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The Effects of an Anti-Poverty Program on Children's Cumulative Poverty-Related Risk: Exploring the Use of Program Services

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Abstract

Using data from an experimental evaluation of New Hope, a program that provided financial incentives to work, this study examined the effects of New Hope on children's cumulative poverty-related risk. Sample includes 654 children ages 1-10. Nine poverty-related risks make up the measure of cumulative risk. New Hope significantly reduced children's cumulative risk. Significant indirect effects of New Hope on children's parent-reported behavior problems and school achievement, via cumulative risk, were found. The effect of New Hope on cumulative risk was moderated by child age; effects were concentrated among children less than age five. Results show a relationship between use of different program services and cumulative risk. Use of the health insurance and child care subsidies, as well as the total number of services used, were related to lower cumulative risk.

The Effects of an Anti-Poverty Program on Children's Cumulative Poverty-Related Risk: Exploring the Use of Program Services

Developmental risk has been defined as biological and environmental conditions that increase the likelihood of later unfavorable outcomes. Studies often focus on risk for developmental psychopathology and low school achievement. Risk occurs at different levels, including individual (such as, low birth weight, difficult temperament), family (such as, single parent family, maternal depression), and broader contextual levels (such as, neighborhood violence, concentrated neighborhood poverty). Research has shown that risks for childhood externalizing and internalizing symptoms operate cumulatively (Ackerman, Izard, Schoff, Youngstrom & Kogos, 1999; Loeber et al., 2001; Moffitt & Caspi, 2001; Rutter, 1979; Sameroff & Chandler, 1975). The more risks children experience, the more likely they are to develop behavior problems or other negative outcomes.

Many risk factors are associated with poverty. Although hypothesized effects on multiple risks underlie the call for more comprehensive programs to prevent developmental psychopathology (Coie et al., 1993; Mrazek & Haggerty, 1994), the literature on cumulative risk has rarely been linked to evaluations of programs and policies for children in poverty. Prior anti-poverty programs, such as comprehensive early childhood programs, appear to have had impacts on multiple risks for outcomes such as antisocial behavior (Yoshikawa, 1994). However, effects on cumulative risk have not been examined in programs that seek to reduce poverty by affecting parental employment and income.

The current study seeks to address this gap by examining the extent to which two anti-poverty programs affected children's cumulative level of risk. While most studies of risk examine risk as a predictor of developmental outcomes, this study will consider risk itself as an

outcome. Nine poverty-related risks will make up the measure of cumulative risk: income poverty, maternal education, number of children in household, single parent family, maternal depressive symptoms, parenting stress, maternal warmth, material hardship, and food insufficiency. This research will also consider cumulative risk as a mediator, examining whether cumulative risk helps explain effects of programs on child outcomes, in particular, school achievement and psychopathology. Both externalizing behaviors – aggressive, non-compliant, hyperactive and attention deficit behaviors – and internalizing behaviors – withdrawn, anxious, and depressed behaviors (Achenbach et al., 1991) – will be considered. The phrase "behavior problems" will refer to externalizing and internalizing symptoms considered together.

Effects of family-income poverty on children's development

Poverty is related to poor mental health outcomes (McLeod & Shanahan, 1993; McLoyd, 1990; McLoyd & Wilson, 1991). In their analysis of a nationally representative sample, McLeod and Shanahan (1993) found that persistent poverty was related to children's internalizing symptoms while current poverty was related to children's externalizing symptoms. McLoyd (1990) contends that the relationship between poverty and children's poor socioemotional functioning – including increased internalizing symptoms – is partially mediated through more harsh and inconsistent parenting (she also hypothesizes other mediating factors).

A great deal of research has supported the notion that poverty is related to poor cognitive development and school achievement (Duncan, Klebanov, & Brooks-Gunn, 1994; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Levin, 1991; Smith, Brooks-Gunn, & Klebanov, 1997). Poverty has been found to be associated with lower IQ scores at age five (Duncan et al., 1994), with lower levels of completed schooling (Duncan, et al., 1998), and with lower levels of verbal ability in preschool and academic achievement during middle childhood (Smith et al., 1997).

Although some scholars question the magnitude of effects (Mayer, 1997), the bulk of evidence suggests a causal role for poverty, particularly in early childhood, in later cognitive and socioemotional development (Duncan & Brooks-Gunn, 1997).

Poverty-related risk factors and accumulation of risk

Not only is income poverty detrimental to children's development, but it is also related to a number of other risk factors. At the family level, poverty is related to parental non-employment, low levels of parental education, single-parent households, maternal depression, home environments that offer less cognitive stimulation, and more punitive parenting (Aber, Bennett, Conley, & Li, 1997; Brooks-Gunn & Duncan, 1997; Chase-Lansdale & Brooks-Gunn, 1996; Duncan et al., 1994; Huston, 1991; McLoyd, 1990). Outside of the family, poverty is related to residence in lower-income and more dangerous neighborhoods, lower-quality schools and child care settings, and overcrowded housing (Aber et al., 1997; Duncan & Brooks-Gunn, 1997; Duncan et al., 1994). Some researchers propose that not only the prevalence but also the consequences of risk factors are more serious for children in poverty than children who do not live in poverty (McLoyd, 1990; Aber et al., 1997).

Some researchers argue that the strongest predictor of both children's socioemotional and cognitive development is the accumulation of risk (Sameroff, et al., 1998). Individual risks or combinations of a small number of risks are not as important for children's development as the overall number of risks experienced because risk variables may act synergistically. Studies find that the more risk factors children have, the worse their outcomes, across a variety of domains, including externalizing and internalizing behavior problems (Ackerman et al., 1999; Loeber et al., 2001; Moffitt & Caspi, 2001), cognitive development (Sameroff et al., 1993; Hooper et al., 1998), and academic achievement (Pungello et al., 1996; Werner & Smith, 1982). Cumulative

risk accounts for between 12 and 25 percent of the variance in children's behavior problems (Ackerman et al., 1999) and cognitive development (Sameroff et al., 1993). In studies of risk, level of cumulative risk is calculated by assigning each family a score on the presence or absence of each risk factor and then summing the scores.

Relationship between individual risk factors and child outcomes

In addition to poverty itself, many other poverty-related risk factors are related to children's school performance and behavior problems.

Maternal education is related to children's outcomes, particularly educational attainment and school performance. Among many other studies, Haveman, Wolfe and Spaulding (1991) found that the more years of education a mother had, the more likely it was that her children would complete high school.

In two studies, *the number of children in a family* was negatively related to high school completion (Haveman et al., 1991) and to reading achievement test scores among low-income school-aged children (Jackson, 2003). McLanahan (1997) summarized 12 studies that examined the impact of family structure on children's outcomes. Across the studies, living in *a single-parent family* was related to lower school achievement and higher levels of behavior problems.

In their review of the effects of *maternal depression* on children's adjustment, Downey and Coyne (1990) state that, compared to children of non-depressed parents, school-aged children of depressed parents display more internalizing and externalizing symptoms, and have more deficits in academic competence. Although research on younger children has been limited, a recent study (Cicchetti, Rogosch, & Toth, 1998) found that maternal depression was related to parent-reported internalizing symptoms among toddlers. While most of the research described

above was conducted on middle- to upper-class samples, many parents in poverty experience depression and other forms of psychological distress (McLoyd, 1990).

Many parents in poverty also experience *parenting stress*. High levels of parenting stress are consistently related to higher levels of adjustment problems in children (see Crnic and Low, 2002 for a review). *Parental warmth* is also related to child outcomes. Hanson, McLanahan, and Thomson (1997) found that in two-parent families, parental warmth was positively related to school performance but not related to behavior problems. A number of studies have found that among poor children, those who experience parental warmth and positive parent-child interactions have higher school achievement than those who do not (see McLoyd, 1998 for a review).

While income poverty is associated with *material hardship* and *food insufficiency*, material hardship and food insufficiency have been found to be related to children's outcomes, independent of income. For example, Conger, Conger and Elder (1997) found material hardship to be directly negatively related to adolescents' grade point averages. Murphy et al. (1998) found that within a low-income sample, children showed more parent- and child-reported emotional problems when their families suffered from food insufficiency. McDonald, Sigman, Espinosa, and Neumann (1994) found that regardless of socioeconomic status and prior nutrition, a temporary food shortage in Kenya negatively affected school-aged children's level of activity and classroom attention.

Anti-poverty programs

Little research has considered whether different kinds of anti-poverty programs may reduce cumulative levels of poverty-related risk. There is some evidence that early childhood programs with long-term effects were more likely than others to have had cumulative effects on

multiple child and family risks (Yoshikawa, 1995). This hypothesis has not been tested, however, with programs that sought to alleviate poverty directly by increasing income.

Because of the pervasive notion that prior programs, such as the Negative Income Tax (Munnell, 1986), provide disincentives to work (Gueron, 1996), recent anti-poverty approaches have focused on the strategy of providing additional income only to those who work. One recent programs with this "make work pay" approach to reducing poverty is the New Hope Project, which operated in the mid- to late-1990s. The program provided additional income to individuals who worked. Previous evaluations found that the program was successful in its primary goal of decreasing the percentage of families living in poverty (Bos et al., 1998). Among individuals not employed at random assignment, New Hope decreased the percentage of families living in poverty in the second year of follow up by 8 percentage points (Bos et al., 1998).

In addition to decreasing poverty, New Hope had positive impacts on children's development. The program increased children's teacher-reported academic functioning and decreased behavior problems (Bos et al., 1998; Huston et al. 2001). The evaluation also examined impacts on various risk factors individually and found mixed results. For example, New Hope decreased material hardship but had no effect on parenting stress or parental warmth.

Although it examined the program's effects on individual risk factors, the evaluation did not look at risk factors cumulatively. If cumulative risk is important for children's development, as prior research suggests, then it is important to examine whether anti-poverty programs can affect it. This study examines the impacts of New Hope on children's cumulative level of risk. New Hope provided services only to parents. Thus, any effects of the program on children must be indirect. To the extent that the program reduced children's cumulative risk, this could help to explain its effects on children.

Relationship between cumulative risk and subgroups of children

Research shows that the effects of poverty on children's development are stronger when the poverty is experienced in early childhood (Duncan & Brooks-Gunn, 1997) but research has not examined what processes explain the difference. Level of poverty-related cumulative risk could help explain the connection between poverty and early childhood development. Therefore, a program designed to alleviate poverty might have stronger effects on cumulative risk for children in early childhood than older children. Research indicates that boys are more vulnerable than girls to the effects of stressful life events (Garmezy & Rutter, 1985) and that boys are more negatively affected by maternal employment (Brooks-Gunn, Han, & Waldfogel, 2002). In fact, some argue that boys are generally more vulnerable to stress in early and middle childhood than girls (Zaslow & Hayes, 1986). Although boys appear to be at higher risk than girls, research has rarely addressed whether interventions might differentially affect boys' and girls' levels of cumulative risk.

The current study

This study addresses four hypotheses:

1) It is hypothesized that New Hope will decrease levels of cumulative risk.

2) It is hypothesized that there will be an indirect effect of New Hope on children's outcomes, via cumulative risk.

3) It is hypothesized that program effects on cumulative risk will be stronger for boys and for younger children (comparing children in early childhood to those in middle childhood).

4) It is hypothesized that greater use of New Hope program services will be related to lower levels of cumulative risk.

Method

Program and sample

New Hope began operating in the mid-1990s, before the passage of the 1996 welfare reform law. Currently, almost every state includes a make work pay strategy in their current TANF programs (Welfare Information Network, 2001), making the findings from the evaluation of New Hope relevant to current discussions of welfare policy. However, few states have implemented make work pay policies as generous as New Hope.

New Hope

The New Hope Project offered a generous set of work support benefits to low-income residents of two poor neighborhoods in Milwaukee, Wisconsin. The program offered a wage supplement to increase participants' income up to the poverty threshold, affordable health insurance, child care subsidies, and a community service job for those unable to find private employment. In order to qualify for the benefits, participants were required to work thirty hours per week each month.

New Hope was a voluntary program. Participants had to meet four criteria: 1) live in one of the two targeted neighborhoods, 2) be 18 or older, 3) have an income at or below 150 percent of the federal poverty line, and 4) be willing and available to work 30 hours or more per week. Every person who volunteered to participate was randomly assigned to either the program or control group. Only program group members were eligible for New Hope benefits. Members of the control group could receive other benefits or services in the community if they chose. New Hope enrolled and randomly assigned participants between August 1994 and December 1995. The sample includes 591 families (282 in the program group and 294 in the control group). Descriptive information about the sample appears in Table 1.

Two years after random assignment, all sample members with a child between the ages of one and ten were selected to be surveyed. In each family that was surveyed, up to two children between ages one and ten at random assignment were randomly selected to be focal children. Retention rates were 79 percent for the program group and 80 percent for the control group. Attrition analyses showed few differences among those retained and those who were not on baseline characteristics and no differences in predictors of attrition by experimental condition (Bos et al., 1998). The New Hope survey covered the same topics as the MFIP survey, although not all questions were worded in exactly the same way. The survey took place in the respondents' home or, if people had moved more than 50 miles from Milwaukee, by telephone. Parents were given $35 for completing the survey.

Parents were also asked for permission to contact their child(ren)'s schoolteacher to collect data. A survey about children's behavior and school performance was sent to the teacher of each focal child who was age five or older. Included with the survey was a $10 gift certificate to a popular school supply store. Response rates for the teacher survey were 61 percent for the program group and 63 percent for the control group. Prior analyses show little evidence of sample selection bias in the teacher impacts, relative to the larger sample (Huston et al., 2001).

Measures

All measures were scored so that high scores indicate high levels of the construct.

Child behavior problems

Both mothers and teachers rated behaviors from the Problem Behavior Scale of the Social Skills Rating System on a five-point scale ranging from *never* to *all of the time*. Both externalizing (6 items) and internalizing (4 items for mothers; 6 items for teachers) behavior problems were assessed (α range for mothers: .61 to .81; α range for teachers: .78 to .92).

Child academic functioning

Mothers rated children's school performance by answering the following question: "Based on your knowledge of the child's schoolwork, including report cards, how has he or she been doing in school overall?" Response categories on a 5-point scale ranged from *very well* to *not well at all*. Teachers rated the child's performance on a variety of skills (for example, reading, math, intellectual functioning) in comparison to others in the same classroom on ten items from the Academic Subscale of the Social Skills Rating System ($\alpha = .94$).

Assessment of Risk

Cumulative risk was assessed as a count of the number of nine risk variables present at the two-year follow up. When possible, cutoffs marking presence of risk for each variable were chosen to be consistent with prior research. Analyses were robust to other definitions of cutoffs.

Income poverty status. Earnings-related income (including earnings, EITC, and New Hope supplement) was measured for the final year of the follow up. Families whose earnings-related income fell below the federal poverty line were considered at risk (72%).

Level of education. Mothers who did not have a high school diploma or GED at the time of the interview were considered at risk (35%).

Number of children in the household. Families with more than four children in their household at the time of the interview were considered at risk (11%).

Marital status. Mothers who reported that they were not married and were not cohabiting with a boyfriend or partner in the month before the interview were considered at risk (58%).

Depressive symptoms. Mothers answered the Centers for Epidemiological Studies – Depression Scale (CESD) ($\alpha = .90$), the sum of twenty items about the last week, scored on a 0 to 3 point scale. Items include, "I was bothered by things that don't usually bother me." Studies

have shown moderate correlations between the CESD and clinical assessments of depression (see Radloff, 1977). Mothers who scored greater than 16 were considered at risk (51%).

Parenting stress. Mothers were asked how true four different statements were. The statements include, "I often feel angry with my child" ($\alpha = .79$). Those .5 or more standard deviations above the mean were considered at risk (31%).

Parental warmth. Mothers were asked how often they praise their child in a typical week, with a categorical response scale. Mothers who praised their child once per day or less were considered at risk (22%).

Material hardship. Mothers reported whether six different events had occurred in the last year. Events included not being able to pay rent and having phone service disconnected. Families who reported that one or more of the events had occurred were considered at risk (62%).

Food insufficiency. Mothers answered the following question: "Which of the following statements best describes the food eaten in the prior month?" Answer choices were "Enough of the kinds of food we want", "Enough but not always the kind of food we want to eat", "Sometimes not enough to eat" and "Often not enough to eat". Families who chose the last two options were considered at risk (60%).

New Hope service use

Mothers were asked about which of the New Hope services they had used during the two-year follow up period. From their responses, individual dummy variables indicating use of child care subsidies, health insurance, earnings supplements, and community service jobs were created. Additionally, a measure of the total number of services used (ranging from 0 to 4) was created. Measures of service use are only available for those assigned to the program group.

Data Analytic Plan

The impact of New Hope on cumulative risk is assessed using OLS regression, controlling for the following baseline characteristics: age of youngest child, number of children, marital status, whether or not the respondent had a high school diploma, maternal age, focal child age, focal child gender, earnings in the year prior to random assignment, prior welfare receipt, and a dummy variable representing neighborhood. Estimates of effect size were calculated by dividing the difference between the groups by the standard deviation of the control group. The control group standard deviation was used because the program could have affected variance in cumulative risk.

To examine the indirect effects of the programs on child outcomes, via cumulative risk, a regression analysis is used. Recent research describes methods for testing indirect effects while balancing potential type I and type II error rates within an experimental design (MacKinnon et al., 2002). Two z statistics are computed: one for the relationship between the experiment and cumulative risk and one for the relationship between cumulative risk and child outcomes (controlling for the experiment). The z statistics are multiplied and an asymmetric confidence interval is constructed around the product using tables provided in Meeker, Cornwell, and Aroian (1981). This method improves on earlier methods, such as Sobel (1982), by correcting for nonnormality in the distribution of the product of the z coefficients. The analyses of indirect effects are conducted separately for each child outcome measure. Following the recommendations of MacKinnon et al. (2002) and Shrout and Bolger (2002), indirect effects are examined even if no significant relationship between the intervention and child outcomes is detected.

The final analyses presented utilize propensity score analysis (Kemple, Snipes, & Bloom, 2000; Rosenbaum & Rubin, 1983, 1984; Rosenbaum, 1995) to identify participants' likelihood

of using New Hope services. Instead of attempting to match individuals based on patterns of responses on covariates, propensity score analysis creates a single covariate, representing an estimate of the true probability of receiving a treatment. Propensity score analysis has recently begun to be applied to experimental studies, to match strata or individuals in their probability of engaging in a particular endogenous, post-random-assignment behavior. The method can take advantage of an experimental design to assess associations between pre-random-assignment risks and an endogenous post-random assignment behavior (in this case, use of New Hope services), in the presence of the intervention (Kemple et al., 2000). The predicted value from a program-group regression predicting use of New Hope services, from multiple risks, can then be applied to control group members to identify those at differing probabilities of service use in the presence of the program. Experimental impacts can then be run within strata of likelihood for service use.

In the first phase of analyses, we ran regressions in the program group only. Because we are interested in use of New Hope program services, we predicted the number of services used over years 1 and 2 from a set of variables all measured prior to random assignment. The variable coefficients from the regression equation were then used, multiplied by the respondent's value on each relevant variable, to calculate a propensity score for each control and program group participant. This score is essentially the predicted value of number of services used for each participant, and represents each participant's propensity for service use, given exposure to the program (i.e., had they been assigned to the program group).

One additional aspect of the first phase requires explanation. Developing propensity scores using the program group, and then applying them to the control group, is problematic for statistical reasons. Although the program and control groups in a random -assignment study are

drawn from the same population, coefficients estimated from the program group by definition do not fit the data as closely in the control group. As a result, the propensity score would differentiate program-group members' service use more strongly than that of control-group members, and potentially distort impacts. Therefore, it may be preferable to utilize a similar, but external sample for initial development of risk estimates (see Kemple et al., 2000 and Riccio & Bloom, 2001 for more details regarding this problem and solution). Forty five percent of the program group was set aside as an external sample; these cases were discarded (not used) in the subsequent experimental impacts.

Two analyses were conducted with the propensity scores. First, program by propensity score interaction terms were added to the models predicting cumulative risk. This analysis examines whether the program had differential impacts on cumulative risk, depending on individuals' propensity for use of services. Second, program by propensity score interaction terms were added to the models examining program by child age interactions. This analysis examines whether program by child age interactions can be explained by individuals' propensity for use of services.

Results

Due to missing data and the structure of the survey, the final sample size in New Hope varies by child outcome measure. Thus, all results will be presented separately for three overlapping samples. For parent-reported school achievement, the sample size is 654. For parent-reported behavior problems, the sample size is 562. For teacher-reported outcomes the sample size is 420. Prior analyses showed few differences in family background factors among these samples (Huston et al., 2001).

The mean of the cumulative risk index for each sample was as follows: 4.2 (SD = 1.5) for the parent-reported school achievement sample; 4.0 (SD = 1.5) for the parent-reported behavior problems sample; 4.1 (SD = 1.4) for the teacher sample.

Overall, New Hope decreased cumulative risk, although not at conventional levels of statistical significance (see Table 2). Across the samples, the effect size was about the same: Cohen's d = .15 (ß = .07) for children with parent-reported school achievement data; d = .13 (ß = .06) for those with parent-reported behavior problems data; d = .16 (ß = .08) for those with teacher data. Despite the fact that the size of the decrease in cumulative risk was the same across these overlapping samples of children, the decrease was statistically significant at the trend level for those with parent-reported behavior problems data ($p < .10$) but was not statistically significant for those with parent-reported school achievement data ($p = .12$) or teacher data ($p = .16$).

Parent-reported school achievement. Table 3 shows the relationship between New Hope and school achievement (model 1), the relationship between cumulative risk and school achievement (model 2) and the indirect effect of New Hope on school achievement through cumulative risk (bottom of model 2). Cumulative risk was negatively associated with school achievement; this relationship was statistically significant ($p < .001$). For each unit increase in risk (one risk factor), school achievement scores dropped by .14 (.18 standard deviation). The indirect relationship between New Hope and school achievement, via cumulative risk, was also significant at the trend level ($p < .10$).

Parent-reported behavior problems. Analyses for parent-reported behavior problems appear in Table 3. Externalizing and internalizing behavior problems are examined separately. Cumulative risk was positively associated with both externalizing ($p < .01$) and internalizing ($p <$

.001) behavior problems. For each unit increase in risk (one risk factor), externalizing behavior problems increased by .14 standard deviation and internalizing behavior problems increased by .17 standard deviation. The indirect relationship between New Hope and both externalizing and internalizing behavior problems, via cumulative risk, is also significant ($p < .05$ for both).

Teacher-reported child outcomes. Analyses of cumulative risk and teacher-reported school achievement and behavior problems are presented in Table 4. Cumulative risk was not significantly associated with any of the teacher-reported child outcomes. No significant indirect effects were found.

Subgroup analysis. In order to examine whether New Hope's effect on cumulative risk was moderated by child age or child gender, subgroup analyses were conducted. For each sample of children, two sets of analyses were conducted: one comparing New Hope impacts for younger children (age 1-4 at baseline) and older children (age 5-10 at baseline) and one comparing New Hope impacts for boys and girls.

Results for child age indicate that New Hope's effect on cumulative risk was moderated by child age, although this result was statistically significant only for the parent-reported school achievement sample. For this sample, as hypothesized, New Hope's effect was concentrated among the younger children (age less than five at baseline); the interaction term was significant ($p < .05$). For children in early childhood at baseline, New Hope produced a decrease in cumulative risk of moderate effect size, $d = .39$. New Hope did not affect cumulative risk among older children. Results for child gender indicate that New Hope's effect on cumulative risk was not moderated by gender.

Examination of New Hope service use. A non-experimental analysis was conducted predicting cumulative risk from New Hope service use within the program group. Overall

number of services used was significantly negatively related to cumulative risk (b = -.21; SE = .07; β = -.15; p < .01). For each service used, cumulative risk decreased by .21. When examining services individually, use of New Hope's child care subsidies and health insurance were significantly negatively related to cumulative risk (for child care: b = -.005; SE = .001; β = -.16; p < .001; for health insurance: b = -.003; SE = .001; β = -.11; p < .05). Use of New Hope's earnings supplements and community service jobs were not related to cumulative risk. The results presented here are for those children with parent-reported behavior problem data. The pattern of results is the same for those with parent-reported school achievement data and teacher-reported data.

Next, a propensity score analysis was conducting to utilize the experimental design. In the first phase of analysis, the propensity score was developed. We ran an OLS regression utilizing all baseline predictors as the independent variables and the number of New Hope services used over the two year follow up as the dependent variable. The model explained a significant proportion of variance in number of services used ($F(7,89) = 2.33$, p < .01, $R^2 = .36$). Table 5 shows the coefficients (risk weights) for each variable's association with number of services used. The following variables significantly predict the number of services used: child age, maternal education, earnings in the year prior to random assignment, currently receiving public assistance at random assignment. Having a high school diploma and having earnings some earnings in the prior year are positively related to service use, whereas child age and current public assistance receipt are negatively related to service use. The regression weights from this analysis were applied to the control group members and the remaining program group members. Second, program by propensity for service use interaction terms were added to the OLS regression models predicting cumulative risk. Overall, there were no significant program by

propensity for service use interactions. The effect of the program on cumulative risk did not differ by individuals' likelihood for using more New Hope services.

Finally, program by propensity for service use interaction terms were added to the OLS regression models predicting cumulative risk from a program by child age interaction term. If the size of the program by child age interaction term decreases when the program by propensity for service use interaction term is entered in to the model, it can be concluded that the likelihood of using services significantly mediated the program by child age effect. For the parent-reported school achievement sample, likelihood of using New Hope services reduced the size of the program by child age interaction term, making it non-significant (original model: b = -.52; SE = .28; β = -.10; $p < .10$; after including additional interaction term: b = -.36; SE = .32; β = -.07; $p > .10$). The differences in program impacts for children of different ages can be explained by mothers' likelihood of using more New Hope services. This conclusion is supported by results indicating that parents of young children had a significantly higher propensity for service use than parents of older children ($t(326) = 8.22$; $p < .0001$).

Follow-up analyses

Follow-up analyses attempt to adjust for potential bias in the relationship between cumulative risk and child outcomes. Because cumulative risk and child outcomes were measured at the same time, the relationship between risk and child outcomes could potentially be biased. For example, the relationship could be due to the effects of an omitted variable on both risk and child outcomes. One method for overcoming this potential bias is to conduct an instrumental variables analysis (e.g. Foster & McLanahan, 1996; Krueger, 1999; Morris & Gennetian, 2003) by using an exogenous variable (in this case, the experiment) to predict the mediator (in this case cumulative risk). The predicted cumulative risk scores, rather than the

actual scores, are then used to predict child outcomes. Although, as expected, estimates of the relationship between cumulative risk and child outcomes increased using this method, standard errors were too large to make the results interpretable (results not shown). This may be due to three factors. First, the relationship between New Hope and cumulative risk may have been too weak to use the experiment as an instrument. Second, power for detecting an effect in the second stage was relatively low, compared to other instrumental variables studies in the context of randomized experiments (Krueger, 1999). Finally, the exclusion restriction, which requires that the predictor (in this case, the experiment) affect the outcome only through the mediator, may have been violated. New Hope may have affected factors not included in the cumulative risk index.

Discussion

The purpose of this study was to examine the effect of an anti-poverty program that provided earnings supplements on children's cumulative risk and to investigate cumulative risk as a mediator of the programs' effects on children's development. This study is the first to examine whether programs that seek to reduce poverty directly by increasing income also affect cumulative poverty-related risk.

The results of this study reveal New Hope significantly decreased children's cumulative risk. This effect was statistically significant only for the subsample with parent-reported behavior problem data. The effect size was small, .13. New Hope also had indirect effects on increased school achievement and decreased externalizing and internalizing behavior problems, via cumulative risk, for outcomes reported by parents. Although New Hope affected children's teacher-reported outcomes, indirect effects through cumulative risk were not found.

Subgroup analyses revealed that New Hope's effect on cumulative risk were concentrated among younger children, with an effect size of .39 for children under five but no effect for children five and older. This significant interaction was expected because of the literature that demonstrates that poverty is more strongly related to developmental outcomes in early childhood. Because experiencing poverty in early childhood is more strongly related to developmental outcomes than experiencing poverty in middle childhood, it was not surprising that reductions in poverty also had larger effects on younger children. Contrary to expectations, child gender did not moderate New Hope's impact on cumulative risk.

The findings described above may be explained by the comprehensive nature of the New Hope program. The results were not replicated for a program that provided earnings supplements but did not provide other support services to low-income families. An examination of New Hope service use indicates that the use of more program services was related to lower levels of cumulative risk among program group members. Use of child care subsidies and health insurance were each individually related to lower levels of cumulative risk. While the effects of the New Hope program on cumulative risk did not differ by initial level of propensity to use New Hope services, propensity for service use did help explain the fact that effects on cumulative risk were concentrated among younger children. Parents of younger children had higher initial likelihood of using services than those with older children. Together, these findings support the notion that providing comprehensive services to low-income parents can reduce children's cumulative risk. Given the non-experimental findings, future work should attempt to identify the relationship between child age, cumulative risk and parents' use of child care subsidies, health insurance and total number of services used.

Did cumulative poverty-related risk predict of children's school achievement and behavior problems above and beyond either poverty or income alone? Cumulative risk did indeed predict significantly more variance in school achievement, externalizing behavior problems, and internalizing behavior problems than either a dichotomous indicator of poverty status or a continuous measure of income (results available from author).

This research has important implications for both theory and practice. Cumulative risk is typically explored as a predictor of children's outcomes, and rarely as an outcome itself. This study builds on the literature by examining cumulative risk as an outcome. Results show that a program that seeks to alleviate poverty directly by increasing income could reduce levels of cumulative risk. Because research has shown that higher cumulative risk has negative consequences for children's development, the finding that programs not specifically targeted at reducing risk could reduce it is an important one. Overall, effect sizes were small (.10 to .16) but in the range of effects of these antipoverty programs on children (Morris et al., 2001) as well as of quality child care (National Institute of Child Health and Human Development Early Child Care Research Network & Duncan, 2003). Many of the risk factors in the cumulative risk index are not likely to change over a short period of time. For example, not many single mothers will get married and not many individuals will earn high school diplomas or GEDs. Because some of the risk factors are unlikely to change over a short follow up, even in the presence of an earnings supplement program, the fact that the programs did decrease overall cumulative risk is notable. Future work should examine whether reductions in cumulative poverty-related risk are related to longer-term developmental outcomes.

It is important to remember that the program studied here was an effort to "make work pay." Programs whose goal is simply to increase employment might not have the same positive

effects as those found here. They might have no effect on cumulative risk because they do not increase income or they might increase risk, if working without experiencing increases in income makes parents and families more stressed. Future work should compare different policy approaches (for example, mandatory employment programs v. earning supplement programs v. time-limited programs) to determine whether only those that raise income also decrease cumulative risk.

This study also provides some evidence that comprehensiveness might be related to reductions in cumulative risk. As previously mentioned the findings were not replicated for a program that provided earnings supplements but not the same level of comprehensive services. Future work should more directly compare programs that provide comprehensive services with those that do not to determine whether more comprehensive program are more successful at reducing cumulative risk.

Some limitations of this study should be mentioned. The cumulative risk index was significantly related to parent-reported child outcomes but not to teacher-reported child outcomes. This suggests that there may have been some mono-method bias. The relationship between risk and children's outcomes may be reflecting the mothers' points of view or way of thinking, rather than a true relationship between them. Perhaps higher-risk mothers are more stressed and therefore view, and report on, their children's behavior more negatively. Prior research has found that cumulative risk is significantly related to standardized measures of children's intelligence and cognitive development (Hooper et al., 1998; Sameroff, et al., 1993) but prior research has not examined the relationship between risk and teacher-reported measures of school achievement and behavior problems. Further research is needed to understand whether cumulative risk predicts children's teacher-reported outcomes.

Unlike other studies that use cumulative risk as a predictor, this study considers cumulative risk as an outcome. It provides evidence that anti-poverty programs can affect cumulative risk. This is especially true for young children, where New Hope's decrease in risk is most pronounced. The fact that programs that increase income by offering earnings supplements also decrease cumulative poverty-related risk is an important finding for both research and policy.

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Table 1

Sample characteristics measured at baseline

Never married (%)	62.8
Three or more children (%)	46.4
Youngest child age 2 or younger at random assignment (%)	49.5
Youngest child age 3-5 or younger at random assignment (%)	29.1
Youngest child age 6 or older at random assignment (%)	21.4
Parents age (in years)	29.2
Child's age at time of interview (in years) (New Hope n = 931)	7.2
Child male (%) (New Hope n = 931)	52.0
High school diploma (%)	62.1
Earnings in the past year $0 (%)	40.1
Earnings in past year between $1 and $4,999 (%)	23.4
Earnings in past year $5,000 or greater (%)	22.6
Prior AFDC receipt 2-4 years (%)	26.6
Prior AFDC receipt 5 or more years (%)	33.7
n	591

Table 2

Summary of Regression Analyses Examining New Hope Impact on Cumulative Poverty-Related Risk

	Parent-reported school achievement (n = 654)		Parent-reported behavior problems (n = 562)		Teacher sample (n = 420)	
	b(beta)	SE	b(beta)	SE	b(beta)	SE
Control variables (measured at baseline)						
Marital status (1 = never married; 0 = ever married)	.09(.03)	.14	.16(.05)	.13	-.11(-.04)	.17
Number of children (1 = three or more; 0 = other)	.30(.10)*	.14	.34(.11)*	.13	.26(.09)	.17
Age of youngest child at random assignment (1 = 2 or younger; 0 = other)	.10(.03)	.19	.24(.08)	.20	-.17(-.06)	.23
Age of youngest child at random assignment (1 = 3-5; 0 = other)	.30(.10)	.19	.26(.08)	.18	.15(.05)	.22
Parent age (in years)	.03(.11)*	.01	.02(.17)^{t}	.01	.01(.06)	.02
Child age at time of interview (in years)	.05(.08)*	.02	.08(.17)**	.03	.04(.05)	.03
Child gender (1 = male; 0 = female)	.09(.03)	.09	.14(.05)	.11	.07(.03)	.13
High school diploma (1= yes; 0 = no)	-1.10(-.37)***	.13	-1.08(-.35)***	.12	-1.16(-.39)***	.15
Earnings in past year (1 = between $1 and $4,999; 0 = other)	.06(.02)	.14	-.07(-.02)	.13	-.07(-.02)	.16
Earnings in past year (1 = $5,000 or greater; 0 = other)	-.32(-.09)t	.17	-.42(-.12)**	.15	-.22(-.07)	.20
Prior AFDC receipt (1 = 2-4 years; 0 = other)	.22(.06)	.18	.06(.02)	.14	.32(.09)	.23
Prior AFDC receipt (1 = 5 or more years; 0 = other)	.32(.11)*	.15	.29(.09)*	.14	.57(.20)**	.18
Location of residence (1 = Northside; 0 = Other)	.23(.08)^{t}	.13	.19(.06)^{t}	.11	.21(.07)	.15
Experimental condition (1 = New Hope; 0 = control)	-.20(-.07)	.13	.19(.06)^{t}	.11	-.22(-.08)	.16
Effect size (Cohen's *d*)	.15		.13		.16	

^{t} $p < .10$; * p < .05; ** p < .01; *** p < .001.

Table 3

Summary of Regression Analyses Examining the Indirect Effect of New Hope on Parent-reported School Achievement, via Cumulative Risk

	School achievement				Externalizing behavior problems				Internalizing behavior problems			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE
Control variables (measured at baseline)												
Marital status (1 = never married; 0 = ever married)	-.19(-.08)t	.10	-.15(-.07)	.10	-.09(-.06)	.07	-.13(-.08)t	.07	.11(.07)	.07	.09(.06)	.07
Number of children (1 = three or more; 0 = other)	-.22(-.10)*	.11	-.19(-.08)t	.11	.09(.06)	.07	.08(.05)	.07	-.01(-.01)	.07	-.03(-.02)	.07
Age of youngest child at random assignment (1 = 2 or younger; 0 = other)	.09(.04)	.15	.11(.05)	.15	.14(.10)	.11	.13(.09)	.11	.17(.11)	.11	.14(.09)	.11
Age of youngest child at random assignment (1 = 3-5; 0 = other)	-.01(-.01)	.14	.01(.01)	.14	.02(.01)	.10	-.01(-.01)	.10	.25(.15)*	.10	.22(.13)*	.10
Parent age (in years)	.002(.01)	.01	.01(.03)	.01	-.003(-.03)	.01	-.01(-.06)	.01	.01(.08)	.01	.01(.05)	.01
Child age at time of interview (in years)	-.10(-.20)***	.02	-.09(-.19)***	.02	-.04(-.18)**	.01	-.05(-.19)**	.01	.08(.32)***	.01	.07(.30)***	.01
Child gender (1 = male; 0 = female)	-.42(-.19)***	.09	-.41(-.18)***	.09	.05(.03)	.06	.04(.03)	.06	.02(.01)	.06	.02(.01)	.06
High school diploma (1= yes; 0 = no)	-.02(-.01)	.10	-.17(-.07)	.10	-.07(-.05)	.06	.01(.01)	.07	-.06(-.04)	.06	.02(.01)	.07
Earnings in past year (1 = between $1 and $4,999; 0 = other)	.11(.05)	.10	.10(.04)	.11	.01(.01)	.07	.01(.01)	.07	.09(.06)	.07	.10(.07)	.07
Earnings in past year (1 = $5,000 or greater; 0 = other)	.06(.02)	.12	.03(.01)	.12	-.04(-.02)	.08	-.03(-.02)	.08	.08(.05)	.08	.12(.07)	.09
Prior AFDC receipt (1 = 2-4 years; 0 = other)	-.14(-.05)	.13	-.13(-.05)	.13	.17(.10)*	.08	.17(.10)*	.08	.20(.12)*	.08	.20(.12)*	.08
Prior AFDC receipt (1 = 5 or more years; 0 = other)	-.19(-.08)t	.11	-.18(-.08)	.11	.14(.09)t	.08	.14(.09)t	.08	.09(.05)	.08	.08(.05)	.08
Location of residence (1 = Northside; 0 = other)	.03(.01)	.09	.06(.03)	.09	-.03(-.02)	.06	-.04(-.03)	.06	.04(.03)	.06	.01(.01)	.06
Experimental condition (1 = New Hope; 0 = control)	.09(.04)	.09	.06(.03)	.09	-.04(-.03)	.06	-.01(-.01)	.06	-.03(-.02)	.06	-.02(-.01)	.06
Cumulative risk (continuous)			-.14(-.18)***	.03			.07(.14)**	.02			.08(.17)***	.02
Indirect effect of New Hope via cumulative risk			.03[t]	.02			-.01*	.01			-.02*	.01
Confidence interval			(.004, .05)				(-.03, -.0003)				(-.03, -.0004)	
	n = 654				n = 562				n = 562			

[t] $p < .10$; * p < .05; ** p < .01; *** p < .001.

Table 4

Summary of Regression Analyses Examining New Hope Teacher-reported Child Outcomes

	School achievement				Externalizing behavior problems				Internalizing behavior problems			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE	b(beta)	SE
Control variables (measured at baseline)												
Marital status	-.28(-.14)*	.11	-.29(-.15)*	.11	.02(.02)	.10	.04(.02)	.10	.02(.01)	.07	.01(.01)	.08
Number of children	-.10(-.05)	.12	-.12(-.06)	.12	.01(.01)	.09	.01(.005)	.09	-.03(-.03)	.07	-.03(-.02)	.07
Age of youngest child at random assignment	.01(.01)	.16	.03(.02)	.16	-.06(-.04)	.13	-.10(-.06)	.13	.09(.07)	.10	.05(.04)	.10
Age of youngest child at random assignment	-.02(-.01)	.14	-.01(-.004)	.14	-.05(-.03)	.12	-.07(-.04)	.12	.06(.05)	.09	.06(.05)	.09
Parent age	-.01(-.08)	.01	-.01(-.09)	.01	-.01(-.08)	.01	-.01(-.08)	.01	.01(.05)	.01	.003(.04)	.01
Child age at time of interview	-.05(-.13)*	.02	-.05(-.13)*	.02	.03(.08)	.02	.04(.10)	.02	.05(.19)**	.02	.05(.19)**	.02
Child gender	-.27(-.14)**	.09	-.25(-.13)**	.09	.33(.19)***	.09	.35(.20)***	.09	.01(.01)	.06	.02(.02)	.06
High school diploma	.06(.03)	.10	.08(.04)	.12	-.03(-.02)	.09	-.08(-.05)	.09	-.02(-.01)	.07	-.02(-.01)	.07
Earnings in past year	.02(.01)	.11	.01(.01)	.11	-.01(-.01)	.10	-.03(-.02)	.10	-.06(-.05)	.07	-.05(-.04)	.08
Earnings in past year	-.06(-.03)	.13	-.06(-.03)	.13	.25(.12)*	.12	.23(.12)t	.12	.08(.05)	.09	.08(.06)	.09
Prior AFDC receipt	-.001(-.001)	.15	-.04(-.02)	.15	-.02(-.01)	.13	-.004(-.002)	.13	.04(.03)	.09	.05(.03)	.09
Prior AFDC receipt	-.07(-.03)	.12	-.11(-.06)	.12	.15(.09)	.10	.15(.09)	.11	.13(.11)t	.07	.14(.12)t	.08
Location of residence	-.14(-.07)	.10	-.11(-.06)	.10	.29(.17)**	.08	.30(.18)**	.09	.07(.05)	.06	.06(.05)	.06
Experimental condition	.23(.12)*	.10	.22(.11)*	.11	-.09(-.05)	.09	-.10(-.06)	.09	-.07(-.06)	.06	-.08(-.07)	.07
Cumulative risk			.005(.007)	.04			-.02(-.03)	.03			.003(.01)	.02

n = 420

[t] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 5

Summary of Regression Analyses Predicting Number of New Hope Services Used in a Random Subsample of the Program Group

	b(beta)	SE
Marital status (1 = never married; 0 = ever married)	.32(.13)	.30
Number of children (1 = three or more children; 0 = other)	.37(.15)	.27
Age of youngest child at random assignment (1 = 2 or younger; 0 = other)	-.04(-.02)	.44
Age of youngest child at random assignment (1 = 3-5; 0 = other)	-.21(-.07)	.44
Parent age (in years)	.03(.15)	.03
Child age at time of interview (in years)	-.12(-.31)^{t}	.06
Child gender (1 = male; 0 = female)	.22(.09)	.27
High school diploma (1= yes; 0 = no)	1.08(.43)***	.29
Earnings in past year (1 = between $1 and $4,999; 0 = other)	.58(.24)^{t}	.32
Earnings in past year (1 = $5,000 or greater; 0 = other)	.32(.12)	.41
Prior AFDC receipt (1 = 2-4 years; 0 = other)	.44(.17)	.30
Location of residence (1 = northside; 0 = other)	.12(.05)	.27
Currently receiving any public assistance (1 = yes; 0 = no)	-.61(-.22)^{t}	.32
Currently employed (1 = yes; 0 = no)	-.38(-.16)	.31
Have a car (1 = yes; 0 = no)	-.35(-.14)	.28
Residential moves in the past year (1 = 2 or more; 0 = other)	.46(.19)	.28
On AFDC as a child (1 = yes; 0 = no)	.47(.19)^{t}	.28
n = 89	R^2 = .36	

^{t} p < .10; * p < .05; ** p < .01; *** p < .001.