



## Childhood risk and protective factors and late adolescent adjustment in inner city minority youth

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### Abstract

This investigation examined longitudinal relationships among childhood risk and protective factors and academic, social, and mental health outcomes in late adolescence. Data were drawn from the Chicago Longitudinal Study, a research project that has tracked a cohort of 1539 impoverished inner-city youth from birth to young adulthood. An ecological model containing information on child characteristics, family processes, early childhood intervention program participation, and middle childhood indicators of competence and problems was used to predict depression, juvenile delinquency, and high school or GED completion during late adolescence or young adulthood. Multivariate negative binomial and logistic regression analyses were used to show that cumulative family risk from birth to age 12 significantly predicted increases in juvenile court petitions and decreases in high school or GED completion. Early childhood intervention in preschool had the widest ranging protective effects on all three adolescent outcomes. The probability of high school or GED completion was significantly increased by preschool intervention, by parent(s) participating in the child's early elementary school experiences, by satisfactory elementary school grades, and by the child's ability to be task oriented. Being female, participating in preschool intervention, displaying shy or anxious behavior, and having higher grades in middle school predicted lower rates of juvenile court involvement while acting out behavior in middle school increased court involvement rates. Preschool intervention, peer social skills, early classroom adjustment, and shy or anxious behavior in middle school were protective factors against

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adolescent depression while being female and having higher grades in early elementary school were associated with higher rates of adolescent depression. Implications for social work practice and future research were discussed.

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## 1. Introduction

Over the past three decades, research on childhood risk and resilience has burgeoned. The foundation for resilience research was formed from seminal studies that examined enigmatic groups of individuals who were able to ‘overcome the odds’ by maintaining adaptive functioning in the wake of various risk situations (Anthony, 1974; Farber & Egeland, 1987; Cowen, Wyman, Work & Parker, 1990; Masten, Best & Garmezy, 1990; Werner & Smith, 1992; Luthar, Doernberger & Zigler, 1993 among others). Risk and resilience research has also benefited from integrative literature reviews, which have critiqued the conceptual and methodological techniques used in this area of inquiry (Rutter, 1987; Luthar & Zigler, 1991; Masten & Coatsworth, 1995, 1998; Luthar, Cicchetti & Becker, 2000; Fraser, Kirby & Smokowski, In Press). Taken together, these major studies and reviews of the field have helped promote important advances, such as moving from concepts of ‘invulnerability’ to thresholds of resilience, distinguishing resilience which is influenced by dynamic environmental transactions from ‘ego-resiliency’ which is a personality trait, considering different categories of chronic vs. transitory risk factors, examining resilience outcomes as domain-specific, and calling for specific attention to be paid to mapping protective mechanisms.

Notwithstanding the extensive body of knowledge that has developed on resilience, important questions remain unanswered. First, there is a serious lack of studies investigating adaptive or resilient development in minority youth (Winfield, 1995; Luthar, 1997). Developmental models of minority and disadvantaged groups commonly focus on negative outcomes, shedding little light on adaptive outcomes and protective processes (McLoyd, 1990a,b; Nettles & Pleck, 1993). It is unclear, for example, how risk and protective factors, which have been mapped for Anglo children, function for African American youth growing up in impoverished inner-city neighborhoods. Further, many of the studies that have been done on minority youth rely on race comparative research designs. These designs have been criticized for propagating a deficit perspective and for emphasizing a cultural equivalence model that implicitly accepts the notion that some cultural styles are better than others (Luthar, 1993; Cauce, 1995; Cauce, Ryan & Grove, 1998). Thus, comparative studies of development that examine one racial or ethnic group relative to others may compromise our knowledge of adaptive development which occurs *within* each specific racial or minority group.

Second, few studies of resilience in adolescence have been conducted (Masten, 1994). Even more rare are ‘prospective studies linking multiple aspects of adaptation,

cumulative adversity exposure, and multiple resource/protective factors, particularly over long time intervals' (Masten et al., 1999, p. 144). Researchers are just beginning to include multiple indicators of resilience in their investigations. This is important because there is controversy in the resilience research literature concerning how domains of resilient functioning interrelate. Only a few studies have integrated multiple global and domain-specific indicators of resilience (see e.g. Reynolds, 1998; Masten et al., 1999). Thus, our knowledge base is limited concerning how academic, social conduct, and psychological domains of resilience are associated and if these disparate domains have unique risk and protective processes. These issues are examined in more detail below.

### *1.1. Cumulative family risk*

Risk factors are any variables that increase the probability of onset, exacerbation, or maintenance of a problem condition (Fraser et al., *In Press*). Risk factors can arise from any ecological level; however, it is commonly thought that distal risk, such as neighborhood poverty, is largely mediated through family processes that are closer to the individual (McLoyd, 1990b, 1998; Duncan & Raudenbush, 2001). Risk factors may exert strong effects in some settings and at some times and weak effects in other settings and times (Booth & Crouter, 2001). Consequently, there is an important and complex set of interactions among risk factors, context, timing of onset during development, and the length or duration of the risk (see e.g. Elder, 1974/1999).

As the number of risk factors increases, the accumulation appears to exert an increasingly strong influence on children (Seifer, Sameroff, Baldwin & Baldwin, 1992; Garmezy, 1993; Dishion, Capaldi & Yoerger, 1999; Greenberg, Speltz, DeKlyen & Jones, 2001; Rutter, 2001). Rutter (1979) found that the presence of a single family stressor had a negligible effect on the rate of psychiatric disorder among children. The presence of two or more risk factors, however, multiplicatively increased the rate of disorder among children. In a longitudinal study, Fergusson and Lynskey (1996) developed an index of family stress and then, using this index, they compared youths at age 15 on measures of delinquency, substance abuse, and other social problems. The relationship between the number of family stressors and the presence of social problems was positive but non-linear. One or two family stressors seemed to make little difference, but several created high odds for serious behavioral problems. Similarly, in a multi-state study of 78 710 children in 6th through 12th grades, Pollard, Hawkins and Arthur (1999), p. 151 found substance abuse, school problems, and delinquency to be strongly related to risk exposure, with 'steep increases in prevalence associated with the highest levels of risk.' Thus, the effect of exposure to several risk factors may not simply be additive. Although the effect of a single stressor may be negligible, the effect of three or four stressors may be far greater than a three-fold or four-fold increase in vulnerability. Children exposed to the least cumulative risk appear to fare the best. Those children with the highest levels of exposure are the least likely to produce adaptive behavior (Pollard et al., 1999; Rutter, 2000). Two questions concerning the functioning of risk factors

require further clarification. First, are specific single risk factors more potent than others, thus contributing relatively more to the deleterious effect of accumulated risk? Few investigators have examined the effects of single risk factors and cumulated risk indices in the same analysis. Even fewer have done so across multiple adjustment domains. Second, does accumulated risk have a linear or non-linear impact on adjustment outcomes and does this relationship vary across adjustment domains and in different development stages? The second question provides a transition to examine the developmental dynamics of different adjustment domains.

### 1.2. Relationships among adjustment domains

Researchers define competence as successfully achieving developmental tasks that are considered normative for a particular age and environmental context (Garmezy & Masten, 1991; Masten & Coatsworth, 1995, 1998). Adequate coping is not necessarily accompanied by high levels of adaptation within all spheres of functioning (Luthar & Zigler, 1991; Garmezy, 1993). Being resilient or competent does not imply that children survive without pain or anxiety. Significant psychological distress has been observed in children who were behaviorally competent (Farber & Egeland, 1987; Luthar, 1991; Luthar et al., 2000). Similarly, definitions of resilience based on competence in a single functional domain – for example, academic success – may give a false impression, because competence in one area represents only a small part of what may be considered successful coping (Luthar et al., 1993).

Research findings mapping the linkages among domains of adjustment have been inconclusive. For example in the Kauai study, Werner and Smith (1992) found that many ‘invulnerable’ children had painful memories, nightmares, and other adjustment problems. For high risk urban adolescents, Luthar (1991) reported high levels of internal distress in individuals who were externally highly competent in academic accomplishments and social behavior. Mental health symptom levels reported by these resilient youth were not significantly different from symptom levels in high-stress low competence youth. Likewise, in a study of 150 ninth-grade youth from inner city schools, Luthar et al. (1993) found that high performing, resilient children had depressive symptoms comparable to low-performing, highly stressed youths. Luthar (1997) once again found highly-stressed but behaviorally competent youth displaying vulnerability to emotional distress. Over 70% of youth who showed competence in one domain also displayed significant problems in another sphere of functioning. Specifically, she wrote, ‘bright inner-city teens appeared to do very well in the presence of positive psychosocial forces. However, in the presence of negative forces, they seemed to be hurt (*e.g. emotionally distressed*) more than did their less intelligent peers’. (Luthar, 1997, p. 465, italics added). Thus, academically competent children and adolescents may be internalizing symptoms, causing them to be emotionally troubled.

Academic competence may have complex interrelations with social functioning for disadvantaged minority children. For example, Cauce, Felner and Primavera

(1982) found that high levels of informal social support were negatively associated with academic performance in disadvantaged inner-city males. Luthar (1995) also found inner-city peer group integration was associated with declines in academic functioning, lending support to the negative association between academics and social functioning in disadvantaged environments. However, after studying 205 children from an urban area, Masten et al. (1999) reported that high functioning children who had high levels of exposure to adversity differed little from high functioning children who had low levels of exposure to adversity. Clearly, more research is needed to determine how adaptation domains are interrelated.

### *1.3. Protective factors*

Protective factors are internal and external resources that modify or buffer the impact of risk factors (Rutter, 1987; Luthar et al., 2000; Fraser et al., in press). Like risk factors, protective factors may be domain specific. That is, they may operate principally within specific domains of development and have limited spillover to other domains. While some protective factors, such as self-efficacy, appear to have a widespread effect on functioning, other protective factors are more specific. For instance, academic achievement, one of the most prominent developmental outcomes through childhood and adolescence, appears to be promoted by having more individual resources and social capital (Coleman, 1988). Competence in the academic domain appears to be influenced by IQ, motivation to succeed, beliefs in one's abilities, and positive attitudes about school (Masten & Coatsworth, 1998). Cognitive patterns attributing success to hard work and effort (and failure as the lack of hard work) also facilitate academic achievement by fostering an internal sense of control over personal achievement (Stevenson, Chen & Lee, 1993). In contrast, socioemotional functioning, another important developmental outcome has been associated with higher IQ and positive academic achievement (Hartup, 1983; Masten & Coatsworth, 1995). However, factors that promote adaptive development in this domain appear to be more rooted in environmental interactions with parents, teachers and peers (Masten & Coatsworth, 1998).

Three broad categories of protective variables have been found to promote resilience in childhood (Garmezy, 1985). The first refers to individual dispositional attributes, including temperamental factors, social orientation and responsiveness to change, cognitive abilities, and coping skills. The second general category of protective factors is the family milieu. A positive relationship with at least one parent or a parental figure serves an important protective function. Other important family variables include cohesion, warmth, harmony, supervision, and absence of neglect. The third category of protective influences in childhood encompasses attributes of the extrafamilial social environment. These include the availability of external resources and extended social supports as well as the individual's use of those resources. The two most prominent predictors of resilience throughout childhood and adolescence are having a strong prosocial relationship with at least one caring adult and having good intellectual capabilities (Werner & Smith, 1982; Rutter, 1990; Masten & Coatsworth, 1998).

Protective factors have been examined in two ways – as additive models and in interactive models. Additive models, in which protective factors are said to exhibit main or compensatory effects, suggest that the presence of a risk factor directly increases the likelihood of a negative outcome and the presence of a protective factor directly increases the likelihood of a positive outcome (Masten, 1987; Pellegrini, 1990; Luthar, 1991). Risk and protection are often seen as polar opposites with protective factors promoting normative developmental outcomes (for an exception, see Ladd & Burgess, 2001). In interactive models, protective factors have effect only in combination with risk factors. In other words, protective factors are thought to exert little effect when stress is low. Their effect emerges when stress is high (Masten, 1987). This protective factor modeling approach utilizes statistical interaction terms. Because statistical interaction terms can be unstable and difficult to replicate (Rutter, 1987; Luthar & Zigler, 1991; Luthar, 1993), additive or main effects models are more common in resilience research.

Reynolds (1998) provided an useful example of a main effect examination of risk and protective factors and their differential impact across multiple outcome domains. He examined middle childhood resilience in the Chicago Longitudinal Study using a sample of 1170 economically disadvantaged, inner city African American children. He investigated academic, social, and total (academic plus social) resilience during middle childhood as dichotomous outcomes coded from academic tests and teacher ratings. In order to account for variability in risk exposure, Reynolds used a risk index as a covariate in his analyses. Measuring sixth grade competence outcomes, he found Child Parent Center intervention was significantly associated with scholastic and total, but not social, resilience. Gender, parental expectations, early classroom adjustment, and early academic achievement were found to be important predictors of sixth grade resilience. Path modeling revealed that early childhood intervention participation and parent expectations promoted middle childhood academic and social resilience outcomes and mediated the effects of cumulative risk. The current study builds upon Reynolds (1998) investigation by examining longitudinal risk and resilience processes from childhood into late adolescence in the same sample of high risk, minority, inner city children.

To summarize, our understanding of resilience has grown substantially over the past three decades. At the same time, more longitudinal research is needed on minority children in diverse ecological contexts. The deleterious effect of cumulative risk needs to be further examined. Longitudinal dynamics among adjustment domains need to be assessed. Protective factors need to be more closely mapped; detailing which of these factors cut across and which are unique to specific adjustment domains.

The current study addressed these concerns by investigating academic, social, and psychological adjustment from childhood to late adolescence in a sample of inner city minority youth. The relationships among single risk factors, cumulative risk, and an array of protective factors were examined to see which factors inhibited or promoted functioning across different domains of functioning.

## 2. Research design and methods

### 2.1. Sample

Data for this investigation was drawn from the Chicago Longitudinal Study (CLS: Reynolds, 1991, 1998; Smokowski, Reynolds & Bezrucko, 1999; Reynolds, Temple, Robertson & Mann, 2001). The CLS follows a cohort of 1539 disadvantaged, minority children (93% African American, 7% Latino or Other) who were born in 1980 and attended kindergarten programs within the Chicago Public School System in 1985–1986. Out of the full sample of 1539, a subset of 989 children (64% of the sample) received preschool services from one of Chicago's 20 Child-Parent Center (CPC) programs. An additional set of 550 children (36% of the sample) did not attend CPC preschool and serve as a non-CPC comparison group. The full sample represented 17 neighborhood areas and 25 schools, many of which were in the most impoverished areas in Chicago.

The sample was evenly split between girls and boys. Approximately, 76% of the children lived in neighborhoods where 60% or more of the residents were considered to have low incomes. Table 1 presents information on family risk factors from birth through adolescence.

The sample was clearly at high risk based on indicators of socioeconomic disadvantage. For example, at birth 75% of the children were in single parent or non-married families. Thirty-five percent of the children had teenage mothers and 40% of these parents had not graduated from high school. From age 8 to 17, family risk for the entire sample was remarkably stable. Slightly more than four out of ten children had parents who had not graduated from high school. Approximately, 80–87% of the children were eligible for a free or reduced lunch at school, a commonly used indicator of family socioeconomic status. From birth through adolescence, more than 60% of the sample children lived in single or non-married parent homes at any of the measured intervals. Finally, from age 8 to 12, at least 50% of parents in the sample were unemployed. This percentage only decreased below 50% (to 43%) when children were age 17. These family risk indicators show that this sample was indeed made up of high risk families. Adolescent outcomes also reflected this disadvantage. At age 16, 45% of the sample with data showed signs of depression, 19% had juvenile court petitions filed against them, and only 61% of the sample children had graduated from high school or had gotten a GED by age 22.

### 2.2. Measures of independent variables

*Family risk* – A variety of family risk indicators were collected from birth to age 17. Specifically, five dichotomous indicators of family risk were collected when the child was age 8, 10, 12 and 17. These variables are shown in Table 1. They are; (a) parent did not graduate from high school; (b) child was eligible for a free lunch subsidy (during school-age data collection); (c) there were four or more children in the family; (d) parent was not working full or part time; and (e) child lived in single parent or non-married family. Data from birth records were also collected.

Table 1  
Descriptive statistics and correlations for family risk from birth to late adolescence

Risk factor	N	Reporter <sup>1</sup>	Age/year	Min	Max	Mean	S.D.	Spearman's non-parametric correlation		
								Depression (Age 16)	Juvenile court petitions (<Age 18)	High school or GED completion (Age 22)
<b>Birth to age 3</b>										
Cumulative risk factors – 0–3	1523	1–5	0–3/1980–1983	0.00	5.0	1.67	1.10	–0.038	0.074**	–0.132***
N of missing risk factors	1539	1–5	0–3/1980–1983	0.00	6.0	0.426	1.11	–0.005	–0.123***	0.080**
Parent is not a HS graduate+	1456	4	0/1980	0.00	1.0	0.404	0.491	0.043	0.089**	–0.114***
4 or more children in home+	1346	1, 2, 3, 4	0/1980	0.00	1.0	0.102	0.303	–0.056	–0.001	–0.039
Any indicated child neglect or abuse (DCFS or court)+	1408	3, 5	0–3/1980–1983	0.00	1.0	0.021	0.142	0.024	0.024	–0.043
Child lives in single parent or non-married family+	1456	3, 4	0/1980	0.00	1.0	0.751	0.432	0.053	0.087**	–0.078**
Low birthweight (<2500 g)+	1456	4	0/1980	0.00	1.0	0.124	0.330	–0.019	–0.017	–0.042
Mother is 19 years of age or less at child's birth+	1456	4	0/1980	0.00	1.0	0.346	0.476	0.063	0.007	–0.045
<b>Child age 8</b>										
Cumulative risk factors age 8	1539	1, 2, 3, 4	8/1988	0.00	5.0	2.54	1.29	0.068*	0.152***	–0.148***
N of missing risk factors	1539	1, 2, 3, 4	8/1988	0.00	5.0	0.445	0.915	–0.008	–0.089***	–0.043
Parent is not a HS grad+	1510	1, 4	8/1988	0.00	1.0	0.434	0.496	0.043	0.084**	–0.203***
4 or more children at home+	1453	1, 2, 3, 4	8/1988	0.00	1.0	0.363	0.481	0.037	0.068**	–0.095**
Any free lunch for child+	1265	1, 6	8/1988	0.00	1.0	0.875	0.331	0.043	0.068*	–0.150***
Child lives in single parent or non-married family+	1500	1, 2, 3	8/1988	0.00	1.0	0.602	0.490	–0.011	0.069**	–0.050
Parent reported not being employed full or part time	1282	1, 3	8/1988	0.00	1.0	0.559	0.497	0.054	0.051	–0.011
<b>Child age 10</b>										
Cumulative risk factors age 10	1539	1, 2, 3, 4	10/1990	0.00	5.0	2.58	1.33	0.069	0.167***	–0.185***
N of missing risk factors	1539	1, 2, 3, 4	10/1990	0.00	5.0	0.406	0.898	0.007	–0.081**	–0.055*

Table 1 (Continued)

Risk factor	N	Reporter <sup>1</sup>	Age/year	Min	Max	Mean	S.D.	Spearman's non-parametric correlation		
								Depression (Age 16)	Juvenile court petitions (<Age 18)	High school or GED completion (Age 22)
Parent reported not being employed full or part time	1299	1, 2, 3	10/1990	0.00	1.0	0.503	0.500	0.028	0.068*	-0.059*
Any free lunch for child+	1299	1, 6	10/1990	0.00	1.0	0.841	0.366	0.016	-0.051	-0.099***
Child lives in single parent or non-married family+	1506	1, 2, 3	10/1990	0.00	1.0	0.653	0.476	0.036	0.098***	-0.071*
Parent is not a HS graduate+	1513	1, 4	10/1990	0.00	1.0	0.454	0.498	0.088*	0.087**	-0.199***
4 or more children in home+	1453	1, 2, 3, 4	10/1990	0.00	1.00	0.377	0.485	-0.034	0.071**	-0.105***
Child age 12										
Cumulative risk factors	1539	1, 2, 3, 4	12/1992	0.00	5.0	2.71	1.30	0.058	0.160***	-0.183***
N of missing risk factors	1539	1, 2, 3, 4	12/1992	0.00	5.0	0.210	0.593	-0.020	-0.068*	-0.084**
Parent is not a HS graduate+	1513	1, 4	12/1992	0.00	1.0	0.439	0.496	0.086*	0.066*	-0.192***
Parent reported not being+ employed full or part time+	1301	1, 2, 3	12/1992	0.00	1.0	0.514	0.500	0.031	0.076**	-0.080*
Any free lunch+	1323	1, 2, 6	12/1992	0.00	1.0	0.8360	0.370	0.000	0.064*	-0.122***
Child lives in single parent or non-married family+	1509	1, 4	12/1992	0.00	1.0	0.6779	0.467	0.024	0.106***	-0.067*
4 or more children in home+	1461	1, 2, 3, 4	12/1992	0.00	1.0	0.3470	0.476	0.008	0.084**	-0.127***
Child age 17										
Cumulative risk factors age 17	1539	1, 2, 3, 4	17/1997	0.00	5.0	2.44	1.33	-	0.119***	-0.150***
N of missing risk factors	1539	1, 2, 3, 4	17/1997	0.00	5.0	0.365	0.879	-	-0.074**	-0.061*
Parent is not a HS graduate+	1519	1, 4	17/1997	0.00	1.0	0.415	0.493	-	0.057*	-0.211***
Parent reported not being+ employed full or part time+	1307	1, 2, 3	17/1997	0.00	1.0	0.434	0.496	-	0.046	-0.081**
Any free lunch for child+	1323	1, 2, 6	17/1997	0.00	1.0	0.792	0.406	-	0.070*	-0.153***
Child lives in single parent or non-married family+	1510	1, 4	17/1997	0.00	1.0	0.694	0.461	-	0.043	-0.031
4 or more children in home+	1474	1, 2, 3, 4	17/1997	0.00	1.0	0.314	0.464	-	0.099**	-0.139***

Table 1 (Continued)

Risk factor	N	Reporter <sup>1</sup>	Age/year	Min	Max	Mean	S.D.	Spearman's non-parametric correlation		
								Depression (Age 16)	Juvenile court petitions (<Age 18)	High school or GED completion (Age 22)
Any child neglect or abuse (birth to 16)	1539	3, 5	0–17/1980–1997	0.00	1.0	0.09	0.29	0.023	0.095***	–0.073**
Cumulative risk factors <i>Birth to age 12</i>	1539	1, 2, 3, 4	0–12/1980–1992	0.00	20	9.34	4.34	0.063	0.166***	–0.195***
N of missing risk factors <i>Birth to age 12</i>	1539	1, 2, 3, 4	0–12/1980–1992	0.00	20	1.66	3.42	–0.009	–0.097**	–0.005
Adolescent Outcomes										
Depression	801	2	16/1996	0.00	1.0	0.45	0.50	–	0.080*	–0.113**
Juvenile arrest	1404	5	<18/1980–1998	0.00	1.0	0.21	0.41	–	–	–0.329***
High school completion	1334	1, 2, 6	By 22/2002	0.00	1.0	0.62	0.49	–	–	–

+ Non-parametric bivariate correlations: Spearman's Rho – \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . + included in risk index.

<sup>1</sup> Note: 1 = Parent, 2 = Child, 3 = IDHHS: Illinois Department of Health and Human Service, 4 = IDPH: Illinois Department of Public Health, 5 = CCJJ: Cook County Juvenile Justice, 6 = Chicago Public School system.

From birth to age 3, risk factors were slightly different. Parent education, family size and single parent family status were identical. However, indicators of low birth weight (below 2500 g), whether or not the child's mother was 19 years old or less at the child's birth, and any report of child neglect or abuse to Child Protective Services or the court system were also included.

Because the accumulation of risk factors may pose a stronger threat to functioning than any particular risk factor on its own (Garmezy, 1993; Seifer et al., 1992; Rutter, 2001), cumulative adversity present in the child's life was measured using a Family Risk Index. The Family Risk Index provided an additive scale score that was the sum of the five dichotomously defined risk indicators collected when the child was age 8, 10, 12 and 17. From birth to age 3, the scale had six indicators. The five main indicators in this index have been similarly used in prior studies (Rutter, 1987; Bendersky & Lewis, 1994; Reynolds, 1998). Scale indicators are associated with lower developmental adjustment and decreased academic achievement (Natriello, McDill & Pallas, 1990). Shown in Table 1, the sample had an average of approximately two and one half family risk factors at each of the school age data collection intervals.

A comprehensive childhood family risk index was also calculated by adding the number of family risk factors at each data collection interval from birth to age 12. This resulted in a scale with a range from 0 to 20, a mean of 9.34 and a standard deviation of 4.3. Childhood family risk was normally distributed in the sample.

*Child attributes and characteristics* that were used as independent variables in this study are listed in Table 2. *Gender* was a dichotomous variable coded 0 for males and 1 for females. The child's *early academic achievement* was measured by averaging reading and mathematics scores on the Iowa Test of basic skills. Scores from grades 1, 3 and 6 were used as three separate continuous variables. Scores were measured as 'grade equivalents'. Scoring 3.8 or above, for e.g. demonstrated performance equal to the 8th month of third grade. ITBS tests were typically administered in the 8th month of the school year.

*Early perceived school competence* was measured by a 10 item child self perception scale administered during grades 5 and 6. Internal consistency reliability for the scale was 0.74.

*Early classroom adjustment* was measured by teacher ratings of the child's socioemotional maturity. The scale is the sum of six items rated from poor (1) to excellent (5). Items were: concentrates on work, follows directions, is self confident, gets along well with others, participates in group discussions and takes responsibility for actions. Internal consistency reliability for the scale was 0.94. The scale was administered yearly from grade 1 to grade 6. For a longitudinal indicator of childhood adjustment, a continuous variable was created that assessed the number of years teachers rated the child's classroom adjustment average or above from grades 1 to 6.

*Middle childhood competencies and problems* were assessed using the Teacher-Child Rating Scale (TCRS; Hightower, Spinnell & Lotyczewski, 1989). The T-CRS includes 20 competence items (rated from 1, 'not at all' to 5, 'very well') that create four subscales, measuring socio-emotional adjustment in the areas of frustra-

Table 2  
Protective factors and child characteristics from birth to late adolescence

	N	Reporter	Age/year	Min	Max	Mean	S.D.	Spearman's non-parametric correlation		
								Depression (Age 16)	Juvenile arrest (<Age 18)	High school or GED completion (Age 22)
Protective factors										
Gender (1 = Female)	1539	Parent	0/1980	0	1	0.50	0.50	0.096**	-0.316***	0.165***
Child parent center preschool participation	1539	CPS	3–9/1983–1985	0	1	0.64	0.48	-0.066	-0.094**	0.112***
Average of child's math and reading scores in Grade 1	1327	CPS	6/1986	-0.90	4.05	1.56	0.673	-0.025	-0.162***	0.262***
Average of child's math and reading scores in Grade 3	1299	CPS	8/1988	-0.80	6.15	3.05	1.00	0.022	-0.172***	0.306***
Average of child's math and reading scores in Grade 6	1208	CPS	11/1991	1.30	9.45	5.20	1.33	-0.005	-0.231***	0.358***
Number of years teachers rated parent participation in school average or above (Grades 1–6)	1539	CPS-teachers	6–11/1986–1991	0	6	1.84	1.52	-0.038	-0.125***	0.265***
Number of years teachers rated child's classroom adjustment Average or above (Grades 1–6)	1539	Teachers	6–11/1986–1991	0	6	2.24	1.73	-0.053	-0.148***	0.305***
Child's self perception of competence in school (Grades 5–6)	1054	Child	8–10/1988–1990	15	48	35.87	5.12	-0.074	-0.135***	0.140***
Grade 6–7 child characteristics										
Peer social skills <sup>a</sup>	1058	Teachers	12–13/1991–1992	-2.7	1.9	0	1.0	-0.137***	-0.197***	0.259***
Shy or anxious behavior <sup>a</sup>	1058	Teachers	12–13/1991–1992	-1.0	4.5	0	1.0	-0.016	0.076*	-0.165***
Assertiveness skills <sup>a</sup>	1058	Teachers	12–13/1991–1992	-2.4	2.2	0	1.0	-0.023	-0.109***	0.202***

Table 2 (Continued)

	<i>N</i>	Reporter	Age/year	Min	Max	Mean	S.D.	Spearman's non-parametric correlation		
								Depression (Age 16)	Juvenile arrest (<Age 18)	High school or GED completion (Age 22)
Task orientation <sup>a</sup>	1058	Teachers	12–13/1991–1992	–1.8	2.0	0	1.0	–0.051	–0.259***	0.309***
Acting out behavior <sup>a</sup>	1058	Teachers	12–13/1991–1992	–1.0	2.8	0	1.0	0.114**	0.320***	–0.303***
Learning Problems <sup>a</sup>	1058	Teachers	12–13/1991–1992	–1.3	2.3	0	1.0	0.039	0.283***	–0.321***
Frustration tolerance <sup>a</sup>	1057	Teachers	12–13/1991–1992	–2.0	2.3	0	1.0	–0.117**	–0.252***	0.277***
Child's total competence	1058	Teachers	12–13/1991–1992	–2.6	2.5	60.75	15.75	–0.087*	–0.243***	0.308***
Child's total problems	1058	Teachers	12–13/1991–1992	–1.3	3.3	37.03	14.33	0.064	0.292***	–0.327***

<sup>a</sup>=Standardized Scores; \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ ; CPS=Chicago Public School system.

tion tolerance, task orientation, assertiveness skills and peer social skills. The T-CRS includes 18 problems items (scored from 1 ‘not a problem’ to 5 ‘very serious problem’) with subscales assessing acting-out behavior, shy-anxious behavior, and learning problems. Internal consistency reliabilities average over 0.90. Teachers filled out the T-CRS in grades 6 and 7. To minimize missing data, TCRS subscale scores from grades 6 and 7 were standardized and averaged.

*Parental involvement in elementary school* was measured by the number of years teachers rated parents’ participation in school activities as average or above. Data were collected from teacher surveys administered during grades one to six.

*Early childhood intervention* was measured by participation in one of Chicago’s Child Parent Center programs. Program participation was scored as a dichotomous variable – whether or not the child attended a CPC preschool. The sample sizes for preschool participation vary by outcome domain. For adolescent depression, 542 children (68%) attended CPC preschool and 259 (32%) did not. For juvenile court involvement, 911 (65%) children attended CPC preschool and 493 (35%) did not. Finally, for high school or GED completion, 869 (65%) children attended CPC preschool and 465 (35%) did not. For each domain, the percentage of participants vs. non-participants closely approximates the percentages in the full sample (65 vs. 35%).

### 2.3. Measures of dependent variables

Three dependent variables were selected to assess key indicators of educational attainment, social functioning, and mental health in adolescence and early adulthood. Graduation from high school or receiving a General Education Diploma (GED) by age 22 data collection was a dichotomous outcome that was considered a key indicator of educational attainment. The number of juvenile court petitions filed against the adolescent was a highly skewed continuous variable (e.g. most adolescents had none) and was considered to be a key indicator of poor social functioning or low rule abiding behavior. Finally, adolescent depression was assessed during grade 10, approximately age 16, using three ‘yes’ or ‘no’ items from a student survey. The three items were: ‘In the past year, I have felt really down about life in general’, ‘In the past year, I have felt seriously depressed’, and ‘In the past year, I have felt hopeless about the future’. Internal consistency reliability for this scale was 0.61. This was also a highly skewed continuous variable. Most students answered ‘no’ to all three of these questions. Answering ‘yes’ to any of these questions was considered to be an indication of possible depression. No clinical diagnosis of major depression was implied, but rather this indicator was used as a rough estimate of mental health functioning. Descriptive statistics for the three dependent variables are provided at the end of Table 1.

### 2.4. Data analyses

*Missing data analyses* were conducted to examine whether sample participants with available data were similar to sample participants with missing data. 1406 out

of the 1539 sample participants (91%) had juvenile arrest data. For high school or GED completion, 1334 of the 1539 sample participants had data and 205 (13%) were lost to attrition. Adolescent depression had the most serious problem with missing data. This dependent variable was derived from a survey sent to adolescents in the sample during 10th grade. Of the 1539 surveys sent out, 801 (52%) were returned. In order to determine if the sample participants missing on adolescent depression, juvenile arrest, and high school completion were different from the rest of the sample, dichotomous missing data indicators were computed for adolescent depression, juvenile arrest, and high school or GED completion. Chi-square and *T*-tests were performed using the missing vs. not missing indicator as the grouping variables and childhood risk and protective factors as the test variables.

*Bivariate correlational analyses* were used to begin to examine relationships between childhood risk and protective factors and adolescent adjustment outcomes. Family structure risk factors from birth to age 17 were examined as individual factors, as aggregated risk indices from each time period (birth to age 3, 8, 10, 12 and 17), and as a single childhood risk index that was the summation of the individual risk factors from birth to age 12. Correlational analyses specifically evaluated if cumulated family risk displayed a stronger negative association with adjustment outcomes than individual family risk factors did on their own.

*Cumulative family risk* was further examined in the second stage of the study's analyses. This second stage of data analyses sought to determine if cumulative risk had a linear or non-linear impact on childhood and adolescent adjustment outcomes. The cumulative childhood risk index was broken into thirds to identify children with low, moderate, and high levels of family structure risk. As shown in Table 1, the childhood risk index had a range of 0–20 with a mean of 9.3 and a standard deviation of 4.3. Children with fewer than 8 family structure risk factors were considered low risk. Those with 8–11 were considered to have experienced moderate risk. Children with 12 or more family structure risk factors were considered to have had high or severe levels of family risk. These high risk children spent nearly all of their childhoods in large families with single or unmarried parents, who did not finish high school, and who were chronically (rather than episodically) unemployed. These risk factors are consistently associated with low socioeconomic status and appear to influence parenting practices and child development by raising parent stress (McLoyd, 1990b, 1998). A series of univariate ANOVAs were run to see if there were differences in middle childhood and adolescent outcomes based on these levels of risk. High school or GED completion rate was tested with a Chi-square test because it was a dichotomous outcome cross-classified with a categorical variable.

### *2.5. Multivariate modeling of risk and protective factors*

Finally, stepwise regression analyses were used to see which individual, family, and program participation variables predicted adolescent adjustment outcomes in multivariate models. Independent variables were individually added to the model in blocks to examine mediation processes. High school or GED completion was a

dichotomous outcome, making logistic regression the optimal analytic strategy. This analysis was conducted using SPSS 11.0.

Adolescent depression and juvenile arrest records were count data. Both of these outcomes were highly skewed, continuous variables. To examine delinquency prediction using the number of delinquency petitions and depression using the number of positive answers to depression survey items, a negative binomial regression model was estimated. This method of data analysis has previously been used in social science research to model the frequency of delinquency (Nagin & Land, 1993). The use of a negative binomial model has been recommended for highly skewed dependent variables where the variance of the dependent variable is sufficiently larger than this variable's mean. While the negative binomial regression model assumes a poisson distribution and characterizes data as a poisson model would, the negative binomial model allows for the probability of  $Y$  to be unequal among the study sample (Land, McCall & Nagin, 1996). In the example of juvenile delinquency, individuals who have received one or more petitions to the juvenile court may be more likely to experience further arrests than individuals who have never had a juvenile arrest. The use of a negative binomial model is more conservative than the use of a conventional poisson model, which may decrease the standard error estimates and overstate statistical significance of certain factors (Land et al., 1996). To further specify this assumption, a zero-inflated probability (ZIP) version of the negative binomial model was estimated. The ZIP model allows for the possibility that the individuals with zero arrests are fundamentally different from those with one or more arrests. This analysis was conducted using the statistical package STATA.

### 3. Results

#### 3.1. *Missing data analyses*

Chi-square tests were used to cross-classify the dichotomous missing data indicator and dichotomous family risk variables.  $T$ -tests were used with continuous cumulative family risk or protective factor variables. These tests indicated that sample participants with missing data on adolescent depression had significantly more cumulative family risk at ages 8, 10, 12 and 17. Compared to sample participants with depression data, more of these children came from single parent homes with parents who did not finish high school. Fewer of these children had attended CPC preschool. They had lower test scores in grades 1, 3 and 6, less total competence and more total problems in grades 6–7. In adolescence, sample participants with missing data on depression had more arrests and more of them had dropped out of high school. Clearly, adolescents who returned the 10th grade survey were more advantaged than those who did not. Consequently, results for adolescent depression may be underestimated because the highest risk adolescents were less likely to be included in the analyses, lowering the variation in the sample.

High school or GED completion had a different profile of missing vs. not missing data. Most of the individual family risk factor comparisons revealed no significant

differences between missing and not missing groups. Sample participants who did not have high school or GED completion data were more likely to have four or more children in their homes and more indicated reports of child abuse or neglect from birth to age 3. As a group, they also had significantly lower averages on cumulative family risk at ages 8, 10, 12 and 17. While this indicated that they experienced less cumulative family risk, they also had significantly less parent participation in elementary school, lower ratings of classroom adjustment, and less total competence in grades 6–7. Compared with those participants with data, fewer of the sample participants with missing data on high school or GED completion had attended CPC preschool. The implications of this pattern of differences are not immediately clear. Participants with missing data on high school or GED completion experienced less cumulative family risk and, at the same time, had fewer childhood protective factors.

Compared to participants with data, missing cases on juvenile arrest experienced significantly fewer family risk factors, especially single parent or non-married household status, number of children in the home, and cumulative family risk. Once again, this loss of lower risk cases may cut down the variance in the sample, rendering results that are underestimated. Detailed tables for the missing data analyses are available upon request from the first author.

### 3.2. *Bivariate correlational analyses*

Non-parametric correlation coefficients are shown in Table 1. Non-parametric correlations revealed few significant associations between adolescent depression and family risk factors. All of the correlations were below 0.10. The only relationship that reached statistical significance was between the parent not graduating from high school by the time the child was age 10 ( $\rho=0.088$ ,  $P<0.05$ ) or age 12 ( $\rho=0.086$ ,  $P<0.05$ ) and subsequent adolescent depression at age 16. The only cumulative risk index that showed a statistically significant association with adolescent depression was family cumulative risk at age 8 ( $\rho=0.068$ ,  $P<0.05$ ). Cumulative family risk from birth to age 12 did not have a significant correlation with adolescent depression.

Family risk factors displayed stronger relationships with juvenile court petitions. For parsimony, only correlations above 0.10 will be discussed. However, all the correlations are presented in Table 1. The strongest relationships that surfaced were between juvenile court petitions and cumulative family risk when the child was age 8 ( $\rho=0.152$ ,  $P<0.001$ ), age 10 ( $\rho=0.167$ ,  $P<0.001$ ), age 12 ( $\rho=0.160$ ,  $P<0.001$ ), and age 17 ( $\rho=0.119$ ,  $P<0.001$ ). Cumulative family risk from birth to age 12 displayed a statistically significant association with juvenile court petitions ( $\rho=0.166$ ,  $P<0.001$ ).

The associations between high school completion and family risk factors revealed a different pattern of relationships. Cumulative family risk indicators at the different time intervals had statistically significant, negative correlations with high school or GED completion. However, the strongest and highly consistent correlation across time intervals was between the parent not having completed high school and adolescent high school completion (e.g. age 8,  $\rho=-0.203$ ,  $P<0.001$  or age 17,

$\rho = -0.211, P < 0.001$ ). The association between cumulative family risk from birth to age 12 and high school or GED completion was nearly as strong ( $\rho = -0.195, P < 0.001$ ).

Correlations between the adolescent outcome variables are provided at the end of Table 1. The strongest association was between high school or GED completion and juvenile court petitions ( $\rho = -0.329, P < 0.001$ ). Adolescent depression and high school or GED completion were negatively associated ( $\rho = -0.113, P < 0.01$ ) and adolescent depression and juvenile court petitions were positively associated ( $\rho = 0.080, P < 0.05$ ).

Non-parametric correlations between childhood protective factors and adolescent outcomes are provided in Table 2. Bivariate relationships between child characteristics and adolescent depression were stronger than the associations between family risk factors and adolescent depression. Adolescent depression was associated with being female ( $\rho = 0.096, P < 0.01$ ), having lower levels of peer social skills ( $\rho = -0.137, P < 0.001$ ), frustration tolerance ( $\rho = -0.117, P < 0.001$ ) and displaying higher levels of acting out behavior ( $\rho = 0.114, P < 0.001$ ) in grades 6–7.

Juvenile court petitions were associated with all of the protective factors and child characteristics listed in Table 2. The strongest relationships were between juvenile court petitions and acting out behavior ( $\rho = 0.320, P < 0.001$ ), learning problems ( $\rho = 0.283, P < 0.001$ ), and total problem behavior ( $\rho = 0.292, P < 0.001$ ) in grades 6–7.

High school or GED completion also had strong relationships with protective factors and child characteristics. The strongest relationships were between high school or GED completion and childhood standardized test scores from 3rd and 6th grades ( $\rho = 0.306, P < 0.001$  and  $\rho = 0.358, P < 0.001$ , respectively). Acting out behavior, learning problems, and total problem behavior in grades 6–7 all had statistically significant correlations above  $-0.3$  with high school or GED completion.

Teacher ratings of the child's adjustment in school from grades 1–6, task orientation, and total competence in grades 6–7 all had positive associations above  $0.3$  ( $P < 0.001$ ) with high school or GED completion.

### 3.3. Cumulative family risk

Results examining cumulative family risk as a categorical variable are presented in Table 3. To guard against the risk of making a Type I error from running multiple tests, only results that were statistically significant at the  $P < 0.01$  level were reported.

There were statistically significant differences between the mean scores for the three cumulative risk levels on most of the child characteristics from grades 6 to 7 ( $P < 0.01$ ). Specifically, low risk children had the lowest scores and high risk children had the highest scores on shy or anxious behavior, learning problems, and T-CRS ratings of total problems. Conversely, the low risk children had the highest scores and high risk children had the lowest scores on peer social skills, task orientation, and T-CRS ratings of total competence. High risk children also had significantly lower academic test scores in grades 6 and 8. Adolescent depression

Table 3  
Late childhood and late adolescence outcomes by level of risk

Variable	N	Reporter	Age/year	Childhood risk (birth to age 12)			F	Post hoc comparisons
				Low (0–7 risk factors)	Medium (8–11 risk factors)	High (12–20 risk factors)		
<b>Grade 6–7 characteristics</b>								
Peer social skills <sup>a</sup>	1058	Teachers	12–13/1991	0.130 (1.0)	0.026 (1.0)	–0.117 (0.97)	5.54**	Low different from high
Shy or anxious behavior <sup>a</sup>	1058	Teachers	12–13/1991	–0.082 (0.97)	–0.080 (0.91)	0.126 (1.1)	5.42**	Low-Med different from high
Task orientation <sup>a</sup>	1058	Teachers	12–13/1991	0.111 (1.0)	0.041 (0.98)	–0.115 (0.99)	4.91**	Low different from high
Learning problems <sup>a</sup>	1058	Teachers	12–13/1991	–0.131 (0.98)	–0.034 (0.99)	0.125 (1.0)	6.10**	Low different from high
Total competence <sup>a</sup>	1058	Teachers	12–13/1991	0.132 (1.0)	0.039 (0.99)	–0.130 (0.97)	6.47**	Low-Med different from high
Total problems <sup>a</sup>	1058	Teachers	12–13/1991	–0.120 (1.0)	–0.055 (0.97)	0.133 (1.0)	6.43**	Low-Med different from high
Gr. 6 reading and math avg.	1208	CPS	12/1991	5.73 (1.3)	5.35 (1.3)	4.97 (1.3)	34.8***	All groups different
Gr. 8 reading and math avg.	1096	CPS	14/1993	7.57 (1.6)	7.10 (1.5)	6.74 (1.7)	24.2***	All groups different
<b>Outcomes in Adolescence</b>								
Depression	801	Child	16/1996	0.66 (0.91)	0.70 (0.93)	0.80 (1.0)	1.5	No differences
Juvenile arrest	1406	CCJJ	<18/<1998	0.28 (1.0)	0.51 (1.5)	0.93 (2.3)	18.7***	Low-Med different from high
High school or GED completion rate	1334	CPS, Parent, Child	22/2001	0.71 (0.46)	0.65 (0.48)	0.50 (0.50)	$\chi^2_{(2)} = 44.1***$	Low-Med different from high

<sup>a</sup> = Standardized scores: One way ANOVA; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . Post hoc comparisons were Tukey’s HSD when group variances were equal and Dunnett’s C when variances were unequal. CPS=Chicago Public School system, CCJJ: Cook County Juvenile Justice system. High school or GED completion rate was tested with a Chi-square test because it was a dichotomous outcome cross classified with a categorical variable. Follow-up comparisons were performed by selecting two out of the three levels and running the Chi-square test again.

was not statistically significantly different across the levels of risk. The average number of juvenile arrest petitions for the high risk group was significantly higher than the other two levels of risk. Finally, the high school or GED completion rate for the high risk group was 50% compared to 65% for moderate risk, and 71% for the low risk group ( $\chi^2_{(2)} = 44.1, P < 0.001$ ).

Interestingly, Tukey's HSD post hoc tests showed two major patterns. First, there was a linear pattern where level of cumulative risk gradually increased negative outcomes, and decreased positive outcomes. The low risk group mean was significantly different from the high risk group mean while the moderate group was not different from the other two. This linear relationship was the case for peer social skills, task orientation, and learning problems. Grade 6 and 8 academic test scores also had a negative linear relationship with increasing level of risk.

The second pattern revealed was non-linear. In this pattern, low and moderate risk groups were comparable while high risk groups were significantly different. This threshold effect was present for shy or anxious behavior, T-CRS total competence and total problems scores, adolescent juvenile court petitions, and high school or GED completion.

### 3.4. Predicting adolescent outcomes

The results obtained from running negative binomial regression models for adolescent depression and juvenile arrest petitions are presented in Table 4. The coefficients represented in Table 4 illustrate interpretable marginal effects estimated using STATA. Marginal effects are the percentage point differences between groups after adjusting for other variables in the model. They were derived from the partial derivatives evaluated at the mean of the explanatory variable. Positive coefficients suggest that the rates of delinquency or depression are higher for each unit change of the explanatory variable, while negative coefficients illustrate lower rates of juvenile delinquency or depression for each unit change of the explanatory variable.

### 3.5. Depression

In the multivariate model, several childhood risk and protective factors surfaced as significant predictors of adolescent depression. Risk factors that predicted adolescent depression at the trend level ( $P < 0.10$ ) were: being female, displaying lower levels of classroom adjustment in grades 1–6, and exhibiting shy or anxious behavior in grades 6–7. Each unit increase in the average of reading and math scores during third grade was associated with a 15% point increase in adolescent depression ( $P < 0.05$ ). Child Parent Center preschool participation was associated with a 22 percentage point reduction in adolescent depression ( $P < 0.05$ ). Finally, every unit increase in peer social skills in grades 6–7 was associated with a 20 percentage point decrease in adolescent depression ( $P < 0.001$ ).

*Juvenile arrest*—There were several childhood factors that predicted juvenile arrest rates at the trend level ( $P < 0.10$ ). Child Parent Center preschool participation was associated with a 23% point reduction in juvenile court petitions. CPC preschool

Table 4  
Multivariate regression models for adolescent outcomes

	Marginal effects from Negative binomial regression		Odds ratios from logistic regression
	Depression (Age 16)	Juvenile court petitions ( < Age 18)	High school or GED completion (Age 22)
Childhood risk and protective factors			
Gender (1 = Female)	0.15 +	−0.87***	1.20
Cumulative family risk (birth to age 12)	0.01	0.03*	0.93**
<i>N</i> of missing risk factors (birth to age 12)	−0.01	−0.03	0.97
Child parent center preschool participation	−0.22**	−0.23 +	1.39 +
Average of child's math and reading scores in Gr. 1	0.05	0.13	1.01
Number of years teachers rated parent participation in school average or above (Gr. 1–6)	−0.01	−0.05	1.17*
Average of child's math and reading scores in Gr. 3	0.16*	0.04	0.80
Number of years teachers rated child's classroom adjustment average or above (Gr. 1–6)	−0.05 +	0.04	1.12
Child's self perception of competence in school (Gr. 5–6)	0.00	−0.01	0.99
Grade 6–7 characteristics			
Peer social skills <sup>a</sup>	−0.20**	−0.07	0.94
Shy or anxious behavior <sup>a</sup>	−0.11 +	−0.13 +	1.01
Assertiveness skills <sup>a</sup>	0.03	−0.05	0.92
Task orientation <sup>a</sup>	0.01	0.11	1.67*
Acting out behavior <sup>a</sup>	0.08	0.36**	0.69*
Learning problems <sup>a</sup>	−0.03	0.09	1.25
Frustration tolerance <sup>a</sup>	−0.01	−0.00	1.00
Gr. 6 reading and math avg.	−0.07	−0.14 +	1.58***

Note: +  $P < 0.10$ , \* $P < 0.05$ , \*\* $P < 0.01$ , \*\*\* $P < 0.001$ . Marginal effects are the percentage point differences between groups after adjusting for other variables in the model. They were derived from the partial derivatives evaluated at the mean of the explanatory variable. This model was run using a maximum-likelihood zero-inflated negative binomial regression model where the dependent variable is a non-negative count variable. All covariates and independent variables were assessed simultaneously.

was statistically significant ( $P < 0.05$ ) in the stepwise models until grade 6 test scores entered on the final step. A unit change increase in either shy or anxious behavior during grades 6–7 or grade 6 reading and math scores was associated with a 13 or 14% point reduction in juvenile court petitions. Being female was associated with an 87% point reduction in juvenile court petitions ( $P < 0.001$ ). Every increase in family risk from birth to age 12 was associated with a 3% point increase in juvenile court petitions ( $P < 0.05$ ) and finally, every increase in acting out behavior in grades 6–7 was associated with a 36% point increase in juvenile court petitions.

*High school or GED completion* was regressed on childhood risk and protective factors using logistic regression. Odds ratios for childhood risk and protective factors that were included in the models are presented in Table 4. Holding other

factors constant, each family risk factor that was added to the child's life from birth to age 12 was associated with a 7% ( $P < 0.01$ ) decrease in the probability of completing high school or receiving a GED. Acting out in grades 6–7 was also an important risk factor. Every increase in acting out behavior was associated with a 31% ( $P < 0.05$ ) reduction in the probability of graduating from high school or completing a GED. There were also several significant protective factors. The likelihood of graduating from high school or getting a GED certificate was 39% higher for children who participated in the CPC preschool program compared to children who did not ( $P < 0.10$ ). Each increase in the number of years of parent participation in school during grades 1–6 was associated with a 17% increase in the probability of high school or GED completion ( $P < 0.05$ ). Finally, every increase in task orientation during grades 6–7 and in 6th grade standardized test scores was associated with a 67% and a 58% increase in the chances of graduating from high school or completing a GED ( $P < 0.05$  and  $P < 0.001$ , respectively). The full model fit the data well ( $\chi^2_{(18)} = 191.35$ ,  $P < 0.001$ ), correctly classifying 81% of individuals who graduated and 57% of those who did not.

#### 4. Discussion

This study investigated risk and resilience from childhood through adolescence in a large sample of inner city minority youth. Family risk factors were not significantly associated with adolescent depression, but had a positive relationship with juvenile arrest rates and a strong negative association with high school or GED completion. Some of the main effects for protective factors were far stronger than the effects for cumulative family risk.

##### 4.1. Risk factors

The strongest relationship between a family risk factor and an outcome surfaced between parent's educational status (i.e. not having finished high school) and adolescent high school or GED completion. This correlation between the parent's low educational status and the adolescent not finishing school was even stronger than the influence that cumulative family risk had on adolescent educational attainment. This illustrated how risk can be passed down from generation to generation.

Cumulative family risk during childhood exerted an important influence across adolescent outcomes. In multivariate models, cumulative family risk significantly increased the chances of juvenile court involvement and decreased the probability of completing high school or getting a GED by age 22. This indication of the strength of cumulative risk both confirms work completed by other resilience researchers (Rutter, 1979; Seifer et al., 1992; Garnezy, 1993; Coie et al., 1993; Dishion et al., 1999; Greenberg et al., 2001; Rutter, 2001) and extends our understanding of the topic. Cumulative family risk was not a significant predictor of adolescent depression. Further, much of the relationship it had with high school or GED completion appeared to derive from the contribution of a single risk factor

– parent educational status. This suggests that although it is certainly important, cumulative risk needs to be examined along with individual risk factors across multiple domains of adolescent functioning. Risk dynamics are complex and need to be further examined using diverse methods and models.

Further evidence for risk complexity was shown in this study's analysis of low, moderate, and high risk groups. Cumulative risk had both linear and non-linear effects depending upon the outcome of interest. No clear pattern of linear vs. non-linear effects surfaced. Moving from moderate to high cumulative family risk resulted in a significant increase in shy or anxious behavior, and total problem behavior while decreasing total competent behavior. This threshold effect was in line with other research (Fergusson and Lynskey, 1996; Pollard et al., 1999), prompting us to agree that cumulative risk may have a non-linear relationship with childhood and adolescent outcomes. Future research should closely examine risk thresholds for different outcome domains. At the same time, cumulative family risk had a negative linear relationship with peer social skills, task orientation, and standardized test scores in grades 6 and 8. It also had a positive linear relationship with learning problems. This conflicting evidence leads us to conclude that some children may have thresholds of tolerance for risk beyond which they should not be pushed while other children may experience gradual deterioration of competencies and elevations in problems with increasing accumulation of family risk.

In addition to cumulative family risk, there were several child characteristics that heightened the chances of problematic adolescent outcomes. For example, being female, and having higher standardized test scores in 3rd grade were risk factors associated with increases in adolescent depression. Also, children with higher levels of teacher-reported acting out behaviors during grades 6–7 had significantly higher rates of juvenile court petitions in adolescence and lower chances of completing high school or a GED program. We highlight these findings to illustrate that some risk factors were domain specific (e.g. were only associated with depression) while others were related to multiple outcomes (e.g. childhood acting out predicted both juvenile arrest and decreased educational attainment).

#### *4.2. Protective factors*

Protective factors were stronger predictors of adolescent outcomes than risk factors. This was true for every multivariate model that we examined. Participation in Child Parent Center preschool was the protective factor with the widest ranging effects across outcomes. CPC participants had significantly lower rates of adolescent depression, fewer juvenile court petitions, and their probability of completing high school or their GED was 36% greater than non-participants. This robust relationship between early childhood prevention and adolescent outcomes was striking, especially considering the extensive array of child attributes and risk factors that were included in the multivariate models. It was beyond the purview of this investigation to delineate precise mechanisms or pathways for CPC effects. This has been discussed at length elsewhere (Reynolds, 1991, 1998; Reynolds et al., 2001). However, the CPC effects in this study are particularly noteworthy because it is the first time that

program effects on adolescent depression have been examined. Further, the CPC effect for adolescent depression may be underestimated. Missing data analyses showed that higher risk adolescents were less likely to be included in the analyses, lowering the variation in the sample. If these higher risk adolescents were included, the effect of CPC preschool participation on adolescent depression may have been even stronger.

Two other protective factors cut across two but not all three of the adolescent outcomes. Children who displayed shy or anxious behavior during grades 6–7 had lower rates of depression and fewer juvenile court petitions. Similarly, children with higher standardized test scores during grade 6 had fewer juvenile court petitions and significantly higher chances of finishing high school or getting a GED.

Each outcome also had unique protective factors. Classroom adjustment in elementary school and peer social skills during grades 6–7 were associated with lower rates of adolescent depression. Females had significantly lower rates of juvenile court petitions. Finally, parent participation in elementary school and child task orientation significantly increased the odds of completing high school or a GED program.

These associations begin to illuminate complex relationships between academic functioning, social adjustment (in the form of rule abiding behavior), and mental health. There were universal protective factors (i.e. early intervention), common protective factors that were associated with more than one outcome, and unique protective factors within each outcome domain. Further, early indicators of social skill, academic functioning, and mental health sometimes predicted later functioning in other areas (e.g. childhood peer social skills predicted adolescent depression, childhood acting out predicted high school or GED completion). Future research should continue to delineate protective factor profiles for different domains of functioning, paying special attention to protective factors that are unique to one outcome vs. ones that are generally applicable to multiple outcomes. Future studies should also try to replicate the patterns of relationships found in the current investigation.

### *4.3. Implications for social work practice*

This investigation's most straightforward implication for social work practice is that the results underscored the need to support high-quality early childhood intervention efforts. CPC program participation was the protective factor with the widest-ranging effects – even up to 17 years after the intervention was provided. This, along with previous work cited above, makes a compelling case for both intervention effectiveness and the lasting effect comprehensive services provided early in life can have on educational attainment, social conduct, and mental health.

Social work practitioners should also welcome the evidence showing that protective factors, compared to risk factors, have a stronger longitudinal influence on adolescent outcomes. This lends support to strengths-based approaches to social work practice wherein building assets and opportunities is just as important as ameliorating risks. Once again, intervention appears to be optimal when provided

as early as possible in the lifespan. Supporting early classroom adjustment, building peer social skills, encouraging parent participation in elementary school, and increasing child task orientation are all targets for social work practice that appear to have long-term benefits.

Finally, social workers should keep in mind the complexity of both risk and protective factors. Risk factors may gradually lead to problems or may have a serious threshold effect beyond which problems rapidly manifest. Cumulative risk should always be assessed. Practitioners need to be familiar with risk and protective factor profiles that are associated with specific outcome domains. Understanding this complexity will help to make practice interventions specific and well-targeted.

#### *4.4. Limitations*

Missing data attrition was the most important weakness in this longitudinal analysis. Because of missing data, the investigation's sample size fluctuated between the three multivariate models. Further, missing data analyses indicated that high risk study participants were less likely to return the 10th grade survey, making our adolescent depression data biased towards lower risk and higher functioning adolescents. This decreased variation in the adolescent depression data may have decreased the strength of our findings for this outcome.

Participants with missing data on high school or GED completion and juvenile arrest experienced less cumulative family risk and, at the same time, had fewer childhood protective factors. It is important to note this potential bias, but at the same time, it is harder to interpret how this pattern may have influenced our results. Because they experienced less family risk, these sample participants may have had the family resources to move out of inner-city Chicago. Children who did not participate in CPC preschool were more likely to have missing data on high school or GED completion, indicating that the CPC program effect for this outcome may be biased downward as well.

This study's aim was to illuminate how risk and protective factors functioned for inner city minority youth. Sample participants were all minority and were primarily (93%) African American. While this attempted to fill a gap in our current knowledge of development in minority children, it also limited the generalizability of the results. Consequently, caution should be used when applying the study results beyond their application to minority youth who grew up in impoverished neighborhoods in Chicago.

Finally, our scale for adolescent depression had marginally acceptable psychometrics and was not as rigorously measured as the other two dependent variables. The score was based on responses to three dichotomous questions that may have been useful signs of depression. However, it was not indicative of clinical depression. Future studies considering the interplay of multiple adjustment domains in adolescence would benefit from including a more rigorous measure of mental health.

## **5. Conclusions**

Family risk factors had a strong influence across adjustment indicators in childhood and adolescence. Cumulative family risk was particularly deleterious and

its effects were either linear or non-linear depending upon the outcome under consideration. The deleterious effects of cumulative family risk need to be further examined in future research. Relationships between protective factors and adolescent outcomes were even stronger than risk factor associations. Early childhood intervention had the broadest protective effect and, for the first time, was shown to be related to lower rates of adolescent depression. Each adolescent outcome had a distinct profile of significant risk and protective factors. Future research should try to replicate and refine these profiles so that they can ultimately be used as targets for prevention programming.

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## References

- Anthony, E. J. (1974). The syndrome of the psychological invulnerable child. In E. J. Anthony, (pp. 529–544) *The child in his family children at psychiatric risk*, vol. 3. New York: John Wiley and Sons.
- Bendersky, M., & Lewis, M. (1994). Environmental risk, biological risk, and developmental outcome. *Developmental Psychology*, 30, 484–494.
- In Booth, A. & Crouter, A. C. (2001). Does it take a village?. Lawrence Erlbaum, Mahwah, NJ.
- Cauce, A. (1995). Behavior problems in 5- to 11-year-old children from low-income families: Of norms and cutoffs: Response. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34(5), 537–538.
- Cauce, A., Felner, R. D., & Primavera, J. (1982). Social support in high-risk adolescents: Structural components and adaptive impact. *American Journal of Community Psychology*, 10(4), 417–428.
- Cauce, A., Ryan, K., & Grove, K. (1998). Children and adolescents of color, where are you? Participation, selection, recruitment and retention in developmental research. In V. McLoyd, L. Steinberg, *Studying minority adolescents: Conceptual, methodological and theoretical issues* (pp. 147–166). Mahwah, NJ: Lawrence Erlbaum.
- Coie, J. D., Watt, N. F., West, S. G., Hawkins, J. D., Asarnow, J. R., Markman, H. J., Ramey, S. L., Shure, M. B., & Long, B. (1993). The science of prevention: A conceptual framework and some directions for a national research program. *American Psychologist*, 48, 1013–1022.
- Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology*, 94(Suppl), S95–S120.
- Cowen, E. L., Wyman, P. A., Work, W. C., & Parker, G. R. (1990). The Rochester child resilience project: Overview and summary of first year findings. *Development and Psychopathology*, 2, 193–212.
- Dishion, T. J., Capaldi, D. M., & Yoerger, K. (1999). Middle childhood antecedents to progressions in male adolescent substance use: An ecological analysis of risk and protection. *Journal of Adolescent Research*, 14(2), 175–205.

- Duncan, G. J., & Raudenbush, S. W. (2001). Neighborhoods and adolescent development: How can we determine the links?. In A. Booth, A. C. Crouter, *Does it take a village?* (pp. 105–136). Mahwah, NJ: Lawrence Erlbaum.
- Elder, G. H. (1974/1999). *Children of the great depression: Social change in life experiences*. Chicago: University of Chicago Press.
- Farber, A., & Egeland, B. (1987). Invulnerability among abused and neglected children. In E. Anthony, B. Cohler, *The invulnerable child* (pp. 253–288). New York: Guilford Press.
- Fergusson, D. M., & Lynskey, M. T. (1996). Adolescent resiliency to family adversity. *Journal of Child Psychology and Psychiatry*, 37, 281–292.
- Fraser, M. W., Kirby, L. D., Smokowski, P. R. (In Press). Risk and resilience in childhood. In: M. W. Fraser (Ed.) *Risk and Resilience in Childhood: An Ecological Perspective (2nd Edn)*. Washington D.C.: National Association of Social Workers.
- Garnezy, N. (1985). Stress-resistant children: The search for protective factors. In J. E. Stevenson, *Recent research in developmental psychopathology* (pp. 213–233). Tarrytown, NY: Pergamon Press.
- Garnezy, N. (1993). Children in poverty: Resilience despite risk. *Psychiatry*, 56, 127–136.
- Garnezy, N., & Masten, A. (1991). 'The protective role of competence indicators in children at risk. In E. M. Cummings, *Lifespan developmental psychology: Perspectives on stress and coping* (pp. 151–176). Hillsdale, NJ: Lawrence Erlbaum.
- Greenberg, M. T., Speltz, M. L., DeKlyen, M., & Jones, K. (2001). Correlates of clinic referral for early conduct problems: Variable- and person-oriented approaches. *Development and Psychopathology*, 13, 255–276.
- Hartup, W. W. (1983). Peer relations. In: P. J. Mussen (Series Ed.) & E. M. Hetherington (Vol. Ed.). *Handbook of child psychology: socialization, personality, and social development*, Vol. 4 New York: Wiley pp. 103–196.
- Hightower, A., Spinnell, A., Lotyczewski, B. (1989). *Teacher-child rating scale (T-CRS) guidelines*. Rochester, NY: Primary Mental Health Project.
- Ladd, G. W., & Burgess, K. B. (2001). Do relational risks and protective factors moderate the linkages between childhood aggression and early psychological and school adjustment?. *Child Development*, 72(5), 1579–1601.
- Land, L. C., McCall, P. L., & Nagin, D. S. (1996). A comparison of poisson, negative binomial, and semiparametric mixed poisson regression models with empirical applications to criminal careers research. *Sociological Methods and Research*, 24, 387–442.
- Luthar, S. (1991). Vulnerability and resilience: A study of high-risk adolescents. *Child Development*, 62, 600–616.
- Luthar, S. (1993). Annotation: Methodological and conceptual issues in research on childhood resilience. *Journal of Child Psychology and Psychiatry*, 34(4), 441–453.
- Luthar, S. (1995). Social competence in the school setting: Prospective cross-domain associations among inner-city teens. *Child Development*, 66(2), 416–429.
- Luthar, S. (1997). Sociodemographic disadvantage and psychosocial adjustment: Perspectives from developmental psychopathology. In S. Luthar, J. Burack, D. Cicchetti, J. Weisz, *Developmental psychopathology: Perspectives on adjustment, risk, and disorder* (pp. 459–485). New York, NY: Cambridge University Press.
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, 71(3), 543–562.
- Luthar, S. S., Doernberger, C. H., & Zigler, E. (1993). Resilience is not a unidimensional construct: Insights from a prospective study of inner-city adolescents. *Development and Psychopathology*, 5, 703–717.
- Luthar, S., & Zigler, E. (1991). Vulnerability and competence: A review of research on resilience in childhood. *American Journal of Orthopsychiatry*, 61(1), 6–22.
- Masten, A. (1987). Resilience in development: Implications of the study of successful adaptation for developmental psychopathology. In D. Cicchetti, *The emergence of a discipline: Rochester symposium on developmental psychopathology* (pp. 261–294). Hillsdale, NJ: Lawrence Erlbaum.

- Masten, A. (1994). Resilience in individual development: Successful adaptation despite risk and adversity. In M. C. Wang, E. W. Gordon, *Educational resilience in inner-city America: Challenges and prospects*. Hilldale, NJ: Lawrence Erlbaum.
- Masten, A., Best, K., & Garmezy, N. (1990). Resilience and development: Contributions from the study of children who overcome adversity. *Development-and-Psychopathology*, 2(4), 425–444.
- Masten, A., & Coatsworth, J. D. (1995). Competence, resilience and psychopathology. In D. Cicchetti, D. J. Cohen, (pp. 715–752) *Developmental psychopathology: Risk, disorder and adaptation*, vol. 2. New York: John Wiley and Sons, Inc.
- Masten, A., & Coatsworth, J. D. (1998). The development of competence in favorable and unfavorable environments: Lessons from research on successful children. *American Psychologist*, 53(2), 205–220.
- Masten, A. S., Hubbard, J. J., Gest, S. D., Tellegen, A., Garmezy, N., & Ramirez, M. (1999). Competence in the contest of adversity: Pathways to resilience and maladaptation from childhood to late adolescence. *Development and Psychopathology*, 11, 143–169.
- McLoyd, V. C. (1990a). Minority children: Introduction to the special issue. *Child Development*, 61, 263–266.
- McLoyd, V. C. (1990b). The impact of economic hardship on black families and children: Psychological distress, parenting and socioemotional development. *Child Development*, 61, 311–346.
- McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, 53(2), 185–204.
- Nagin, D. S., & Land, K. C. (1993). Age, criminal careers, and population heterogeneity: Specification and estimation of a non-parametric, mixed poisson model. *Criminology*, 31, 327–362.
- Natriello, G., McDill, E. I., & Pallas, A. M. (1990). *Schooling and disadvantaged children; racing against catastrophe*. New York: Teachers College Press, Columbia University.
- Nettles, S. M., & Pleck, J. H. (1993). *Risk, resilience, and development: The multiple ecologies of black adolescents*. US: Center for Research on Effective Schooling for Disadvantaged Students.
- Pellegrini, D. S. (1990). Psychosocial risk and protective factors in childhood. *Journal of Developmental and Behavioral Pediatrics*, 11(4), 201–209.
- Pollard, J. A., Hawkins, J. D., & Arthur, M. W. (1999). Risk and protection: Are both necessary to understand diverse behavioral outcomes in adolescence?. *Social Work Research*, 23(3), 145–158.
- Reynolds, A. J. (1991). Early schooling of children at risk. *American Educational Research Journal*, 28, 392–422.
- Reynolds, A. J. (1998). Resilience among black urban youth: Prevalence, intervention effects and mechanisms of influence. *American Journal of Orthopsychiatry*, 68(1), 84–100.
- Reynolds, A., Temple, J., Robertson, D., & Mann, E. (2001). Long term effects of an early childhood intervention on educational achievement and juvenile arrest: A fifteen year follow-up of low income children in public schools. *Journal of the American Medical Association*, 285(18), 2339–2346.
- Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In J. S. Bruner, A. Garten, (pp. 49–74) *Primary prevention of psychopathology*, vol. 3. Hanover, NH: University Press of New England.
- Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry*, 57(3), 316–331.
- Rutter, M. (1990). Psychosocial resilience and protective mechanisms. In J. Rolf, A. S. Masten, D. Cicchetti, K. H. Nuechterlein, S. Weintraub, *Risk and protective factors in the development of psychopathology* (pp. 181–214). New York: Cambridge University Press.
- Rutter, M. (2000). Resilience reconsidered: Conceptual considerations, empirical findings, and policy implications. In J. P. Shonkoff, S. J. Meisels, *Handbook of early childhood intervention* (2nd ed) (pp. 651–682). New York, NY: Cambridge University Press.
- Rutter, M. (2001). Psychosocial adversity: Risk, resilience, and recovery. In J. M. Richman, M. W. Fraser, *The context of youth violence: resilience, risk, and protection* (pp. 13–41). Westport, CT: Praeger Publishers.

- Seifer, R., Sameroff, A. J., Baldwin, C. P., & Baldwin, A. (1992). Child and family factors that ameliorate risk between 4 and 13 years of age. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31, 893–903.
- Smokowski, P. R., Reynolds, A. J., & Bezrucko, N. (1999). Resilience and protective factors in adolescence: An autobiographical perspective from disadvantaged youth. *Journal of School Psychology*, 37(4), 425–448.
- Stevenson, H. W., Chen, C., & Lee, S. Y. (1993). Mathematics achievement of Chinese, Japanese, and American children: Ten years later. *Science*, 259, 53–58.
- Werner, E., & Smith, R. (1982). *Vulnerable but invincible: A longitudinal study of resilient children and youth*. New York: Adams, Bannister, and Cox.
- Werner, E., & Smith, R. (1992). *Overcoming the odds: High-risk children from birth to adulthood*. Ithaca, NY: Cornell University Press.
- Winfield, L. F. (1995). The knowledge base on resilience in African–American adolescents. In L. J. Crockett, A. C. Crouter, *Pathways through adolescence: Individual development in relation to social contexts. The Penn state series on child and adolescent development* (pp. 87–118). Hillsdale, NJ, England: Lawrence Erlbaum.