when comparing K classes versus K-1 classes (i.e.

the second model would be a significant improvement from the first model). Another method used to determine model fit is based on a line graph of the BIC and ABIC values and assessing for where the values leveled off.

The BIC, ABIC, and LMR-LRT values can be found in Table 10. Four profiles provided the best model fit with a significant LMR-LRT and lower BIC and ABIC than the three profile model (see Table 10). Although the five profile model had a lower BIC and ABIC than the four profile model, the LMR-LRT was not significant, which supported using a four profile model.

Figure 2 illustrates the different configurations of protective factors across the four latent profiles. The first group was comprised of 14% of the sample. This group was termed “low protection & high religious” due to the low levels of individual-level, lower than average family-level, and high religious protective factors. The second group represented 20% of the sample and ranged from almost a full standard deviation to close to a quarter of a standard deviation lower on all protective factors. Due to the lack of protective factors this group was labeled “low protection”. The third group comprised of 36% of the sample, and due to the slightly higher values of individual-level protective factors and low religious involvement, the third group was named “moderate protection & low religious”. The final group represented 30% of the sample and had almost a quarter of a standard deviation to over a standard deviation higher than average across protective factors. Due to the high values of protective factors the fourth group was termed “high protection”.

PREDICTING RESILIENCE BASED ON LATENT PROFILES

After establishing four profiles of protective factors, the next aim of this study was to investigate whether the different latent profiles or protective factors at age 2 predicted whether children displayed high-threshold or low-threshold resilience at age 4. Unstandardized regression coefficients and the corresponding odds ratios are displayed in Tables 11-13. Two models were run for each classification of resilience (social skills, mathematics ability, and literacy). In the first model, multinomial logistic regressions identified whether different profiles of protective factors predicted whether or not children displayed low-threshold or high-threshold resilience in comparison to a lack of resilience. The second model of protective factor configurations predicted whether or not children displayed high-threshold resilience at age 4 in comparison to low-threshold resilience.

Social Skills Resilience

For resilience based on social skills, no profiles significantly predicted low-threshold resilience. In comparison to the "low protection" profile, children in the "moderate protection and unreligious" and "high protection" profiles were 93% ($p < 0.01$) and 58% ($p = 0.06$) more likely to display high-threshold resilience, respectively (see Table 11). In comparison to children in the "low protection and religious" profile, children in the "moderate protection and unreligious" and "high protection" profiles were 96% ($p < 0.01$) and 60% ($p < 0.05$) more likely to display high-threshold resilience. In comparison to low-threshold resilience, the "moderate protection and unreligious" profile was 90% ($p < 0.05$) and 149% ($p < 0.05$) more likely to display high-threshold resilience

than the “low protection” and “low protection and religious” profiles, respectively. The “high protection” profile was 45% ($p < 0.05$) less likely the “moderate protection and unreligious” profile to display high-threshold resilience compared to low-threshold resilience. In sum, the “moderate protection and unreligious” and “high protection” profiles were related to an increased likelihood of displaying high-threshold resilience, however the “high protection” profile, in comparison to “moderate protection and unreligious” profile, was related to a lower likelihood of displaying high-threshold resilience compared to low-threshold resilience.

Mathematics Resilience

In comparison to the “low protection” profile, children in the “moderate protection and unreligious” and “high protection” profiles were, respectively, 101% ($p < 0.001$) and 93% ($p < 0.05$) more likely to display low-threshold resilience and were 208% ($p < 0.001$) and 212% ($p < 0.001$) more likely to display high-threshold resilience (see Table 12). In comparison to the “low protection and religious” profile, children in the “moderate protection and unreligious” and “high protection” profiles were 121% ($p < 0.01$) and 112% ($p < 0.05$) more likely to display low-threshold resilience and were 287% ($p < 0.001$) and 293% ($p < 0.001$) more likely to display high-threshold resilience, respectively. There were no significant differences between profiles in predicting high-threshold resilience from low-threshold resilience when based on mathematics ability. Overall, the “moderate protection and unreligious” and “high protection” profiles significantly predicted resilience; however they did not significantly predict a boost from low-threshold to high-threshold resilience.

Literacy Resilience

For resilience based on literacy, no profiles significantly predicted children displaying low-threshold resilience (see Table 13). In comparison to the "low protection" profile, children were 90% ($p = 0.09$) and 172% ($p < 0.01$) more likely to display high-threshold resilience in the "moderate protection and unreligious" and "high protection" profiles, respectively. Children in the "moderate protection and unreligious" and "high protection" profiles were, respectively, 141% ($p = 0.07$) and 245% ($p < 0.001$) more likely to display high-threshold resilience as compared with the "low protection and religious" group. In comparison to low-threshold resilience, children in the "high protection" profile were only marginally more likely to display high-threshold resilience as compared to the "low protection" (OR = 2.10, $p = 0.07$) and "low protection and religious" (OR = 2.44, $p < 0.06$) profiles. In sum, the "high protection" profile significantly predicted high-threshold resilience compared to not resilient and marginally predicted high-threshold resilience in comparison to low-threshold resilience as defined by literacy.

Chapter 5: Discussion

The negative effects of poverty on children's development are well documented (e.g. Berger et al., 2009). Nevertheless some children are able to overcome the odds and display resilience (Zolkoski & Bullock, 2012). There has been some debate on how to operationalize resilience and the implications for long-term outcomes (Masten, 2014). Additionally, some ways of modeling protective factors to predict resilience might be more informative than others. The current study investigated how different thresholds of defining resilience related to later outcomes and different approaches of modeling protective factors.

My first main finding was that different ways of measuring resilience at age 4 (i.e. social skills, mathematics, and literacy) were differentially related to whether children displayed positive outcomes in a single domain or multiple domains in kindergarten. For example, when defining resilience as children's social skills in preschool, reaching high-threshold resilience was a significant predictor of social skills in kindergarten whereas resilience defined as mathematics in preschool was associated with lower behavior problems and higher math and reading abilities in kindergarten. It seems that some ways of measuring resilience are more predictive of overall positive development, whereas others support a "skills beget skills" argument (Duncan et al., 2007). In other words, resilience as defined by social skills demonstrates a "skill beget skills" because it was associated with better social skills one year later. In contrast, resilience as defined by mathematics was associated with positive development in multiple domains one year later. One exception is that reaching high-threshold resilience, in comparison to low-

threshold resilience, was related to increased behavior problems. This unexpected finding could be an example of a floor effect. In other words, children who reach low-threshold resilience might have such a low amount of behavior problems that even the slight increase to high-threshold resilience is still a low amount of problem behaviors. Overall the way resilience is measured (i.e. social skills, mathematics, literacy) has implications for children's later development.

In regards to whether different thresholds of resilience are predictive of kindergarten outcomes, there was little evidence that reaching high-threshold resilience is significantly better for children than low threshold resilience except for the domain that resilience is measured by social skills. Thus, it appears that children must only be doing better than peers in similar risky environments in order to have continued positive outcomes one year later (Rutter, 2006). There could be several explanations as to why we did not find significant differences between high-threshold and low-threshold resilience at preschool in predicting kindergarten outcomes. First, we could have missed a more meaningful cut-off for defining different thresholds of resilience. Masten (2001) highlights the difficulty in defining resilience and how sociocultural context influences what researchers classify as positive development. Thus further investigation is warranted for exploring whether there are different levels of resilience and how this might influence future functioning. A second explanation for the lack of differences between high and low thresholds of resilience in kindergarten outcomes could be that resilience should be classified based on positive development in multiple domains instead of just one. Thus, reaching high-threshold resilience in domains might be more predictive of positive

development than reaching low-threshold resilience in a single domain. Indeed, researchers have debated whether or not resilience should be classified based on multiple systems or a single criterion (Luthar et al., 2000; Masten, 2001). Future research should explore how displaying resilience across multiple domains or a single domain and at varying levels relates to later developmental outcomes.

A second set of findings in this study concerned the utility of different models of protective factors in predicting resilience. The cumulative index model of protective factors differentially predicted high-threshold resilience from low-threshold resilience as classified as social skills, however it was not significantly better at predicting high-threshold resilience than low-threshold resilience for either cognitive outcome. In line with previous research, a cumulative index model was predictive of children's outcomes (Gutman, Sameroff, & Eccles, 2002; Sameroff et al., 1987), but it seems a cumulative index model is not as useful for differentiating between different levels of positive development. In comparison, the individual factor model provided information on which protective factors were most influential when all factors were present and on which protective factors were most beneficial for different classifications of resilience. Similar to the cumulative index model, the individual factor model provided limited results on differentiating between low and high thresholds of resilience. Thus by using an individual factor model, as compared with a cumulative index model, we are able to gain more information on which protective factors might be the most influential in promoting resilience in different domains. Previous research has illustrated that certain protective factors are more influential for certain domains of development (Masten, 2001). This

study extends on that work by examining protective factors at multiple ecological levels (i.e. individual, family, and community), and illustrating which protective factors are most influential for different conceptualizations of resilience (i.e. both low-threshold vs. high-threshold, and social skills, mathematics, and literacy).

The final aim of this study examined how different protective factors co-occur and whether different profiles of protective factors are associated with low-threshold or high-threshold resilience. Similar to previous person-centered approaches, we found that protective factors did co-occur and that specific profiles of these factors were related to different classifications of resilience (i.e. social skills, mathematics, and literacy) (Masten, 2001; Roy & Raven, 2014). Surprisingly, maternal religious involvement seemed to differentiate between clusters of protective factors. The "moderate protection and unreligious" profile was related to social skills resilience, whereas the "high protection" profile was related to literacy resilience and either of these profiles was related to mathematics resilience. Overall, the profiles with more protective factors were related to displaying either threshold of resilience and there was not a lot of evidence that LPA differentially predicted low-threshold or high-threshold resilience.

In reviewing all the approaches of modeling protective factors to predict resilience, I found that the individual factor model and LPA model were more informative than a cumulative risk index. While the cumulative risk index is a more conventional way of exploring how different factors, especially risk factors (Gutman, Sameroff, & Eccles, 2002; Roy & Raver, 2014), influence children's development and it provided the least information on how to promote resilience among children in poverty.

In contrast, an individual factor model demonstrated which protective factors are most associated with resilience and the LPA model illustrated how protective factors co-occur among children in poverty and specific profiles associated with resilience. Thus these two methods used together can inform future intervention research by providing information on what protective factors are likely to happen naturally and which protective factors might be the most useful to target with intervention efforts in order to promote positive development.

Although this study has several strengths, a few limitations should be taken into account when interpreting results. First, although seven protective factors were explored and at multiple socio-ecological levels, there are many more that could be influential in promoting resilience among children in poverty (Garmezy, 1998; Masten & Coatsworth, 1998; Zolkowski & Bullock, 2012). Though ECLS-B provided a nationally representative sample with longitudinal data, it did not collect information on all of the potential protective factors that could have promoted resilience. Future research should continue to investigate several protective factors at multiple socio-ecological levels to provide a more holistic future of how different contexts interact to promote resilience.

A second limitation of the current study is that poverty was the only risk factor considered. Poverty has many co-occurring risk factors and therefore children must overcome these risk factors in addition to poverty in order to be resilient (Abelev, 2009; Yoshikawa et al., 2012). Future work should investigate how protective factors and risk factors co-occur among children who later display resilience and how protective and risk factors interact to promote resilience.

Third, the current study was not able to assess long-term outcomes of displaying resilience at preschool. Differences between different thresholds of resilience might be more evident at later waves of development; however the ECLS-B only collected data after the transition to kindergarten. Future research should explore the long-term trajectories of children displaying different levels of resilience to see if thresholds are more meaningful for later outcomes.

Fourth, the selection of cut-offs for the thresholds of resilience warrants further investigation. Several researchers discuss the difficulties in selecting criteria for resilience (Luthar et al., 2000; Masten, 2001) and thus researchers should be more transparent about their criteria used for classifying resilience. Future research should continue to investigate the implications of different criteria for research both for short-term and long-term outcomes, while explicitly stating their cut-offs for different measures. This will allow for replication and expansion in future studies on resilience.

Fifth, there was very little evidence that the two resilience groups were clearly distinct in how they predicted future child skills, and when there was evidence, the odds ratios were small. This could be related to the idea that I missed a more meaningful cut-off for the resilience groups. Another possibility is that there are further factors contributing to the likelihood of displaying resilience that were not accounted for in the current study.

Despite these limitations, the current study provides several important contributions to research on resilience and provides ideas for future research. In this study, there was evidence that high-threshold resilience was not more beneficial for

children's long-term outcomes than low-threshold resilience and different ways of measuring resilience related to different kindergarten outcomes. Future research should continue to explore how different thresholds of resilience might relate to long-term outcomes (i.e. over a year later) and whether resilience across multiple domains is significantly better than resilience in a single domain for later outcomes. The current study also illustrated that combining multiple approaches to modeling protective factors provides a more nuanced and holistic perspective of resilience among children in poverty. Future work should continue to incorporate multiple methodologies but also incorporate how risk factors interact with protective factors to promote resilience among children in poverty. Finally, this study clearly defines different cut-offs used to protective factors and resilience. Future research should also explicitly state criterion used for classifying resilience so that comparisons can be made between studies and allow for successive work to build upon a clear definition of resilience.

Tables

Table 1. Weighted Sample Statistics for Low Income Subsample of ECLS-B (N = 2,050) at Age 2

	Mean (SD) or percent
Child characteristics	
Age (months)	24.60 (1.22)
Male	0.51
White	0.32
Black	0.22
Latino	0.40
Asian/other	0.07
Household characteristics	
Mother education	3.09 (1.34)
Mother age (years)	27.16 (5.99)
Mother depression	0.45 (1.01)
Mother born in U.S.	0.72
Parents married	0.50
Parents separated	0.04
Parents divorced	0.07
Parents widowed	0.01
Parents never married	0.40
Household size	4.80 (1.64)

Table 2. Means and Standard Deviations of Protective Factors at Age 2

	Mean (SD)	***Range***	***Proportion with Protective Factor***
Individual-Level			
Vocabulary	26.09 (12.00)	0-50	.20
Self-regulation	13.15 (3.67)	4-20	.18
Attachment security	0.54 (0.50)	0-1	.53
Family-Level			
Parent responsiveness	4.06 (0.85)	1.67-6.67	.17
Parent investment	5.00 (1.79)	0.5-11.98	.15
Community-Level			
Neighborhood quality	3.42 (1.19)	1-5	.22
Maternal religious attendance	1.40 (1.33)	0-4	.26

Table 3. Weighted Correlation Table.

	1	2	3	4	5	6	7	8
1. Preschool Social Skills	1							
2. Preschool Behavior Problems	-0.37	1						
3. Preschool Math Abilities	0.27	-0.21	1					
4. Preschool Literacy	0.25	-0.21	0.72	1				
5. KG Social Skills	0.28	-0.28	0.32	0.28	1			
6. KG Behavior Problems	-0.24	0.37	-0.14	-0.14	-0.56	1		
7. KG Math Abilities	0.26	-0.13	0.63	0.54	0.37	-0.19	1	
8. KG Literacy	0.2	-0.14	0.58	0.58	0.35	-0.21	0.76	1
9. Vocabulary	0.29	-0.15	0.25	0.21	0.22	-0.14	0.27	0.22
10. Self-Regulation	0.2	-0.22	0.25	0.18	0.16	-0.15	0.21	0.16
11. Secure Attachment	0.08	-0.15	0.13	0.06	0.1	-0.1	0.08	0.06
12. Parental Responsiveness	0.19	-0.09	0.21	0.24	0.11	**-0.02**	0.2	0.2
13. Parental Investment	0.05	-0.1	0.07	**0.04**	0.07	**-0.04**	0.08	0.06
14. Neighborhood Quality	**0.04**	-0.06	0.08	0.09	0.06	-0.06	0.11	0.09
15. Religious Involvement	**0.01**	-0.11	0.06	**0.02**	0.07	-0.09	0.06	0.05

Note. Bolded values are NS (i.e. all other values $p < .05$)

Table 3. Weighted Correlation Table continued.

	9	10	11	12	13	14	15
1. Preschool Social Skills							
2. Preschool Behavior Problems							
3. Preschool Math Abilities							
4. Preschool Literacy							
5. KG Social Skills							
6. KG Behavior Problems							
7. KG Math Abilities							
8. KG Literacy							
9. Vocabulary	1						
10. Self-Regulation	0.3	1					
11. Secure Attachment	0.14	0.39	1				
12. Parental Responsiveness	0.24	0.23	0.17	1			
13. Parental Investment	0.08	**0.03**	**0**	0.07	1		
14. Neighborhood Quality	0.07	0.09	0.1	0.13	**0.01**	1	
15. Religious Involvement	0.07	0.08	0.08	0.07	0.11	0.09	1

Note. Bolded values are NS (i.e. all other values $p < .05$)

Table 4. Results From Linear Regressions of Preschool Social Skills Resilience Predicting Kindergarten Outcomes

		Social Skills		Behavior Problems		Mathematics		Reading	
		B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Referent is not resilient	Low-Threshold	-0.16 (0.69)	-0.01	0.39 (0.55)	0.03	-0.20 (0.67)	-0.01	-0.52 (1.13)	-0.01
	High-Threshold	1.12 (0.46)*	0.09	-0.41 (0.35)	-0.04	0.96 (0.65)	0.04	-0.44 (0.79)	-0.02
Referent is low-threshold	High-Threshold	1.27 (0.61)*	0.10	-0.80 (0.54)	-0.07	1.16 (0.82)	0.05	0.08 (1.15)	0.00

Note. * $p < .05$.

Table 5. Results From Linear Regressions of Preschool Mathematics Resilience Predicting Kindergarten Outcomes

		Social Skills		Behavior Problems		Mathematics		Reading	
		B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Referent is not resilient	Low-Threshold	2.07 (0.70)	0.14	-0.67 (0.47)***	-0.06	3.80 (0.95)***	0.16	4.24 (1.13)***	0.13
	High-Threshold	1.63 (0.86)ǂ	0.08	0.95 (0.72)	0.06	6.30 (1.12)***	0.19	5.66 (1.49)***	0.12
Referent is low-threshold	High-Threshold	-0.44 (0.74)	-0.02	1.62 (0.66)*	0.10	2.50 (1.18)*	0.08	1.42 (1.33)	0.03

Note. . *** $p < .001$. * $p < .05$. ǂ $p < .10$.

Table 6. Results From Linear Regressions of Preschool Literacy Resilience Predicting Kindergarten Outcomes

		Social Skills		Behavior Problems		Mathematics		Reading	
		B (SE)	*β*	B (SE)	*β*	B (SE)	*β*	B (SE)	*β*
Referent is not resilient	Low-Threshold	0.23 (0.58)	0.02	0.00 (0.47)	0.00	2.09 (0.55)***	0.08	5.82 (1.08)***	0.17
	High-Threshold	-1.11 (1.24)	-0.05	-0.45 (0.57)	-0.03	1.89 (1.5)ǂ	0.05	9.40 (1.60)***	0.19
Referent is low-threshold	High-Threshold	-1.34 (1.3)	-0.06	-0.46 (0.54)	-0.03	-0.20 (1.04)	-0.01	3.57 (1.52)*	0.07

Note. . *** $p < .001$. * $p < .05$. ǂ $p < .10$.

Table 7. Results of Individual Protective Factors at Age 2 Predicting Social Skills Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Vocabulary	0.00 (0.01)	1.00	0.05 (0.01)***	1.05	0.04 (0.01)***	1.05
Self-Regulation	0.04 (0.03)	1.04	0.03 (0.03)	1.03	0.00 (0.03)	1.00
Secure Attachment	-0.32 (0.24)	0.73	-0.06 (0.18)	0.94	0.26 (0.26)	1.30
Parent Responsiveness	0.35 (0.19) ǂ	1.43	0.18 (0.11) ǂ	1.20	-0.17 (0.19)	0.84
Parental Investment	-0.08 (0.07)	0.92	0.02 (0.05)	1.02	0.10 (0.07)	1.11
Neighborhood Quality	0.06 (0.08)	1.06	0.07 (0.08)	1.07	0.01 (0.11)	1.01
Religious Attendance	0.16 (0.09) ǂ	1.17	-0.06 (0.06)	0.94	-0.22 (0.10)	0.80

Note. *** $p < .001$. ǂ $p < .10$.

Table 8. Results of Individual Protective Factors at Age 2 Predicting Mathematics Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Vocabulary	0.02 (0.01)*	1.02	0.03 (0.01)**	1.04	0.01 (0.01)	1.01
Self-Regulation	0.10 (0.03)***	1.10	0.17 (0.04)***	1.19	0.08 (0.05)	1.08
Secure Attachment	-0.23 (0.18)	0.80	0.03 (0.29)	1.04	0.26 (0.30)	1.30
Parent Responsiveness	0.42 (0.15)***	1.52	0.17 (0.14)	1.19	-0.25 (0.19)	0.78
Parental Investment	-0.04 (0.05)	0.96	0.00 (0.06)	1.00	0.03 (0.05)	1.03
Neighborhood Quality	0.04 (0.07)	1.04	-0.04 (0.09)	0.97	-0.08 (0.10)	0.93
Religious Attendance	-0.07 (0.06)	0.94	-0.03 (0.09)	0.97	0.04 (0.10)	1.04

Note. *** $p < .001$. ** $p < .01$. * $p < .05$.

Table 9. Results of Individual Protective Factors at Age 2 Predicting Literacy Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Vocabulary	0.02 (0.01)*	1.02	0.01 (0.01)	1.01	-0.01 (0.02)	0.99
Self-Regulation	0.04 (0.04)	1.04	0.15 (0.05)***	1.16	0.11 (0.05)*	1.12
Secure Attachment	-0.19 (0.24)	0.83	-0.22 (0.30)	0.80	-0.04 (0.25)	0.96
Parent Responsiveness	0.19 (0.16)	1.21	0.59 (0.20)***	1.80	0.40 (0.23) ǂ	1.49
Parental Investment	-0.06 (0.06)	0.94	0.01 (0.06)	1.01	0.07 (0.07)	1.07
Neighborhood Quality	0.18 (0.09)*	1.20	0.23 (0.09)**	1.26	0.05 (0.11)	1.05
Religious Attendance	-0.03 (0.06)	0.97	0.04 (0.11)	1.04	0.07 (0.12)	1.07

Note. *** $p < .001$. ** $p < .01$. * $p < .05$. ǂ $p < .10$.

Table 10. Model Fit Statistics for Latent Profile Analysis

	1 profile	2 profiles	3 profiles	**4 profiles**	5 profiles	6 profiles
Parameters	13	21	29	**37**	45	53
Entropy	--	0.66	0.75	**0.77**	0.76	0.79
AIC	95961	94668	94169	**93557**	93391	93292
BIC	96042	94798	94349	**93785**	93669	93619
ABIC	96000	94731	94256	**93668**	93526	93451
LRT	--	0.00	0.02	**0.03**	0.39	0.58

Table 11. Results of Latent Profiles Predicting Social Skills Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Profile 2 vs 1	0.26 (0.42)	1.29	-0.01 (0.31)	0.99	-0.27 (0.40)	0.76
Profile 2 vs 3	0.02 (0.34)	1.02	0.66 (0.25)**	1.93	0.64 (0.33)*	1.90
Profile 2 vs 4	0.42 (0.34)	1.53	0.46 (0.24) ǂ	1.58	0.03 (0.34)	1.04
Profile 1 vs 3	-0.24 (0.41)	0.79	0.67 (0.26)**	1.96	0.91 (0.43)*	2.49
Profile 1 vs 4	0.17 (0.38)	1.18	0.47 (0.22)*	1.60	0.30 (0.41)	1.36
Profile 3 vs 4	0.41 (0.29)	1.50	-0.20 (0.16)	0.82	-0.61 (0.30)*	0.55

Note. ** $p < .01$. * $p < .05$. ǂ $p < .10$.

Profiles: 1. Low protection & religious; 2. Low protection; 3. Moderate protection & unreligious; 4. High protection.

Table 12. Results of Latent Profiles Predicting Mathematics Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Profile 2 vs 1	-0.09 (0.34)	0.91	-0.23 (0.42)	0.80	-0.14 (0.52)	0.87
Profile 2 vs 3	0.70 (0.25)***	2.01	1.12 (0.39)***	3.08	0.43 (0.36)	1.53
Profile 2 vs 4	0.66 (0.27)*	1.93	1.14 (0.35)***	3.12	0.48 (0.35)	1.62
Profile 1 vs 3	0.79 (031)**	2.21	1.35 (0.41)***	3.87	0.56 (0.48)	1.75
Profile 1 vs 4	0.75 (0.36)*	2.12	1.37 (0.35)***	3.93	0.62 (0.45)	1.85
Profile 3 vs 4	-0.04 (0.19)	0.96	0.02 (0.28)	1.02	0.06 (0.31)	1.06

Note. *** $p < .001$. ** $p < .01$. * $p < .05$. Profiles: 1. Low protection & religious; 2. Low protection; 3. Moderate protection & unreligious; 4. High protection.

Table 13. Results of Latent Profiles Predicting Literacy Resilience at Age 4

	Referent is not resilient				Referent is low-threshold	
	Low-Threshold		High-Threshold		High-Threshold	
	B (SE)	OR	B (SE)	OR	B (SE)	OR
Profile 2 vs 1	-0.09 (0.35)	0.92	-0.24 (0.51)	0.79	-0.15 (0.59)	0.86
Profile 2 vs 3	0.21 (0.26)	1.23	0.64 (0.38) ǂ	1.90	0.44 (0.41)	1.55
Profile 2 vs 4	0.26 (0.30)	1.30	1.00 (0.37)**	2.72	0.74 (0.41) ǂ	2.10
Profile 1 vs 3	0.29 (0.38)	1.34	0.88 (0.48) ǂ	2.41	0.59 (0.55)	1.80
Profile 1 vs 4	0.35 (0.35)	1.42	1.24 (0.42)***	3.45	0.89 (0.47) ǂ	2.44
Profile 3 vs 4	0.06 (0.22)	1.06	0.36 (0.32)	1.43	0.30 (0.34)	1.36

Note. *** $p < .001$. ** $p < .01$. ǂ $p < .10$.

Profiles: 1. Low protection & religious; 2. Low protection; 3. Moderate protection & unreligious; 4. High protection.

Figures

Figure 1. Distributions of 4th grade math scores for poor and non-poor children in the NAEP

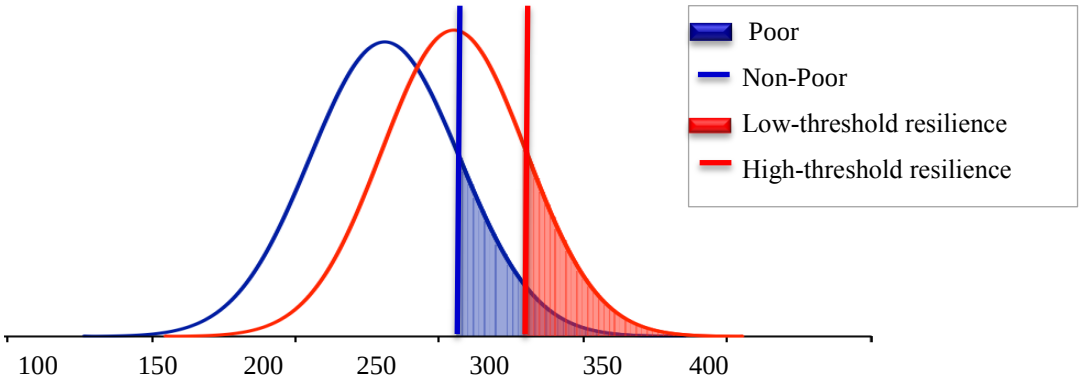
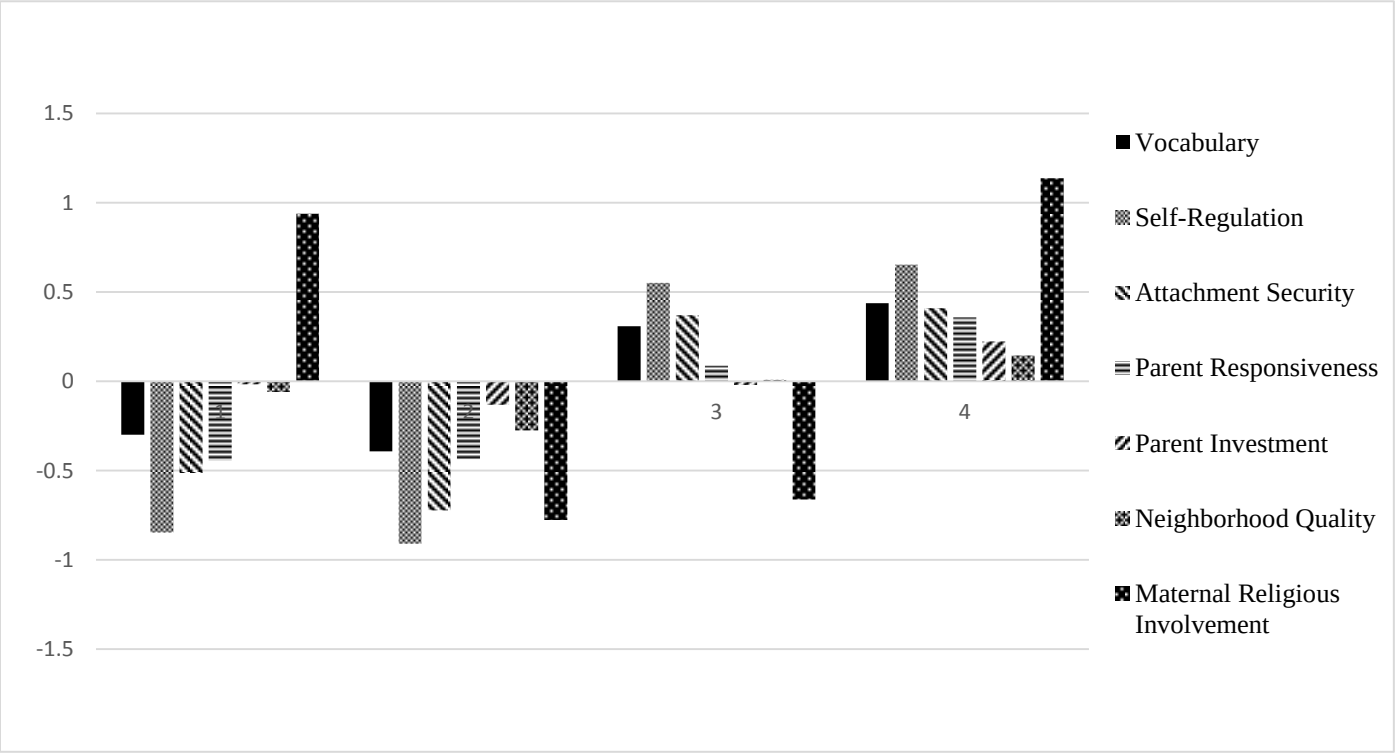


Figure 2. Latent profiles of protective factors

Profiles: 1. Low protection & religious; 2. Low protection; 3. Moderate protection & unreligious; 4. High protection



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