The Impact of Poverty-related Risks and Receipt of Multiple Public Assistance Programs on Early Child Cognitive Skills

A Thesis in
Human Development and Family Studies

by
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Research has found that receipt of public assistance programs can reduce the negative effects of targeted poverty-related risk factors on child developmental outcomes. Less research has been conducted on the effects of participating in various programs that are indirectly related to a broad array of poverty-related factors and child cognitive outcomes at school entry. We explore whether maternal participation in multiple public assistance programs during children’s infancy serves as a promotive or protective factor for children’s cognitive skills in kindergarten, when faced with high poverty-related risk factors (compared to families facing fewer risks). Among a sample of 2600 low-income children from the Early Childhood Longitudinal Study – Birth cohort (ECLS-B), multivariate results confirm that experiencing higher levels of risk is negative associated with children’s early reading and math skills. Maternal receipt of multiple public assistance programs during the child’s infancy is unable to serve as a promotive or protective factor. Discussion and policy implications focus on why multiple public assistance program receipt is unable to serve as promotive or protective factors and thus lessen the effects of poverty-related risks on early childhood cognitive skills.
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Chapter 1

Introduction

In the fall of 2011, the U.S. Census Bureau reported that 46.2 million individuals (15%) lived below the poverty line in 2010. The percentage of individuals living below the poverty line has not been as high since 1993. Additionally, the percentage of the nation’s children living in poverty has increased to 22%, up from 20.7% in 2009 (US Census Bureau, 2011), which means that more than 2 million children are living in poverty compared to a decade prior (Wight, Thampi, & Briggs, 2010). Among children under the age of 6, 46% reside in low income households (Chau, Thampi, & Wight, 2010). Even more concerning is that 10% of children live in ‘deep poverty,’ or in households that make less than 50% of the Federal Poverty Line annually, compared to 6% in 2000 (Chau, et al., 2010; US Census Bureau, 2010). Thus, today a great proportion of young children are experiencing poverty.

Experiencing poverty during early childhood places children at risk for lower reading and math achievement during kindergarten (Chatterji, 2006; Lee & Burkam, 2002). Academic achievement skills at school entry are critical as they are positively associated with later reading and math achievement (Duncan et al., 2007). In an effort to prevent low income families from experiencing the negative outcomes associated with poverty-related risks, the federal government provides income assistance through various public assistance programs. Although the size of the effects have been questioned (Mayer, 1997), research has demonstrated increases in family income can improve children’s cognitive abilities (Costello, Compton, Keeler, & Angold, 2003; Duncan & Brooks-Gunn, 1997; Duncan, Morris, & Rodrigues, 2011; McLoyd, 1998; P. A. Morris, Huston, Duncan, Crosby, & Bos, 2001). From a parental and policy perspective, participation in public assistance programs is often a means to help parents make ends meet and
thus possibly buffer their children from the negative effects of poverty. Therefore as parents participate in more programs, the benefits of these programs may be greater for their children, as more needs are possibly met. Although research has focused on the protective effect of participating in multiple public assistance programs on school-aged children’s weight status (Jones, Jahns, Laraia, & Haughton, 2003), research that has focused on the association between public assistance programs and cognitive development in early childhood has narrowly focused on the effect of one program (e.g. Bassuk et al., 1997; Devaney & Moffitt, 1991; Reichman, Teitler, Garfinkel, & Garcia, 2004). As unemployment rates remain stable and poverty rates continue to rise, it is critical to understand how multiple public assistance policies can be used to reduce socioeconomic inequalities in education.

In this study we use data from the Early Childhood Longitudinal Study – Birth cohort (ECLS-B), a study conducted by the National Center for Education Statistics (NCES) that follows a cohort of infants and their mothers born in 2001 from birth through kindergarten. We build on the cumulative risk literature (Deater-Deckard et al., 1998; Rutter, 1979; Sameroff, Seifer, Baldwin, & Baldwin, 1993; Sameroff, Seifer, Zax, & Barocas, 1987; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987) to examine whether receipt of multiple public assistance programs can serve as either a protective or promotive factor for low-income children from a broad array of poverty-related risks. Using risk factors proposed by Sameroff and colleagues (1993), a cumulative poverty-related risk index was created by aggregating maternal reports of 10 different poverty-related risks during the child’s infancy. We then converted the poverty-related risk index into a binary indicator of high-risk based on families that displayed 3 or more risks. Following work by Gutman, Sameroff and Eccles (2002), we explored both direct (i.e. promotive) and interactive (i.e. protective) effects of public assistance receipt in order to determine whether receipt of public assistance is beneficial for all low-income children regardless of poverty-related risks (i.e. promotive factor), or for low-income children who are facing high levels of risks (i.e. protective factor).
protective factors). With the majority of states making substantial cuts to programs geared
towards children’s development, such as public health insurance and the Special Supplemental
Nutrition Program for Women, Infants, and Children (WIC) (Johnson, Oliff, & Williams, 2010;
Neuberger, 2011), in addition to cuts to K-12 education (Johnson et al., 2011), evaluating the
promotive/protective effects of existing anti-poverty programs has never been more relevant.

Poverty, early child development, and cumulative risk

Exposure to poverty can be particularly detrimental to children’s early cognitive
development (Duncan, Brooks Gunn, & Klebanov, 1994; McLoyd, 1998). For example, Klien
and Knitzer (2007) find that by age 4, children from low-income households are almost two years
behind their higher income counterparts in regards to both cognitive and socio-emotional
development. Aside from low levels of household income, there are several factors highly
correlated with poverty that place children at risk for poor child development and contribute to
child educational disparities. For example, a greater proportion of children living in poverty are of
a racial or ethnic minority group (U.S. Census, 2010), and minority children score lower on
intelligence tests and have lower academic achievement compared to White children (Brooks-
Further, black women are at higher risk of delivering a low birth weight baby compared to white
women (Fang, Madhavan, & Alderman, 1999), and low birth weight has been associated with
developmental delays (Boardman, Powers, Padilla, & Hummer, 2002; Bradley, Caldwell, Rock,

In addition, a significant proportion of low-income women are single parents (Edin &
Kefalas, 2005). With less income and resources, along with household management falling upon
one person (rather than two), single parent families have more difficulties providing their children
the human capital (skills, knowledge, and abilities) and a high-quality home environment needed to succeed in school (Krein & Beller, 1988). Research has found that lower quality early learning environments explain from 40-50% of the relationship between household income and children’s academic performance and cognitive development (Duncan & Brooks-Gunn, 2000; Smith, Brooks-Gunn, & Klebanov, 1997).

The home environments of low-income households are at times crowded environments, with numerous individuals living in the same room. Dense home environments are related to parents being less verbally responsive to their young children and speaking with less complexity (Evans, Maxwell, & Hart, 1999). Low-income parents are considered to be less verbally responsive to their children compared to middle-class parents because they provide greater amounts of non-verbal means of communication (e.g., pointing, gestures) (Pan, Rowe, Singer, & Snow, 2005). Low-income parents also use smaller and less diverse vocabularies when speaking compared to middle-class parents (Hoff-Ginsberg, 1991). The low productivity of parental vocabulary has been linked to income related gaps in the size of young children’s vocabularies (i.e. children 3 years of age or younger), (Arriaga, Fenton, Cronan, & Pethick, 1998; Pan, et al., 2005) and continuing thru preschool (see, Brooks-Gunn, & Markman, 2005). A lower vocabulary skill level has been associated with fewer reading skills in grade school (Snow, Burns, & Griffin, 1998).

Maternal education is positively correlated with children’s academic achievement skills (Krein & Beller, 1988). Unfortunately, low-income mothers have low levels of education and high rates of unemployment compared to middle- and upper-income women (Dworsky & Courtney, 2007; Harris, 1993). Parents’ level of education influences their own beliefs and behaviors towards their children’s education (Davis-Kean, 2005), resulting in parents with greater education being more involved with their children’s education. Greater educational involvement by parents is related to children performing better in school (Stevenson & Baker, 1987).
Experiencing economic hardship is also linked to a decrease in physical health among adults (Lynch, Kaplan, & Shema, 1997) and increases in maternal depression (Kotchick & Forehand, 2002; Lynch, et al., 1997) and marital conflict (Clark-Nicolas & Gray-Little, 1991; Conger et al., 1990). Relationship conflict and lower emotional quality are related to higher rates of child behavior problems and lower rates of child self-regulation (Morris et al., 2002; Shaw, Vondra, Dowell Hommerding, Keenan, & Dunn, 1994), which can be exacerbated in the presence of socio-economic disadvantage. These findings are even more alarming as child behavior problems and poor self regulation are shown to be two very important processes for both school readiness (Blair & Razza, 2007; Fantuzzo et al., 2007; Welsh, Nix, Blair, Bierman, & Nelson, 2010) and later academic achievement (Barriga et al., 2002; Miles & Stipek, 2006).

The literature review above is based on previous work that has examined several poverty-related risk as individual factors; however, it is important to note that these poverty-related risk factors have also been aggregated in previous research to created indices of cumulative risk (e.g. Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Gutman, et al., 2002; Gutman, et al., 2003; Sameroff, 1995; Sameroff, et al., 1993). Research finds the number of poverty-related risks children face simultaneously negatively influences child development (Gutman, Sameroff, & Eccles, 2002). According to the cumulative risk literature, the accumulation of risk factors, rather than any particular risk, impacts development negatively (Rutter, 1979; Sameroff, Seifer, Barocas, et al., 1987; Sameroff, Seifer, Zax, et al., 1987; Sameroff, et al., 1993). In other words, children that face more risks perform worse than children facing fewer risks. For example, the Rochester Longitudinal study, Sameroff and colleagues (1998) find that children with no risks scored 30 points higher on intelligence tests compared to children with higher number of risks (8 or 9 risks). Additional analyses also indicate that children’s IQ was reduced on average by 4 points for each additional risk factor. Further, the accumulation of social and family risk factors has been negatively associated with IQ scores during preschool and early adolescence (Sameroff...
et al., 1987; Sameroff et al., 1993). Overall, risk-related research has established a linear accumulating relationship between the number of risks children are exposed to and negative child and adolescent academic achievement (Gutman, Sameroff, & Cole, 2003; Gutman et al., 2002; Sameroff et al., 1998).

**Public assistance programs and child development**

Participation in public assistance programs has demonstrated positive impacts on child development. While iron and zinc deficiency have been linked to delayed cognitive and motor development of infants and preschoolers (for reviews see, Black, 1998; Pollitt, Saco-Pollit, Leibel, Viteri, 1986), food assistance programs have been able to increase young children’s intake of nutrients. For example, research on the Supplemental Nutrition Assistance Program (SNAP; program formerly known as the Food Stamp Program) and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has found household’s availability of important nutrients, as well as children’s intake of these nutrients, to increase while on these programs (Devaney & Moffitt, 1991; B. J. Lee & Mackey-Bilaver, 2007; Rose, Habicht, & Devaney, 1998).

Eviction and homelessness are associated with school absences, school mobility, and grade retention (Rafferty, Shinn, & Weitzman, 2004). Receipt of Temporary Assistance for Needy Families (TANF) and housing subsidies has served as protective factors against eviction and homelessness (Bassuk, et al., 1997). Further, public housing and rent/mortgage assistance reduces child grade retention indirectly through decreasing residential crowding and thus improving quality conditions in low-income households (Currie & Yelowitz, 2000).

Research suggests that children receiving Medicaid are more likely to receive important care from their physicians that uninsured children do not receive (Currie & Gruber,
Access to care is positively correlated with children’s health, and children in good health perform better in school compared to children in poor health (Schwarz, Lui, & Union, 2000; Zill, 1990). Lastly, child care subsidies, tax breaks and free child care for families below 100% of the Federal Poverty Line, are provided in efforts to increase the enrollment of low-income children into high quality center-based child care arrangements. While the supply of high quality child care is limited compared to the demand for it, empirical research provides evidence that high quality childcare programs can improve low-income children’s school readiness (see Barnett, 1995; Ramey & Ramey, 2004; and Yoshikawa, 1995, for reviews).

During the most recent economic recession a growing number of American families depend on public assistance programs, with TANF caseloads increasing by 10% and SNAP caseloads increasing by 37% (Lower-Bash, 2010; Pavetti & Rosenbaum, 2010). The recent growth of these two programs’ roles are in stark contrast to the rapid decline in public assistance receipt just prior to the 1996 PRWORA welfare policy changes, a change so drastic it has yet to be completely understood empirically (Moffitt, 2002). However, the continued decrease in the median family income (US Census, 2011), paired with a lingering recession, means that low-income families are at risk of experiencing greater amounts of poverty-related risks. Receipt of multiple public assistance programs may have protective or promotive impacts on child development. Promotive factors have positive impacts on individuals regardless of their exposure to adversity; while protective effects interact with risk so that the positive effects are magnified for individuals facing higher levels of adversity (Garmezy, 1993; Gutman et al, 2002, Rutter, 1987). This paper will explore both the possible promotive and protective effects of receipt of public assistance on children’s cognitive outcomes as the effects may impact cognitive skills at school entry uniquely.
Present study

The present study builds upon the cumulative risk literature (Deater-Deckard, et al., 1998; Rutter, 1979; Sameroff, et al., 1993; Sameroff, Seifer, Barocas, et al., 1987; Sameroff, Seifer, Zax, et al., 1987) to examine the effects of exposure to high levels of poverty-related risk and participation in multiple public assistance programs on children’s early cognitive skills during kindergarten. Specifically, we explore (1) whether receipt of public assistance programs can serve as a promotive factor for child cognitive skills, thus helping low-income children regardless of the presence of poverty related risks; and (2) whether receipt of multiple public assistance programs serves as a protective factor for children with families facing high levels of poverty-related risk. If receipt of multiple public assistance programs has a promotive effect, it may provide evidence for policy changes to lessen eligibility requirements for public assistance programs and thus allow more low-income children and families to benefit from these programs. If participation in multiple public assistance programs has a protective effect, it may provide support to provide more targeted assistance for those families with young children facing the greatest level of adversity, as these families may benefit the most from receipt of public assistance. Further, this study contributes to the literature on public assistance and child development by exploring public assistance programs that are indirectly geared towards broad measures of poverty-related risks and the direct and interactive relationship between high-level risk and participation in multiple public assistance programs.
Chapter 2

Method

Data and analytic sample

Data for this study come from the Early Childhood Longitudinal Study- Birth Cohort (ECLS-B), a longitudinal data set collected by the National Center for Education Statistics (NCES). The baseline sample of approximately 10,700 children and their families was designed to be nationally representative of children born in 2001. The ECLS-B follows children from birth through kindergarten with data collected when the child was 9 months of age (2001), 24 months of age (2003), 48 months of age (2005), and at kindergarten entry (2006). Further information on sampling, recruitment, and attrition can be found at http://nces.ed.gov/ecls/birth.asp.

The analytic sample was created by first restricting the full sample to families who’s household incomes fell at or below 200% of the Federal Poverty Line (FPL) when the child was 9 months old (5,000 families excluded), as these families are more likely to face economic hardship and qualify for public assistance programs. The sample was further restricted to children with valid data on both kindergarten cognitive outcome measures (2,200 families excluded) and families with valid data on maternal receipt of public assistance and poverty-related risk factors at the baseline survey (800 families excluded). Families missing values on covariates missing greater than 1% of the sample were dropped from analyses (100 families excluded). Multiple imputation techniques were then used to impute missing data on covariates missing < 1% of sample values (approximately 1.5% of total values). A strength of multiple imputation techniques is that all relevant cases are kept in the analyses for accurate parameter estimates and the standard errors are corrected for the amount of missing information. This is in comparison to listwise
deletion, which results in a sample that no longer represents the population (Graham, 2009; Graham and Schafer, 1999). Thus the analytic sample consisted of 2,600 children living in low-income households.

**Measures**

**Early academic skills**

NCES developed two different measures to assess children’s cognitive development. During the kindergarten wave of data collection, children were directly assessed using both routing and IRT methods to gauge each child’s early math and reading skills. These measures are adaptive in that each child was assessed using different items depending on their abilities to correctly answer items early into the assessment. However, due to difficulties interpreting these theta scores, we chose to present the scale score regression coefficients of children’s early reading skills \( M = 34.65, \ SD = 14.20 \), and early math skills \( M = 37.07, \ SD = 10.57 \). Early reading assessed children’s skills across the following six domains: English language skills; phonological awareness; letter and letter-sound knowledge; print conventions; word recognition; and vocabulary. Early math skills assessed children’s abilities across five domains: number sense, properties and operations; measurement; geometry and spatial sense; data analysis, statistics and probability; and patterns, algebra, and functions. Higher scores on the reading and math measures denote a child with a higher probability of correctly answering any possible item regarding early math and reading skills at kindergarten.
Poverty-related risk factors

To create a linear cumulative poverty-related risk index, risk factors selected for the study described poverty-related risks at the child, maternal and household level based on a battery of research documenting their negative associations with child well-being (Gutman, et al., 2003; Gutman, et al., 2002; McLoyd, 1998; Sameroff, et al., 1993) as well as positive associations to maternal participation in public assistance programs (see, Duncan & Hoffman, 1988 for review). The linear cumulative poverty-related risk index includes broad correlates of poverty that have also been used by Sameroff and colleagues when creating cumulative risk indices based on socio-economic disadvantaged (Sameroff, 1995; Sameroff, et al., 1993).

Risks were converted into binary variables with a value of 1 signifying the child, mother, or household had any of the following risk factors: child minority status (i.e. Black, Hispanic or ‘other’); low birth weight status (< 2,500 grams); maternal unemployment; low maternal education (i.e. less than a high school diploma/GED); poor maternal health; elevated depressive symptoms (at or above the 75 percentile on the Center for Epidemiological Studies Depression Scale (CES-D) short form; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993; Radloff 1977; Radloff 1991); elevated relationship conflict (1 SD below the mean on Relationship/Marital Conflict Scale, lower score denotes more conflict); deep poverty [i.e. household income at or below 50% of the Federal Poverty Line (FPL)]; single parent household; and overcrowding (i.e. 4 or more children under 18 in household). A cumulative index was created by summing across all ten separate risk factors (Range: 0-10, $M = 3.16$, $SD = 1.70$). Based on the average number of risks, children who resided in a household that had 3 or more risk were considered experiencing “high” levels of poverty-related risk and were coded as such in a binary variable measuring high-level risk. Research has documented that the negative impact of risk on child outcomes is
magnified for children facing high levels of risk (Gutman et al., 2003; Sameroff et al., 1993; Sameroff et al., 1998).

**Public assistance participation**

Maternal participation in six different public assistance programs was summed to create a cumulative public assistance program participation index: WIC, TANF, SNAP (program formally known as the Food Stamp Program), Section 8 Housing, child care assistance, and public health insurance. Values from this index signify the number of programs families participated in during the first wave of the study (Range 0-6, $M = 2.37$, $SD = 1.30$).

**Covariates**

The following child, maternal, household, and state-level characteristics were included in the regression models. The characteristics reflect selection factors that could influence mother’s decision to participate in programs as well as children’s cognitive development. Characteristics include child age at wave 1, which was a continuous variable that ranged from 7 to 22 months, and gender (1 = female; 0 = male). We also included a measure of children’s early cognitive and language abilities at the 9 month wave using Bayley Short Form-Research Edition (BSF-R) Mental Scale, which was designed for use in the ECLS-B (Nord et al., 2004). The BSF-R was adapted from the Bayley Scales of Infant Development, Second Edition (Andreassen & Fletcher, 2007), which is a standardized assessment of children’s cognitive and physical development from birth to 42 months of age. The cognitive scale (31 items) of the BSF-R has high reliability ($\alpha = 0.80$) and was used in the current study as a way to capture baseline intellectual capabilities and to maintain consistency with prior ECLS-B research on socioeconomic disadvantaged
populations (Hernandez & Jacknowitz, 2009). Mother characteristics included the mother’s age at child’s birth as a continuous variable that ranged from 15 and 46 years. Household characteristics included measures of whether household income increased to above 200% of the FPL at 24 months (1 = yes; 0 = no) and at 48 months (1 = yes; 0 = no). Region of the country which households resided in was represented by a series of dummy variables Northeast, Midwest, West, and South (reference category). Size of city which households resided in was represented by a series of dummy variables rural (< 2,500), town (2,500 – 49,999), city (>= 50,000; reference category). State-level contextual characteristics were included in the models as they may be related to families experiencing poverty and receiving public assistance, which then influences the outcomes of interest. State level characteristics included the state unemployment rate and state poverty rate based on 2001 data (coinciding with ECLS-B data collected on the poverty-related risk factors and participation in public assistance programs).

Analytic plan

Descriptive analysis and OLS regression models were performed using STATA version 11.1 statistical software (StataCorp LP, College Station, Texas). Descriptive analyses were conducted on non-imputed data. To perform OLS regressions on imputed panel data, we used STATA’s ICE command to impute five data sets and the MICOMBINE in conjunction with the REG command to conduct analyses on regression models. We first tested whether public assistance receipt during infancy can have a promotive effect on child cognitive outcomes during kindergarten, by including the full index of public assistance receipt as a predictor of children’s early reading and math skills. Work from the cumulative risk literature (see, Gutman et al., 2003, for discussion) suggests that if there is a promotive effect, our index of public assistance receipt would be positively related to child cognitive outcomes regardless of the level of risk families
endured during the child’s infancy. Next, we explored whether public assistance receipt has a protective effect on child cognitive outcomes, by interacting the high risk indicator and the continuous variable measuring cumulative participation in public assistance programs. In order for us receipt of multiple public assistance programs to be a protective factor for children’s early cognitive skills against high levels of poverty-related risks, the interaction term is required to be significant and positively associated with children’s early cognitive skills. In all models, standard errors were adjusted using the Huber-White sandwich estimator to account for multiple children in our sample living within the same state (Froot, 1989; Rogers, 1993; Williams, 2000).

Chapter 3

Results

Descriptive results

Table 1 presents the descriptive statistics for the analytic sample. Families in our sample faced on average three poverty-related risks, with the most prevalent risk being children having minority race/ethnicity status (70%), followed by maternal unemployment (57%). On average families participated in a little over two public assistance programs during their child’s first year of life. WIC (85%), public health insurance (Medicaid, SCHIP, CHIP, etc; 74%), and SNAP (39%) were the most widely received public assistance programs. Fifteen percent of our sample (n=400) received only one program during the child’s first year of life; of these families, 70% only received WIC, 20% only received publicly funded child health insurance, and 10% received only child care assistance. Mothers were 25 years old on average at the time of the birth of their child, and the average household annual income was about $19,995. Further, families who
participated in 3 or more programs had significantly lower incomes ($M = $14,212, SD = $9,984) compared to families who participated in 2 or less programs ($M = $24,378, SD = $9,963).

Table 1: Descriptive statistics of analytic sample.

Table 2 presents descriptive statistics for the mean and standard deviation of children’s kindergarten cognitive outcomes by the number of public assistance programs mothers received during the first wave of the study. On average, children with the highest cognitive outcomes in both early reading and math skills had mothers who did not participate in public assistance programs during the child’s first year of life. Children whose mothers participated in five or more programs had the lowest reading and math scores compared to their peers. On average children scored slightly higher on early math skills than reading skills in all groups of public assistance receipt.

Table 2: Sample descriptives of receipt of public assistance programs and child cognitive outcomes.

Table 3 presents descriptive statistics for the mean and standard deviation of children’s kindergarten cognitive outcomes by the level of poverty-related risks mother’s reported the family faced during the child’s infancy. Similar to Table 2, children with the highest cognitive outcomes in both early reading and early math skills have families who face 2 or less risks during the child’s infancy. Children with families facing more than 2 risks have the lowest cognitive skills in kindergarten.

Table 3: Sample descriptives of level of risk and child cognitive outcomes
**Multivariate results**

Following suggestions from the cumulative risk literature (Rutter, 1987, Gutman et al., 2003; Sameroff, 1999), we first examined whether receipt of public assistance programs can have a promotive effect on low income children’s cognitive outcomes in kindergarten. First we predicted children’s early reading and early math skills, using a binary indicator of the level of risk children were exposed to during their infancy to establish the relationship between high levels of risk and children’s early cognitive skills (Table 4, columns M1). Consistent with prior research, children’s exposure to high levels of poverty-related risks was negatively associated with early reading skills ($\beta = -4.40, p < .001$), and early math skills ($\beta = -4.19, p < .001$) after controlling for child, maternal, household, and state characteristics. Next, we tested whether public assistance receipt can act as a promotive factor, by including this index in our models predicting child cognitive outcomes (Table 4, columns M2). However, receipt of multiple public assistance programs does not serve as a promotive factor for children’s cognitive skills, as in a sample of low-income children regardless of the level of risk, maternal receipt of public assistance is negatively related to both children’s early reading ($\beta = -1.07, p < .001$) and early math ($\beta = -0.87, p < .001$) skills. Yet, once we included maternal receipt of multiple public assistance programs children’s exposure to high levels of poverty-related risks is still significantly and negatively related to their early reading ($\beta = -3.66, p < .01$) and early math skills ($\beta = -3.59, p < .001$) in kindergarten. This suggests that even five years later early exposure to high levels of poverty-related risks can negatively impact children’s cognitive outcomes even after controlling for various characteristics and sources of variance, and further that poverty profoundly impacts children beyond receipt of public assistance programs.
Next, we investigated whether receipt of multiple public assistance programs can have protective effects for children’s early cognitive skills against high levels of poverty-related risks. Parallel to earlier findings, exposure to high levels of risk is negatively associated with children’s early reading (β = -3.66, p < .001) and math skills (β = -3.59, p < .001), even after controlling for receipt of public assistance programs and many, child, maternal, household, and state level characteristics (Table 5, columns M1). However, when a variable testing whether or not receipt of public assistance programs can serve as a protective factor for children’s early cognitive skills from high levels of poverty related risks is included, slightly diverging results are obtained for children’s early reading skills compared to early math skills (Table 5, columns M2). For example, while the size of the coefficient of poverty-related risks on children’s early reading skills increases (albeit slightly) for children’s early reading to (β = -3.84, p < .01) the significance of this relationship also decreases once the interaction term is included in the model. Yet, the relationship between poverty-related risk and children’s early math skills decreases in size as well as strength after the interaction term is included (β = -3.08, p < .01). Further, maternal receipt of multiple public assistance programs does not serve as a protective factor as the variable interacting the level of poverty-related risk and public assistance is not significant.

Table 4: OLS regressions testing promotive effects of participation of multiple public assistance programs

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Table 5: OLS regressions testing protective effects of participation of multiple public assistance programs

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Chapter 4

Discussion

Poverty-related risk and receipt of public assistance

The present study investigated participation in multiple public assistance programs as a promotive and protective factor between poverty-related risks and children’s early academic skills. Previous research has indicated that experiencing poverty during early childhood places children at risk for lower cognitive skills at school entry (Chatterji, 2006; Lee & Burkam, 2002) and the home environments of low-income children can explain much of the gap between higher and lower-income children’s early cognitive skills at school entry (Duncan et al., 2000; Smith et al., 1997). A way that low-income families can improve the quality of the home environment is by participating in public assistance programs. Prior research has explored the direct impacts that receipt of one public assistance program may have on child academic achievement (e.g., Currie & Yelowitz, 2000; Gennetian & Morris, 2003). However, research has not focused on the promotive and protective effects of participating in multiple public assistance programs on child cognitive skills at school entry when faced with many poverty-related risks (compared to families facing fewer risks). The present study attempted to address an important gap in literature by exploring whether maternal receipt of multiple public assistance programs can buffer children’s cognitive outcomes in kindergarten from various poverty-related risks.

Consistent with prior research, we found that low-income families experience multiple poverty-related risks (Golden, 2005; Huaqing Qi & Kaiser, 2003; Liaw & Brooks-Gunn, 1994; Werner, 1993) during the child’s infancy. Further, the majority of the families (75%) in our sample relied on the support of multiple public assistance programs (compared to receipt of one or no programs). We also found that families who participate in 3 or more programs have lower household incomes and have children who score the lowest on measures of early cognitive skills.
compared to their low-income peers whose mothers participated in 2 or less programs. Similarly children with high early exposures to poverty related risk (families with 3 or more poverty-related risks) also score lower on both early math and early reading skills than children exposed to lower levels of poverty related risks. Thus, the families most in financial need are participating in a greater number of public assistance programs and families with higher levels of poverty-related risks have children who are faring the worst in kindergarten.

Multivariate models revealed that maternal receipt of multiple public assistance programs does not act as a promotive nor protective factor against the negative impact of poverty-related risks on children’s early math skills and early reading skills assessed in kindergarten. While, previous research has found that participating in three food assistance programs decreases the odds of being overweight among food insecure school-aged girls compared to food insecure school-aged girls who do not participate in any programs (Jones, et al., 2003), our study did not find similar protective or promotive effects. Perhaps this is because our study differed from the latter in that we explored participation in multiple public assistance programs that are not directly related to targeted risk factors each public assistance program was sought to overcome. Further, it is possible that these broader risk factors, which have high rates of occurrence in a sample of low-income families, may present larger barriers that are much more difficult for public assistance to overcome. For example, in post hoc descriptive analyses we found that families receiving multiple public assistance programs were also facing the highest rates of risk and these risks were much more structural in nature, such as living in deep poverty, having a less than a high school diploma, or being a single parent. Thus, perhaps increasing families’ use of multiple programs does not help low-income families overcome all risks and barriers associated with financial independence or secure employment as the factors they are often facing, may take much time and resources to overcome. Many low-income mothers are plagued with mental health issues, have low levels of education, and consequently little job training or experience (Corcoran, Danziger, & Tolman, 2004; Danziger, Kalil, & Anderson, 2000; Danziger & Seefeldt, 2003; Dworsky & Courtney, 2007; Pollack, Danziger, Jayakody, & Seefeldt, 2002). Thus it may be unrealistic to
expect public assistance programs as currently delivered, to quickly address larger structural barriers keeping families in poverty.

Our study’s findings are further contrasted by another study that found participating in WIC and Food Stamps not only lowered the risk of anemia, nutritional deficiency, and failure to thrive for young children, but participation was associated with lowering an indirect risk of abuse and neglect experienced by children (Lee & Mackey-Bilaver, 2007). These findings are at odds with the current study, suggesting that when families participate in multiple public assistance programs there appears to be a positive cumulative effect in reducing the negative impact that broad measures of poverty can have on various measures of children’s overall development. Thus, it remains unclear whether participating in multiple public assistance programs positively impacts child development. To gain a better understanding as to why participating in multiple public assistance programs are positively related to child development in certain circumstances, future research should focus on pinpointing the processes through which participating in multiple public assistance programs impacts child development.

Aside from studying the processes by which participation in multiple public assistance programs is related to early childhood cognitive skills, it is also important to reconsider how risks are conceptualized. Some literature suggests that there may be a threshold relationship, rather than linear, between cumulative risks and child outcomes (Garmezy, 1993; Greenberg, Speltz, DeKlyen, & Jones, 2001), such that children facing over a specific number of risks may have increased risks at different negative outcomes, compared to children under this threshold. It may be possible that public assistance participation is able to buffer children from poverty related risks, but only up to a certain point on the risk spectrum. As the negative impact on child development increases rapidly with each accumulating risk, public assistance receipt may have little positive influence for children further up the risk spectrum. Therefore future research should differentiate not only between the number of programs that families receive but also between the number and type of risks families are facing to better parse out these nuanced relationships.
It is important to note that the results may differ not only if we were to measure participation in public assistance closer to school entry, but also if we had better measures of public assistance participation. Research has shown that mothers move on and off of public assistance frequently (Cancian, Haveman, Meyer, & Wolfe, 2002; Corcoran, et al., 2004; Harris, 1996) and that monthly report of public assistance might be a more accurate measure of participation rather than the yearly retrospective reports used in the current study (Coley, Bachman, Votruba-Drzal, Lohman, & Li-Grining, 2007; Harris, 1993, 1996). Thus, studying the duration of participating in particular programs over time may provide insight into whether it is the amount of time in each program or the number of programs that has the strongest effect in reducing the negative impact of poverty-related risks on children’s cognitive skills at school entry. Further, the two strongest positive predictors of children’s early cognitive skills was moving above 200% of the federal poverty line just prior to the child’s school entry (preschool), or the wave just prior (when the child was a toddler). Thus, research and policy alike would benefit from exploring if there are special developmental periods in which targeted intervention for low-income families may have the strongest impacts on children’s cognitive skills and future academic success.

Summary

This study focuses upon important gaps in current literature by exploring the use of multiple public assistance programs as a protective or promotive factor for children’s early cognitive development among families who faced higher levels of poverty-related risks. Unfortunately, the relationship between high levels of risk and maternal receipt of public assistance programs is far more complex than existing literature conveys, and perhaps due to these nuanced relationships, even receipt of many different programs may be inadequate for buffering children’s early cognitive development. Future directions for this study are to disentangle the types and number of risks that occur in low-income families naturally. This
exploration will aid us to get a better understanding of possible variations in the relationships between these risks and child development, as well as variations in the ability of receipt of public assistance to buffer these effects. Further, the timing of participating in public assistance programs and experiencing poverty-related risks in relation to the developmental time period of the child will be explored in order to contribute to policy discussions of the benefits of various programs over others as children age. The end product of this research will be to elucidate the mechanism through which use of public assistance programs can reduce the negative effects of poverty-related risks on child cognitive skills at school entry.
References


Appendix

Tables and Figures

Table 1. Descriptive statistics of analytic sample (n=2600)\textsuperscript{a}

<table>
<thead>
<tr>
<th>Cognitive outcomes at Kindergarten (Scale Scores)</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Reading Skills</td>
<td>34.67 (14.21)</td>
</tr>
<tr>
<td>Early Math Skills</td>
<td>37.03 (10.58)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual poverty-related risks at 9 months</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child minority status</td>
<td>70%</td>
</tr>
<tr>
<td>Low birth weight status</td>
<td>28%</td>
</tr>
<tr>
<td>Maternal Unemployment</td>
<td>57%</td>
</tr>
<tr>
<td>Low maternal education</td>
<td>27%</td>
</tr>
<tr>
<td>Poor maternal health</td>
<td>11%</td>
</tr>
<tr>
<td>Elevated depressive symptoms</td>
<td>11%</td>
</tr>
<tr>
<td>Elevated relationship conflict</td>
<td>37%</td>
</tr>
<tr>
<td>Deep Poverty</td>
<td>20%</td>
</tr>
<tr>
<td>Single parent household</td>
<td>36%</td>
</tr>
<tr>
<td>Overcrowding</td>
<td>21%</td>
</tr>
</tbody>
</table>

| Cumulative risk index at 9 months                | 3.16 (1.69) |

Public Assistance Programs

<table>
<thead>
<tr>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC</td>
</tr>
<tr>
<td>SNAP (food stamps)</td>
</tr>
<tr>
<td>TANF</td>
</tr>
<tr>
<td>Section 8 housing</td>
</tr>
<tr>
<td>Child care assistance</td>
</tr>
<tr>
<td>Public health insurance</td>
</tr>
</tbody>
</table>

| Public assistance program participation index | 2.37 (1.30) |
| Age at assessment (months)                     | 10.47 (1.90) |
| Gender (female)                                | 50%               |
| IQ at 9 months                                 | 48.06 (10.35) |
| Age at child’s birth (years)                   | 25.24 (6.11) |
| Household income above 200% FPL at 24 months   | 20%               |
| Household income above 200% FPL at Preschool   | 21%               |

<table>
<thead>
<tr>
<th>Region</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northeast</td>
<td>11%</td>
</tr>
<tr>
<td>Midwest</td>
<td>24%</td>
</tr>
<tr>
<td>West</td>
<td>23%</td>
</tr>
<tr>
<td>South</td>
<td>42%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Urbanicity</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural (&lt;2,5000)</td>
<td>21%</td>
</tr>
<tr>
<td>Town (2,500-49,999)</td>
<td>17%</td>
</tr>
<tr>
<td>City (&gt;50,000)</td>
<td>63%</td>
</tr>
</tbody>
</table>

| State unemployment rate                        | 4.69 (0.75) |
| State poverty rate                             | 12.04 (3.01) |

\textsuperscript{a} Sample rounded to nearest 50 as per NCES regulations [US Department of Education and National Center for Education Statistics (n.d.)]

\textsuperscript{b} Mean difference test was conducted using a one-way analysis of variance tests for continuous variables \((p < .001)\).

WIC = Women, Infant, and Children; SNAP = Supplemental Nutrition Assistance Program; TANF = Temporary Assistance for Needy Families; FPL = Federal Poverty Line.
Table 2. Sample descriptives of receipt of public assistance programs and child cognitive outcomes

<table>
<thead>
<tr>
<th>Public Assistance Programs</th>
<th>n^a</th>
<th>Reading Skills</th>
<th>Math Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>0</td>
<td>200</td>
<td>40.73</td>
<td>14.79</td>
</tr>
<tr>
<td>1</td>
<td>400</td>
<td>36.87</td>
<td>14.98</td>
</tr>
<tr>
<td>2</td>
<td>850</td>
<td>35.48</td>
<td>14.27</td>
</tr>
<tr>
<td>3</td>
<td>600</td>
<td>32.88</td>
<td>13.27</td>
</tr>
<tr>
<td>4</td>
<td>400</td>
<td>31.37</td>
<td>13.43</td>
</tr>
<tr>
<td>5+</td>
<td>150</td>
<td>30.49</td>
<td>11.96</td>
</tr>
</tbody>
</table>

^a Rounded to nearest 50 as per NCES regulations [US Department of Education and National Center for Education Statistics (n.d.).]

^b Of the 400 families receiving only one program 70% received only WIC, 20% received publically funded child health insurance (Me Medicaid, SCBHP, CHIP, etc.), 10% received only child care assistance.

^c Collapsed individuals receiving 5 and 6 programs due to small cell sizes.
Table 3. Sample descriptives of level of risk and child cognitive outcomes

<table>
<thead>
<tr>
<th>Risks</th>
<th>n\textsuperscript{a}</th>
<th>Reading Skills</th>
<th>Math Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Low Risk</td>
<td>1000</td>
<td>38.04</td>
<td>14.39</td>
</tr>
<tr>
<td>High Risk</td>
<td>1600</td>
<td>32.56</td>
<td>13.69</td>
</tr>
</tbody>
</table>

\textsuperscript{a} Rounded to nearest 50 as per NCES regulations [US Department of Education and National Center for Education Statistics (n.d.)].
Table 4 OLS regressions testing promotive effects of participation of multiple public assistance programs

<table>
<thead>
<tr>
<th></th>
<th>Early Reading Skills</th>
<th>Early Math Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Binary Risk Indicator (1= high risk)</td>
<td>-4.40(0.58)***</td>
<td>-3.66(0.62)***</td>
</tr>
<tr>
<td>Public Assistance Index</td>
<td>---</td>
<td>-1.07(0.21)***</td>
</tr>
<tr>
<td>Covariates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at wave 1 (months)</td>
<td>0.54(0.15)**</td>
<td>0.54(0.15)**</td>
</tr>
<tr>
<td>Female</td>
<td>2.15(0.52)***</td>
<td>2.16(0.51)***</td>
</tr>
<tr>
<td>IQ at 9 months</td>
<td>0.09(0.02)***</td>
<td>0.10(0.02)***</td>
</tr>
<tr>
<td>Mother and Household Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at child’s birth</td>
<td>0.11(0.06)</td>
<td>0.07(0.06)</td>
</tr>
<tr>
<td>HH income &gt; 200% FPL (24 months)</td>
<td>1.94(0.69)**</td>
<td>1.32(0.68)</td>
</tr>
<tr>
<td>HH income &gt; 200% FPL (48 months)</td>
<td>4.16(1.52)***</td>
<td>3.76(0.92)***</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>0.61(1.53)</td>
<td>0.50(1.54)</td>
</tr>
<tr>
<td>Midwest</td>
<td>-1.99(1.42)</td>
<td>-1.76(1.43)</td>
</tr>
<tr>
<td>West</td>
<td>-0.29(1.39)</td>
<td>-0.48(1.41)</td>
</tr>
<tr>
<td>South (reference)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural ( &lt; 2,500)</td>
<td>-1.00(0.72)</td>
<td>-0.86(0.74)</td>
</tr>
<tr>
<td>Town (2,500 – 49,999)</td>
<td>-0.86(0.74)</td>
<td>-0.73(0.76)</td>
</tr>
<tr>
<td>City (&gt; 50,000) (reference)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>State Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>-0.80(0.68)</td>
<td>-0.79(0.69)</td>
</tr>
<tr>
<td>Poverty rate</td>
<td>-0.06(0.18)</td>
<td>0.07(0.18)</td>
</tr>
</tbody>
</table>

*Note. Standard errors in parentheses and adjusted for the clustering of families by state. *** p < .001; ** p < .01; * p < .05.
*a Analyses are based on imputed sample [n = 2,600 rounded to the nearest 50 per NCES regulations (US Department of Education and National Center for Education Statistics (n.d.))].
Table 5 OLS regressions testing protective effects of participation in multiple public assistance programs\(^a\)

<table>
<thead>
<tr>
<th></th>
<th>Early Reading Skills</th>
<th>Early Math Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td>Binary Risk Indicator (1= high risk)</td>
<td>-3.66(0.62)***</td>
<td>-3.84(1.08)**</td>
</tr>
<tr>
<td>Public Assistance Index</td>
<td>-1.07(0.21)***</td>
<td>-1.12(0.41)**</td>
</tr>
<tr>
<td>High Risk X Public Assistance Index</td>
<td>---</td>
<td>0.08(0.48)</td>
</tr>
<tr>
<td>Covariates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at assessment (months)</td>
<td>0.54(0.15)**</td>
<td>0.54(0.15)**</td>
</tr>
<tr>
<td>Female</td>
<td>2.16(0.51)***</td>
<td>2.16(0.51)***</td>
</tr>
<tr>
<td>IQ at 9 months</td>
<td>0.10(0.02)***</td>
<td>0.10(0.02)***</td>
</tr>
<tr>
<td>Mother and Household Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age at child’s birth</td>
<td>0.07(0.06)</td>
<td>0.07(0.06)</td>
</tr>
<tr>
<td>HH income &gt; 200% FPL (24 months)</td>
<td>1.32(0.68)</td>
<td>1.32(0.67)</td>
</tr>
<tr>
<td>HH income &gt; 200% FPL (48 months)</td>
<td>3.76(0.92)***</td>
<td>3.76(0.92)***</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northeast</td>
<td>0.50(1.54)</td>
<td>0.48(1.42)</td>
</tr>
<tr>
<td>Midwest</td>
<td>-1.76(1.43)</td>
<td>-1.77(1.45)</td>
</tr>
<tr>
<td>West</td>
<td>-0.48(1.41)</td>
<td>-0.48(1.41)</td>
</tr>
<tr>
<td>South (reference)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Urbanicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural ( &lt; 2,500)</td>
<td>-0.86(0.74)</td>
<td>-0.86(0.74)</td>
</tr>
<tr>
<td>Town (2,500 – 49,999)</td>
<td>-0.73(0.76)</td>
<td>-0.73(0.76)</td>
</tr>
<tr>
<td>City ( &gt; 50,000) (reference)</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>State Characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>-0.79(0.69)</td>
<td>-0.79(0.68)</td>
</tr>
<tr>
<td>Poverty rate</td>
<td>0.07(0.18)</td>
<td>0.07(0.18)</td>
</tr>
</tbody>
</table>

\(^{Note.}\) Standard errors in parentheses and adjusted for the clustering of families by state. *** \(p < .001\); ** \(p < .01\); * \(p < .05\).

\(^a\) Analyses are based on imputed sample [n = 2,600 rounded to the nearest 50 per NCES regulations (US Department of Education and National Center for Education Statistics (n.d.))].