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Family income levels, stability, and trends over the course of childhood: Links to behavior, achievement, and health in early adolescence

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Introduction

The study of economic conditions and child development has burgeoned over the last decade in numerous social science fields. That low-income children have worse developmental outcomes than their higher-income counterparts is not disputed. Researchers in different fields disagree, however, on whether income itself is the source of these differences and, therefore, whether increasing low family income is the right public policy solution to the problems poor families face. Studies also differ in important ways with respect to how income is measured and how the associations between income and child well-being are modeled.

This paper takes up several of these issues using newly available data from the second wave of the Panel Study of Income Dynamics Child Development Supplement (PSID-CDS). These data allow us to assess income from birth, over the whole of childhood, for a large sample of nationally representative children. Using several different characterizations of income (including average level, stability, and growth rate) over the course of childhood and separately within developmental periods, we assess linkages to children's behavior, achievement, and health in early adolescence. We also focus on the size of these correlations relative to the correlations between family background characteristics (including mothers' cognitive abilities and a measure that may reflect her organization or efficiency) and child outcomes. In doing so, we add to what is known about the associations between income and child well-being and make recommendations for how these results might be interpreted in light of the potential for public policy interventions.

Background

Many studies have documented correlations between family income and child outcomes. Most research supports the idea that correlations between income and child outcomes are non-

linear, with bigger effects at lower income levels (but see Blau, 1999, for an exception). Thus, in developmental psychology in particular, studies have typically compared poor children to their non-poor counterparts across multiple dimensions of development (see McLoyd, 1998 and also Duncan & Brooks-Gunn, 1997 for extensive reviews). All of these studies suggest that poverty in the United States is widespread and that poor children fare worse developmentally on a vast array of outcomes: 34% of all American children have spent at least one year in an impoverished household; this rate rises to 81% for children of single parents and to 63% for children whose parents did not complete high school (McLoyd, 1998). Poverty rates are higher for ethnic minority families and those with young children (McLoyd, 1998).

Growing up in poverty affects children's physical, cognitive, and emotional health, although in general, developmental studies show that cognitive ability and achievement is more likely to be affected (Duncan & Brooks-Gunn, 1997; Duncan, Brooks-Gunn, Yeung, & Smith, 1998). With respect to health, being born to a poor family significantly increases the chances that a child will be low birth weight, which in turn is associated with high risk of infant mortality and with later deficits in physical and cognitive development. Compared with their more affluent peers, poor children are twice as likely to be in poor health, three to four times as likely to suffer lead poisoning, and more likely to have an unmet need for medical and dental care (Aber, Gershoff, & Raver, 2003). Low family income has been found to be a significant predictor of both age-normed stunting (low height-for-weight) as well as wasting (low weight-for-height) (Korenman, Miller, & Sjaastad, 1995). Rates of injury from accidents are also higher among poor than non-poor children (Klerman, 1991).

In terms of academic achievement and attainment, poor children are more likely than non-poor children to experience developmental delays and also learning disabilities, impairments

that will hamper their abilities in school and beyond. Patterns of early childhood poverty have been found to predict differences in IQ at age 5, with persistent poverty having a significantly stronger impact on IQ than transient poverty (Duncan, Brooks-Gunn, & Klebanov, 1994). Early poverty experiences pose particular risks for children's later academic performance and socioeconomic differences in math and reading test scores between the poor and non-poor appear as early as 1st grade. In turn, economic conditions in early childhood predict completed schooling by early adulthood (Duncan et al., 1998). Poor children are also twice as likely as non-poor children to repeat a grade or to drop out of school (Haveman & Wolfe, 1994).

Finally, children from low-income families are at greater risk for suffering from behavioral or emotional problems. The experience of poverty in early childhood, particularly that of long duration, is associated with increased likelihood that children will evidence behavior problems at age 5 (Duncan et al., 1994). Similarly, poor children also show difficulties with aspects of social competence, such as self-regulation and impulsivity, which are associated with social and emotional competence throughout childhood (Aber et al., 2003). Whereas in general, persistent, rather than intermittent, poverty is worse for child outcomes, there is some evidence that for emotional outcomes current low income may be worse; perhaps because this reflects a "difficult adjustment" period when economic pressure is high (McLoyd, 1998).

As noted above, researchers generally do not dispute such correlations between income and child development. However, there is much controversy about whether these income effects are causal (see Mayer, 1997 and Shea, 2000 in particular), whether income itself has been conceptualized properly (see Duncan, 1996), and whether, even if these two criteria have been met, the effects themselves are substantively important and policy relevant (see Blau, 1999).

The issue at hand in the question of causal impacts is whether observed income effects are spurious, caused by one or more omitted variables that affect family income as well as child outcomes. Economists often discuss such factors as parental mental health, ability, personality, or motivation as likely important omitted variables and worry that their omission produces a serious overstatement of the role that income plays in causing children's development. The best test of this question is with data from a randomized experiment, but until recently, such data were not available for studies of child development. Morris and Gennetian (2003) provide some of the first evidence from experimental data using a sample of school-age children from long-term welfare recipient families. Their results suggest very large effects of experimentally-induced three-year average income on maternally-reported academic achievement, school engagement, positive behavior, and behavior problems. In that study, a $1,000 increase in average annual income is associated with an increase in school achievement and reduction in behavior problems of about one-fifth of one standard deviation and increases in school engagement and positive behavior on the order of one third of a standard deviation. These estimates far exceed the criterion for "large" effects laid out in Duncan and Brooks-Gunn (1997), where an additional *$10,000* would have to amount to a one-quarter standard deviation change in the dependent variable to be deemed substantively important. Morris, Duncan, & Rodriguez (2005) also use experimental data to show that family income has policy-relevant impacts on the school achievement of low-income preschool (but not older) children of single mothers. Specifically, a $1,000 increase in annual income was associated with 6% of one standard unit change in child achievement.

In non-experimental contexts, researchers have adopted econometric techniques such as within-child and within-family fixed-effects regression analysis as well as instrumental variables

analysis to address omitted variables bias (see Blau, 1999; Dahl & Lochner, 2005; Duncan et al., 1998; Taylor, Dearing, & McCartney, 2004; and Votruba-Drzal, 2003, for examples). In general, these estimates have also produced substantively important associations between income and child outcomes, although the size of these effects is typically smaller and sometimes measured imprecisely. Votruba-Drzal's (2003) longitudinal fixed effects estimates, for example, showed that increasing income by $10,000 annually for a very low-income family is associated with one-fifth of a standard deviation increase in the cognitive stimulation the child receives in the home. Dahl and Lochner (2005) use a fixed effect instrumental variables (FEIV) strategy, capitalizing on large changes in the Earned Income Tax Credit over the last two decades, to identify a causal impact of income on children's math and reading achievement. They find that a $1,000 increase in income raises math test scores by 2.1% of a standard deviation and reading test scores by 3.6% of a standard deviation, on average. These effects were two to three times as large, however, for children of non-white, unmarried, and less-educated mothers, and thus both substantively important and policy-relevant.

Accepting the premise that income *does* matter for child development still leaves unresolved several important questions about how to conceptualize income. Single-year measures of income show little association with child outcomes (Blau, 1999); the most informative work in this area assesses income over the whole course of childhood and compares the effect of income during different stages of childhood. Studies that have done so generally find that family income experienced in early childhood is more important than that experienced in middle childhood or adolescence (Duncan & Brooks-Gunn, 1997). This is especially true when predicting cognitive achievement, the argument being that income poverty creates disparities in school readiness and early academic success that persist or widen over the course

of childhood (Duncan et al., 1998; Morris et al., 2005). Second, existing work generally shows that income effects are non-linear and matter most at low levels of income or education (Dahl & Lochner, 2005; Duncan et al., 1998; Shea, 2000; Votruba-Drzal, 2003).

Most current child development studies acknowledge the importance of, and many assess, long-run income, non-linearities in income, and the developmental timing of income. But several dimensions of income are notably under-studied in this literature, including income dynamics and average annual growth (trends) in income. With respect to income dynamics, Duncan (1988; 1996) highlighted the volatility of families' year-to-year income in the Panel Study of Income Dynamics: one-third of families experienced income drops of 50% or more in adjacent years over an 11 year period. The vast majority of these pre-retirement income drops were unexpected. McDonough, Duncan, House, and Williams (199x) linked income instability to adult mortality in the PSID: those who experienced one and two or more 50% drops in income were 1.3 and 1.7 times as likely to die in the subsequent period, respectively, as their counterparts with stable incomes. We know of only a handful of studies that have linked income instability to child development. Kalil and Ziol-Guest (2005) showed that 39% of families in the 1996 panel of the Survey of Income and Program Participation experienced at least one 30 percent drop in income from one four-month period to the next in a two-year period. Income instability in that study was associated with greater odds of children being expelled from school and decreased odds of routine dental visits. Yeung, Linver, & Brooks-Gunn (2002) included a measure of income instability in the second and third year of life (defined as a drop of 30% or more in annual income) in their predictions of 3-5 year old children's cognitive achievement and behavior in the first Wave of the PSID-CDS. 21% of their sample experienced a steep income decline in at least one year between ages 1 and 3 to 5, but there were no associations between

income instability and children's outcomes. Mayer (1997) also found a high prevalence (i.e., between one-third to one-half of the sample) of income instability in the NLSY but these income drops also had relatively small effects, except perhaps in predicting children's years of completed education.

Finally, the directionality of income change is a potentially important influence on child development over and above mean income. One needs only to conduct the mental experiment of asking which of two families with mean incomes over five years of $10,000 per year that one would prefer to live in: Family A with increasing incomes of $8000, $9000, $10,000, $11,000, and $12,000 per year or Family B with decreasing incomes of $12,000, $11,000, $10,000, $9,000, and $8,000. While permanent income averaged across the 5 year period remains the same for both families, it appears likely that family A's outlook as well as their income improve over time. In contrast, family B's economic hardship is likely to be accompanied by increasing psychological strain, worry, and emotional distress. The developmental effects of these income patterns are likely to be very different for the children in each of these families. We could find no developmental studies that assess how trends in long-run income (positive, negative, or flat) affect child development outcomes.

A final question, not often taken up by developmentalists, is whether income effects are policy relevant (but see Morris & Gennetian, 2003, and Votruba-Drzal, 2003 for exceptions). In other words, let us say that our standard for a "large" effect of income is one that changes the dependent variable by one-quarter of one standard deviation with a $10,000 annual increase in family income, perhaps especially for a low-income family. Under how many policy scenarios is such an increase likely? Not many. Such an income change would be about 2.5 to 4 times the maximum benefit (depending on the number of children in the family) received by families

under the Federal Earned Income Tax (EITC) program. Although income transfers themselves may have synergistic or spillover effects on other dimensions of family life that could further benefit child development (an analogy is the finding that one dollar of child support received by a single mother is "worth" more than $1.00 (e.g. Garfinkel, Heinze, & Huang, 2001)), this has not been empirically demonstrated.

Mayer (1997) and Blau (1999) make especially forceful arguments that money is not what matters for child development; rather, they assert, the most important inputs into child development are "fixed factors" such as family background and other family and child characteristics. Blau argues that the best way to help disadvantaged children would be through the public provision of health and education services for young children. Mayer argues that what we need to do is to help parents, but that the things that make a parent warm, steady, and effective are not the things money can buy. These arguments compel us to try to gain additional perspective on this issue by explicitly comparing the effect sizes for income measures versus other family background characteristics, some of which may be "fixed" but others of which may be amenable to intervention. Our paper thus addresses this question.

Method

Sample

Data for this paper are drawn from the Panel Study of Income Dynamics (PSID) Child Development Supplement II. In 1997, the PSID was supplemented with the CDS-I, a study of children aged 0-12 in a sub-sample of families from the PSID. The purpose of the study was to provide a comprehensive, nationally representative, and longitudinal group of children and their families with which to study the impacts of factors such as maternal employment patterns, family structure changes, and poverty on early human capital formation. The PSID CDS-I was

completed in 1997 with 2,380 child households with 3,563 children. In 2002-2003, families in the CDS-I who remained active in the PSID panel as of 2001 were re-contacted for the CDS-II. The CDS-II successfully re-interviewed 2,019 families who provided data on 2,907 of the original children and adolescents who were then aged 5-18 years. This analysis uses the CDS-II children and their families.

We limit the sample to households where the child participates in the 2002 Child Development Supplement and was born prior to 1994 (i.e. 1993 or earlier). The birth year limitation is imposed so that income is recorded in each year of a child's early childhood (which we define as ages zero to four). This strategy is necessary because, starting in 1997, the core PSID was administered only every other year, instead of annually. Therefore, the youngest children who were first observed in the 1997 CDS would have early childhood income measures from only two core PSID assessments (1999 and 2001 core, which would have asked about income in 1998 and 2000)[1]. Given the importance of having multi-year income measures and the empirically-demonstrated importance of income during the earliest years, we trade-off a bigger sample size for more uniform and precise estimates of family income over the first four years of life. Further, any child observation missing any of the control variables are eliminated. Once the sample is limited there are 1,305 children in 974 families. The unit of analysis for this study will be the 1,305 children.

Dependent Variables

Behavior problems. The Behavior Problems Index (BPI) was assessed based on responses by the primary caregiver as to whether a set of 32 problem behaviors was often, sometimes, or never true of the child. Behaviors included having sudden mood changes,

[1] For children whose middle childhood years are between 1997 and 2000 we only have income data for two of those years, 1998 and 2000.

anxiousness, meanness towards others, and obsessiveness. Behaviors were divided into two subscales, a measure of externalizing or aggressive behavior and a measure of internalizing, withdrawn or sad behavior. There were 16 individual components that comprised the externalizing sub-scale and 13 individual components that comprised the internalizing sub-scale (measures identified as in Table 6, Chapter 6, 1997 User Guide). Scores for the externalizing and internalizing are summary scores. Higher scores on these measures imply a greater level of behavior problems.

Cognitive assessments. The CDS-II children were assessed using the Woodcock-Johnson Revised Tests of Achievement (WJ-R), Form B (Woodcock & Johnson, 1989). Three[2] separate sub-tests were administered, two broadly identifying reading skills and one broadly examining mathematical skills. The Letter-Word Identification sub-test measures symbolic learning (matching pictures with words), as well as reading identification skills such as identification of letters and words. The Passage Comprehension sub-test measures comprehension and vocabulary skills using a format of multiple choice questions, as well as fill-in-the-blank problems. The Applied Problems sub-test measures the child's skill in solving practical problems in mathematics. All three of the sub-tests scores are standardized scores. The standardized scores are constructed based on the child's raw score on the test (essentially the number of correct items completed) and the child's age to the nearest month. Raw scores are charted on normative tables based on the child's age and what percentile the child falls into.

The Memory for Digit Span test from the WISC-III is used to assess children's short-term memory (Wechsler, 1974). In the first part of the test, the child is asked to listen and repeat a sequence of numbers stated by the interviewer. In the second part, the child is asked to repeat

[2] The Calculation sub-test was a second mathematics sub-scale that measures the child's performance on math calculations such as addition and subtraction, as well as overall quantitative ability. This sub-test was administered in 1997, but not in the 2002 version.

the numbers in reverse order. The sequence increases in length until the child can no longer repeat the sequence correctly. This analysis uses the total digit span raw score, which is a combination of the Digit Span Forward and Digit Span Backward.

Health outcomes. The primary caregiver reports on the child's health status. Specifically, the primary caregiver is asked in general whether the child's health is excellent, very good, good, fair, or poor. We use this measure in its Likert scale form; additional analyses assess children's poor health, characterized as such if the primary caregiver responds that the child's health in general is "good", "fair" or "poor".

Independent Variables

Measures of income. Lifetime income, income instability, and income growth were constructed from the core PSID surveys. The child's lifetime income is created by taking the average household income in each year since and including the child's birth, up to the year 2000.[3] The previous year's income is reported in each PSID core (i.e., 1984 income is reported in 1985, etc.). Each year's reported total income is first bottom-coded to one dollar to ensure consistency of reporting over time. Income is then converted to year 2000 dollars to adjust for inflation. The child's lifetime average income is computed as the average of all available years of household income. For example, a child who is 13 years old in 2002 (the time of assessment) was born in 1989. His average lifetime income would be the average of household income in 1989 up to 2000 (all set to 2000 dollars).

To examine potential non-linearities in the effect of income we include a series of dichotomous measures derived from average lifetime income. Specifically, six dichotomous variables were created representing whether the average child's lifetime income was less than

[3] As of the writing of this paper, the 2003 core data that would provide income information for the years 2001 and 2002 were not yet available for public download.

$15,000, between $15,000 and $25,000, between $25,000 and $45,000, between $45,000 and $60,000, between $60,000 and $75,000, and over $75,000. In regressions, the lowest income group is omitted.

Our second characterization of income is with income instability. Lifetime income instability is characterized with a series of mutually exclusive dichotomous variables representing different levels of income instability. We characterize income instability as follows: (a) family income never decreased by at least 50 percent in any two adjacent years; (b) family income decreased by at least 50 percent in any two adjacent years, but did so only once in the child's lifetime; (c) family income decreased by at least 50 percent in any two adjacent years, and did so two or more times in the child's life. In regressions, never experiencing at least a 50 percent income decline is the omitted group.

Our final measure of income resources throughout the child's life is income growth. Income growth is a continuous measure constructed by calculating the percent change (either positive or negative) in total household income in adjacent years. For example, if in the first year of the child's life income is $10,000 and in the second year of the child's life income is $12,000, that child would have experienced income growth of 20 percent. Similarly, a child with $12,000 in total household income in the first year and $10,000 in the following year would experience -16 percent income growth between those two years. To calculate lifetime income growth, we average all adjacent-year income growth. Families who experienced average income growth of over 100 percent were top-coded at 100 percent to minimize skewnness. This occurs for only 10 percent of the children.

Developmental timing of economic conditions. Based on previous research suggesting that income in the preschool years is especially important (Morris et al., 2005), we construct

early and middle childhood measures of average income, income instability, and income growth. Early childhood income (and income instability and growth) is the average of household income characteristics when the child is 0 to 4 years of age; middle childhood income (and income instability and growth) is the average of household income characteristics when the child is 5 to 8 years of age.

Our sample of 1,305 children has complete annual information on income characteristics for the first 8 years of childhood. A smaller subset (n = 736) of older PSID-CDS children also had income information at ages 9-12 and in preliminary analyses we examined whether income characteristics measured between the ages of 9-12 were associated with developmental outcomes after age 12 for this subset of children. Our initial analyses found that they were not, and so henceforth we retain the larger sample of 1,305 PSID children (i.e., those children nine years old and older for whom we observe income up to age 8).

In the analyses of the developmental timing of income, income instability represents whether or not the family income ever decreased by more than 50 percent in any two adjacent years within the early childhood period and within the middle childhood period, respectively (the smaller sample size in these subgroup analyses does not allow us to distinguish those with one drop from those with more than one income drop of this magnitude). Similarly, income growth is constructed as it was in the lifetime measure, but separately for the early and middle childhood periods.

Control variables: household characteristics at child's birth. Analyses control for a set of characteristics associated with the household at the time of the child's birth. First, we control for the child's mother's marital status at his or her birth. This variable was created by the PSID from marriage and birth history information pertaining to this child's mother and collected

during waves 1985-2001. It was constructed by comparing the mother's marriage history dates with this individual's birth date as reported in the mother's birth history. We construct a dichotomous variable representing the mother was single (never married, divorced, or separated) at the child's birth, where married at the time of the child's birth is omitted. Second, we control for whether the home that the child resided in is owned in the year of his or her birth (home not owned is omitted). Third, a dichotomous variable was constructed representing whether the child was low birth weight when born. This measure is assessed retrospectively and asked of the primary caregiver in the CDS I. The primary caregiver reports the pounds and ounces at the child's birth, and if this amount is less than or equal to 5.5 pounds, the child was categorized as being low birth weight.

Finally, two variables that control for the head of household characteristics are included in all analyses. First, a dichotomous variable was created to measure whether or not the head of the household was employed in the year of the child's birth (not employed is omitted). Second, the educational attainment of the head of the household in the year that the child was born was constructed; the omitted category references heads who had more than a high school education.

Control variables: primary caregiver characteristics. All analyses control for the primary caregiver's age (assessed in the 1997 CDS-I), entered linearly. All analyses further control for the primary caregivers' scores on the Passage Comprehension sub-scale of the Woodcock-Johnson Revised Tests of Achievement (WJ-R), which was also assessed in the 1997 CDS I. The score reported is the raw score.

Finally, we include a variable drawn from the 1997 CDS I that reflects the interviewers' observations of how clean the respondents' household is, as well as a variable representing the amount of time the head and (when applicable) the head's spouse spend cleaning the house. This

measure is typically used as part of the physical environment subscale of the HOME environment scale. Interviewers recorded whether or not all visible rooms in the house/apartment were clean or cluttered, with responses ranging (on a five-point scale) from very cluttered and not at all clean to not at all cluttered and very clean. Our measure is the average of these two variables (Pearson R = .78). In addition in the 1997 Core interview, the head was asked about how much time he or she spent on housework (time spent cooking, cleaning, and doing other work around the house). This question was also asked of the head about the spouse. These weekly averages were summed and divided by seven to get the average daily hours spent doing housework[4]. Dunifon, Duncan, & Brooks-Gunn (2004) argued persuasively that this measure could be indicative of parents' personality or motivation, because by and large it is not constrained by parental resources. More specifically, Dunifon et al. argued that a measure of home cleanliness, if purged of the amount of time that parents and others spend doing housework, represents a parental characteristic or organization and efficiency. If true, then this measure is a good proxy one for the types of omitted variables that economists are often concerned about. Interestingly, in Yeung et al.'s (2002) analysis of the PSID-CDS I, the measure of the physical environment of the home (in their case, a four-item variable assessing safety, cleanliness, clutter, and monotony) had the largest total effect on preschool children's math test scores; the effect was almost twice as big compared to the effect of average lifetime income on that outcome measure.

Control variables: child's characteristics. All analyses control for several child-level characteristics measured at the time of assessment in 2002. Control variables include whether the child is a boy or a girl (girl is omitted), the child's age in years at assessment, and the child's race as White or non-White (non-White is omitted).

[4] A variable that captured whether or not the family hired help to clean was not available in 1997.

Results

Sample Description

Table 1 presents the overall means and standard deviations of all variables in the analysis at the child level. One-third of the children were born to single mothers and half of the children were born to families where the home was owned. Nine percent of the children were born weighing less than 5.5 pounds. The majority of the heads of the households were employed in the year in which children were born (80 percent), but half of the heads had not earned more than a high school diploma. The primary caregiver had an average Passage Comprehension score in of 31, where the possible raw score range is 0 to 43. Interviewers reported that houses were on average "clean," with household heads and spouses spending an average of 3.6 hours per day cleaning, cooking, and doing general housework. Half of the sample of children is male and 52 percent are White.

The children included here range in age from nine to 19; their average age is about 13 years in 2002. Approximately 10% each of these children are in nine age groups spanning ages 10-18; an additional 5% of the children are age 9 and 5% are age 19 in 2002.

The average annual household income for these children during their lifetime (between birth and age 8) is $54,116 (in $2000), with a median of $44,724 (data not shown). With respect to the six dichotomous variables representing the average child's annual income over the lifetime (between birth and age 8), we find that the modal category was between $25,000 and $45,000 (25 percent), the next largest category reflected annual incomes greater than $75,000 (20 percent), and the smallest category reflected average annual incomes less than $15,000 (11 percent). The remainder had average annual incomes between $15,000 and $25,000 (13

percent), between $45,000 and $60,000 (18 percent), and between $60,000 and $75,000 (12 percent of the sample).

The majority of children (53 percent) do not experience any income instability as we have defined it. However, just over one-fourth of the children experience at least one 50 percent drop in income in any two adjacent years during their lifetime and 20% experience a drop of this magnitude two or more times. The average number of drops experienced by those who experience more than one drop in income of 50 percent or more is 2.6, with the majority experiencing two drops (data not shown).

On average, lifetime average annual income growth is 26 percent, ranging from -47 percent to 100 percent. Nine percent of the children experience years of negative income growth (data not shown), and the median growth rate in the sample is 11 percent (data not shown).

With respect to the developmental timing of income characteristics, the average early childhood income is $48,318, while the average middle childhood household income is $54,387. The largest income category in both early and middle childhood represents those with between $25,000 and $45,000 (27 and 23 percent, respectively) in annual income. Twenty-five percent of the sample experienced at least one 50 percent or greater drop in income in middle and early childhood. Eleven percent of the children experience these drops in both early and middle childhood (data not shown). On average, children experience income growth in both the early and middle childhood years, with average (median) growth in early childhood of 18 (8) percent and in middle childhood of 20 (8) percent. Twenty-four percent of the children experience negative income growth in early childhood, whereas 27 percent of the children experience negative growth in middle childhood (data not shown).

Child Outcomes

Table 1 also presents the summary statistics of the child's behavior, cognitive, and health outcomes. Average externalizing raw scores are 23, while average internalizing raw scores are 17. Externalizing scores can range from 16-48, while internalizing raw scores can range from 13-39. Letter-word identification, passage comprehension, and applied problems sub-tests average approximately 102 each, while the digit span total score is 16 on average. Children's general health on average is between excellent and very good, with the majority (55 percent) of primary caregivers reporting that the child's general health is excellent (data not shown). Finally, 15 percent of the children's primary caregiver's classified them as in poor health.

Regression Analyses

Two sets of regressions were run for the children's outcomes. The first set of regressions includes controls for all of the demographic and family-level characteristics, as well as the six dichotomous variables for average lifetime level of income (lowest income group is omitted), two dichotomous variables for income instability (one 50 percent drop in the lifetime and more than one 50 percent drop in the lifetime), and income growth. The second set of regressions control for the same demographic and family-level characteristics; as well as separate measures for average early and middle childhood levels of income, income instability in early and middle childhood, and income growth during these two stages of childhood.

Ordinary least squares (OLS) regression was run for all child outcomes, including a linear probability model for the "poor child health" measure. The standard errors are corrected (using the cluster option in STATA) in all analyses to account for the presence of siblings in the data (clustering on the family).

Behavior problems. Table 2 presents the regression results for the child's behavior problems, both externalizing and internalizing. Both models for externalizing behavior problems

are statistically significant. Being born to a single mother is associated with a 1/5 of one standard deviation increase in externalizing behavior problems. Interviewer reported cleanliness of the home is associated with lower externalizing behavior problems; specifically, a one unit increase in the observed cleanliness is associated with a 1/8 standard deviation decrease in externalizing behavior problems.

Income levels are associated with externalizing behavior problems as well. However, relative to being in the lowest income group, the only significant coefficient is obtained in the highest income group (average lifetime income of over $75,000), being in the highest group is associated with a 1/3 of one standard deviation lower levels of externalizing behavior problems. Neither income instability nor income growth is significantly associated with externalizing behavior problems. Model 2 illustrates the findings for the analysis controlling for the developmental timing of income, income instability, and income growth. None of the income level coefficients are statistically significant in Model 2 (although here the coefficient for the highest income group in middle childhood is the largest and is approaching significance).

Both models for internalizing behavior problems are also statistically significant. As in the externalizing behavior problems analysis, the clean home measure is associated with lower levels of internalizing behavior problems. Here, a one unit increase in home cleanliness is associated with a 1/8 standard deviation decrease in internalizing behavior problems. White children have higher levels of internalizing behavior problems compared to non-White children. As illustrated in Model 1, relative to being in the poorest income group, children whose average annual incomes are in any of the top three income groups ($45,000 -$60,000; $60,000-$75,000; and greater than $75,000) all have lower levels of internalizing behavior problems, and each of these coefficients is about the same magnitude of about 1/3 of one standard deviation. Again,

neither income instability nor growth is significantly associated with internalizing behavior problems. Model 2 suggests more specific effects in that each of the four highest early childhood income groups is statistically significantly different from the lowest early childhood income group; here, each of these coefficients is associated with lower levels of internalizing behavior problems and all of these effects are on the order of about 1/3 of one standard deviation. In contrast, there is only one significant association for middle childhood income: here, having an annual average income of $15,000 to $25,000 is associated with lower levels of internalizing behavior problems, relative to being in the poorest group, but the size of this effect is somewhat smaller (1/5 of one standard deviation) compared to the income coefficients for early childhood.

Cognitive assessments. Table 3 presents the findings from the two regression Models for the four cognitive outcomes. Both Models predicting letter-word scores are statistically significant. As might be expected, the head of household's education in the year the child was born is significantly associated with the child's eventual letter-word score. Specifically, children in families where the head has earned not more than a high school diploma have letter-word scores 1/5 standard deviation lower than their counterparts where the head has obtained more than a high school diploma at the time of the child's birth. In addition, the primary caregiver's passage comprehension score and the clean home measure are positively associated with the child's letter-word score. A one standard deviation increase in the passage comprehension score of the primary caregiver is associated with an increase of .17 of one standard deviation in child letter-word score, and a one unit increase in home cleanliness is associated with a 1/8 of one standard deviation increase. In both Models, boys have higher scores compared to girls (1/5 standard deviation), and Whites have higher scores compared to non-Whites (1/5 standard deviation). Child's age is also negatively associated with letter-word scores.

Model 1 also shows that relative to being in the lowest average annual income group, those in almost all other groups (with the exception of the second poorest ($15,000-$25,000) group) have significantly higher letter-word scores. The sizes of these effects are about the same (about ¼ of one standard deviation) until the highest income group, where the relative difference is .41 standard deviation unit higher scores on this test. Additionally, experiencing more than one income drop of at least 50 percent in the child's life is associated with lower letter-word scores on the order of .17 standard deviation units.

However, findings from Model 2 provide more specificity and suggest that it is low income in early childhood, but not middle childhood, that is associated with lower letter-word scores; similarly, income instability in early childhood, but not middle childhood, is associated with lower letter-word scores. Moreover, in the early childhood analyses, each of the five higher income groups has statistically significantly higher letter-word scores than the poorest group, and the difference is greater at higher levels of income.

The findings from the Models predicting the child's passage comprehension are also presented in Table 3. Two of the household characteristics at the child's birth are significantly associated with passage comprehension, in both Models. Being born to a single mother is associated with lower passage comprehensions scores compared to children who were born to married mothers. The magnitude of the effect is equivalent to approximately 1/4 standard deviation. Further, children who were born into a household where the head had only a high school education have lower passage comprehension scores. Also, as in the other models, the greater the primary caregiver's passage comprehension and the cleaner the home, the higher the child's passage comprehension. A one standard deviation increase in the primary caregiver's passage comprehension is associated with a 1/5 standard deviation increase in the child's passage

comprehension, and a one unit increase in the interviewer observed home cleanliness measure is associated with .09 standard deviation increase in passage comprehension. All of the child-specific characteristics are also significantly associated with passage comprehension.

Fewer of the income characteristics are associated with passage comprehension scores relative to the letter-word test scores. The only significant association for income levels here is in Model 2, where, relative to being in the poorest group, those with incomes between $15,000 and $25,000 in early childhood have better scores; this effect is about 1/5 of one standard deviation. However, Model 1 shows that experiencing more than one income drop over the lifetime is associated with a .23 standard deviation reduction in passage comprehension scores. Model 2 shows that income instability in both early and middle childhood are associated with decreases of .18 standard deviation in passage comprehension scores.

Table 3 also presents findings from regressions predicting applied problems test scores. Both models are statistically significant. Again, children who were born to households where the head had only a high school education have lower test scores. As with the reading scores presented above, primary caregiver passage comprehension and interviewer reported home cleanliness are associated with higher scores. A one standard deviation increase in the primary caregiver's passage comprehension is associated with a .15 standard deviation higher score on the applied problems test, and a one unit increase in observed home cleanliness is associated with an almost 1/8 standard deviation increase. Boys have lower applied problems scores compared to girls and Whites have higher scores compared to non-Whites.

In terms of level income, the lifetime average analyses presented in Model 1 show a statistically significant difference only for those in the highest income group; relative to those in the poorest group they have math test scores that are .38 standard deviation units higher. Model

2 shows that in general, this pattern applies to average income during both developmental periods, although the coefficients tend to be somewhat larger in the group of middle childhood income dummies. In neither analysis is income instability or growth related to applied problems scores.

Finally, both Models predicting digit span scores are statistically significant and are also presented in Table 3. Across all models, primary caregiver's passage comprehension is positively associated with digit span scores, where a one standard deviation increase in the primary caregiver passage comprehension is associated with a .14 standard deviation increase in the child's digit span. Additionally, child's age is positively associated with increases in digit span. Model 1 shows that greater lifetime income is positively associated with digit span, although the biggest effect (.30 standard deviation units) is in the comparison between those in the highest income group relative to the poorest. This correlation is not apparent in the subgroup analyses presented in Model 2. Further, income instability and income growth are not significantly associated with digit span.

Child health. Table 4 presents the findings for analyses predicting linear scores in child health as well as the dichotomous variable for poor child health. Both Models predicting the linear measure of child health are statistically significant. In these Models, two of the characteristics at birth are significantly associated with poorer caregiver-assessed general child health. Not surprisingly, children who are born low birth weight have poorer assessed general health in both Models, with effect sizes of about ¼ of one standard deviation. Further, those children where the head of household had only a high school education at the child's birth had worse health (1/6 standard deviation). The clean home measure is negatively associated with the

dichotomous measure of poor child health, with a one unit increase in interview assessed home cleanliness resulting in a 1/12 standard deviation decrease in poor child health.

With respect to the income characteristics, Model 1 shows that the lifetime average annual income is negatively associated with poor child health (i.e., positively associated with better assessed child health). Each of the coefficients is statistically significant, and as income increases the association gets stronger. For example, being one income group away from the poorest group (i.e., the $15,000 to $25,000) is associated with a .25 standard deviation decrease in ill health. Being in the highest income group, however, has an effect size of .66. Having two or more drops in income of 50 percent over the lifetime is associated with worse child health (effect size of 1/6 standard deviation). The results presented in Model 2, however, suggest that most of the significant effects are related to early childhood income; the effects here are also non-linear (stronger at higher levels of income) although somewhat weaker than in the full-sample analysis. In Model 2, the only significant income level effect for middle childhood is being in the highest income group relative to the poorest. The findings for the dichotomous poor health variable, also presented in Table 4, are essentially the same.

Extensions

Finally, we performed one extension to these primary analyses. These extensions focused on whether the effects of income instability and income growth differed depending on different average levels of lifetime annual income. To do so, we created three groups of average lifetime income by separating the two lowest income groups from the two middle income groups from the two highest level groups. The Appendix tables present the significant findings for the income characteristics of interest from these sub-group analyses.

For those in the lowest lifetime income group (i.e., less than $25,000 annual average) high levels of income instability is associated with many of the child outcomes. Experiencing multiple income drops over the child's lifetime is associated with sizeable increases in internalizing behavior problems, lower reading scores, and increased probability of poor child health. For internalizing behavior problems and reading test scores, income instability in early childhood is particularly detrimental. However, as in the primary analyses, income has little impact on math test scores or externalizing behavior problems. Surprisingly, income growth in middle childhood among the low-income group is negatively associated with passage comprehension scores, where a 10 percent average income growth during middle childhood is associated with a small decline in passage comprehension (2% of one standard deviation). Similarly, middle childhood income growth is negatively associated with applied problems scores, again with small effect sizes (an average of a 10 percent increase in income in middle childhood associated with 4% of one standard deviation in the applied problems score).

For those children whose average annual lifetime income is in the "middle" of the distribution (between $25,000 and $60,000), there are very few associations between any of the income characteristics and the child outcomes. Here, a 10 percent income growth during this period (experienced by 81 percent of the middle income sample) is associated with a very small (3 percent of one standard deviation) increase in letter-word scores. Additionally, experiencing income instability in middle childhood is associated with 1/5 of one standard deviation decline in passage comprehension scores.

There are again more statistically significant associations for children whose average income over the lifetime is in the highest income category (more than $60,000 per year on average). Experiencing income instability in early childhood for those in the highest income

group is associated with .43 of one standard deviation increase in externalizing behavior problems. Further, income growth in early childhood is associated with small reductions in externalizing behavior problems among the wealthiest children. Specifically, a 10 percent increase in income over the early childhood period (experienced by 63 percent of those in the highest income category) is associated with 6 percent of one standard deviation decrease in externalizing behavior problems. There are no associations with internalizing behavior problems or letter-word scores. Lifetime income growth has a small positive association with passage comprehension scores among these children. Specifically, a 10 percent average income growth over the child's lifetime (63 percent of this higher income sample experiences average growth over 10 percent) is associated with a 4 percent of one standard deviation increase in passage comprehension.

Among the highest income children, the income instability and income growth measures have the most consistent and strongest associations with the health outcomes. Any income instability in the lifetime is associated with worse child health, particularly early childhood income instability (shown in Model 2), whereas growth in income during middle childhood is associated with reductions in poor health among these children. The effects of middle childhood income growth, however, are quite small (a 10 percent growth rate is associated with reductions in ill health of 3 percent of one standard deviation). Income growth in middle childhood is associated with a reduced probability of poor health, although the effect sizes are quite small (10 percent increase associated with reducing the probability of poor health by 1 percentage point).

Discussion

This study examined how lifetime income, income instability, and income growth, measured both across the lifetime and in early and middle childhood influenced a range of child

outcomes. We are able to examine behavioral, cognitive, and health measures for children across a wide range of ages and socioeconomic groups. The analyses control for several measures that are not often available in other datasets that are highly associated with income. The extensions to the main analysis illustrate further the importance of income instability, particularly among those with the lowest incomes.

Among the control variables, the most consistent finding across all of the models is the role of home cleanliness in children's behavior, cognitive, and health outcomes. A cleaner and less cluttered home in 1997 is associated with reduced externalizing and internalizing behavior problems, improved cognitive assessments, and reduced probability of poor health in 2002. This measure has been purged of the amount of time spent doing housework, and thus may be indicative of parental characteristics of organization and efficiency. The inclusion of this variable may be important by serving as a proxy variable for those measures usually omitted in the analysis.

As expected, the primary caregiver's own measure of cognitive skills, passage comprehension, is associated with higher cognitive outcomes among children in 2002. Also not surprising, low birth weight is positively associated with increases the likelihood of poor health. Finally, being born to a single mother is associated with increased externalizing behavior problems and decreased math test scores (both applied problems and digit span scores).

Despite these robust associations between a wide range of background characteristics and control variables, we also found consistent associations between the child's lifetime income and these child outcomes. Early childhood income and income instability most consistently influence letter-word (reading) scores and physical health (and, to a slightly lesser extent, internalizing behavior problems). Our analysis compares children whose average annual

incomes left them near or below the poverty line (less than $15,000 per year in 2000 dollars) to their higher-income counterparts. These low family incomes correspond to the samples analyzed by Morris and colleagues in several studies. Perhaps the most relevant thought experiment is to consider by how much children's outcomes would be improved if all of these poor children were moved up to the adjacent income group ($15,000 to $25,000); this is about the income level increase that might be expected in the current policy environment (e.g., with earnings increases that could be achieved with increased work effort plus benefits from Earned Income Tax Credits). From this perspective, our results tell some consistent stories. First, these improvements in income could be associated with substantive improvements in reading test scores and physical health, especially if the increases were achieved in early childhood. In contrast, income improvements would have far weaker impacts during middle childhood, and increases in income at this level would do little to improve children's math test scores, where the substantively important advantages were enjoyed primarily by children in the highest income group. With respect to children's behavior problems, our results again suggest that income during early childhood is relatively more important than income during middle childhood; at the same time, it would take income increases of a greater magnitude (i.e., moving from the poorest group to a level of at least $25,000 annually) to achieve a substantively important reduction in internalizing problems. Improvements in income would do little to affect levels of externalizing behavior problems.

The extensions to the main analysis suggest, moreover, that income instability is an important factor in the well-being of children in the lowest income group. High levels of income instability were associated with low-income children's internalizing behavior problems, reading test scores (both tests) and health, again especially if early childhood incomes were unstable.

We found very few associations among the middle income children and a slightly less consistent pattern of associations for the highest-income children.

These results correspond to those reported in previous studies and extend what is known about the role of income, especially income instability. With respect to children's cognitive test scores, it is interesting to consider why income (especially during early childhood) is associated most consistently with reading scores and not math scores in later life (i.e., after age 8). It is possible that trajectories of reading achievement are set in motion at an early age, in the home, and that the lowest-income parents do not have the resources to instill advantageous school readiness skills (generally conceived of as pre-reading skills) in their young children. The results we see for reading achievement in early adolescence could reflect these early and persistent patterns of disadvantage. The fact that they persist until early adolescence (and controlling for later income) is worrisome and policy relevant.

In contrast, an advantage in the realm of math test scores is not seen except among the wealthiest children in the sample, which could reflect a flatter distribution of math test scores or simply that a big advantage is not seen except among children whose wealth affords them significant advantages (such as better schools with more challenging math curricula or perhaps outside tutoring, etc.).

We also see a different pattern of income effects for behavior problems depending on the nature of the problem. Again, early income matters, and the effects are substantively important only for children's internalizing, but not externalizing, problems (think a little more theoretically about this).

Limitations

In analyses such as these, one must always worry about the threat of omitted variable bias. It is useful to consider that the size of these effects (for the cognitive achievement outcomes in particular) maps onto to recent statistically sophisticated experimental (Morris et al. 2005) and econometric (Dahl & Lochner, 2005) analyses. We might want to consider fixed-effects analysis, but the income data between 1997 and 2002 is weakest in PSID (because the core moved to every other year in 1997) and is not available at this time in any event. Moreover, this 5-year window would be a shorter period of time than what we can observe for the eight complete years of each child's lifetime here.

No effects of income growth – why? Didn't change under different specifications.

Also note that we do a much less good job of explaining behavior problems anyway – the R-squares are much lower than in predictions of the cognitive tests or the health outcomes.

Are these findings policy-relevant? Relative to other background characteristics, we do find that income has substantively important correlations with an important array of child outcomes; as large or larger effects than parents' education and own test scores and a possible proxy for their motivation. These findings are bolstered by the fact that we use a nationally-representative sample with all income groups represented, not just a low-income sample with a restricted range of income (and possibly child outcomes).

Bigger income impact on letter-word and digit span (effects big and big relative to controls) and very tiny impacts on passage comprehension and applied problems and small compared to controls➔learned skills versus endowments?

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Table 1
Descriptive Statistics of Study Variables (N=1,305)

	Mean or Proportion	SD
Household characteristics at child birth		
Single mother at birth	33%	---
Owns home	49%	---
Low birth weight	9%	---
Head employed	80%	---
Head high school education or less	50%	---
Primary caregiver characteristics		
Age (years)	35.24	7.41
Passage comprehension (1997)	30.99	5.43
Cleanliness of home (1997)	4.08	1.05
Average daily hours cleaning (1997)	3.61	2.35
Child characteristics		
Boy	49%	---
Age (years in 2002)	13.79	2.85
White	53%	---
Economic characteristics		
Lifetime income (2000$)	54277.72	47804.95
<=$15,000	11%	---
>$15,000 & <=$25,000	13%	---
>$25,000 & <=$40,000	25%	---
>$45,000 & <=$60,000	18%	---
>$60,000 & <=$75,000	12%	---
>$75,000	20%	---
Never 50% drop	53%	---
At least 50% drop once	27%	---
At least 50% drop more than once	20%	---
Average income growth	26%	32.91
Period economic characteristics		
Early childhood income (2000$)	48413.06	40500.29

Middle childhood income (2000$)	54619.81	52396.63
Early <=$15,000	15%	---
Early >$15,000 & <=$25,000	13%	---
Early >$25,000 & <=$40,000	27%	---
Early >$45,000 & <=$60,000	18%	---
Early> $60,000 & <=$75,000	11%	---
Early >$75,000	16%	---
Middle <=$15,000	14%	---
Middle >$15,000 & <=$25,000	13%	---
Middle >$25,000 & <=$40,000	23%	---
Middle >$45,000 & <=$60,000	18%	---
Middle> $60,000 & <=$75,000	11%	---
Middle >$75,000	21%	---
Instability in early childhood	24%	---
Instability in middle childhood	26%	---
Average growth in early childhood	18%	31.56
Average growth in middle childhood	20%	36.63
Child outcomes		
Externalizing behavior problems	22.74	5.81
Internalizing behavior problems	16.55	3.90
Letter-word identification	103.02	19.04
Passage comprehension	102.31	15.12
Applied problems	102.74	16.13
Digit span	15.93	4.16
General child health	1.63	0.80
Poor health	15%	---

Table 2

Regression Analyses: Behavior Problems

	Externalizing Behavior					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	0.91	*	0.51	1.01	*	0.51
Owns home	0.00		0.36	0.00		0.37
Low birth weight	-0.44		0.56	-0.36		0.56
Head employed	-0.70		0.54	-0.71		0.55
Head high school education or less	-0.43		0.36	-0.41		0.36
Primary caregiver age	-0.04		0.03	-0.04		0.03
PCG Passage comprehension	-0.06		0.04	-0.06		0.04
Cleanliness of home	-0.72	***	0.18	-0.74	***	0.18
Average daily hours spent cleaning	-0.03		0.07	-0.02		0.07
Boy	-0.34		0.31	-0.36		0.32
Age (years)	-0.12	*	0.06	-0.11	*	0.06
White	0.70	*	0.41	0.71	*	0.40
Lifetime income >$15,000 & <=$25,000	-0.68		0.81	---		
Lifetime income>$25,000 & <=$40,000	-0.54		0.79	---		
Lifetime income >$45,000 & <=$60,000	-0.99		0.84	---		
Lifetime income >$60,000 & <=$75,000	-0.81		0.95	---		
Lifetime income >$75,000	-1.75	*	0.90	---		
At least 50% drop once	-0.34		0.41	---		
At least 50% drop more than once	0.73		0.56	---		
Average income growth	0.00		0.01	---		
Early income >$15,000 & <=$25,000	---			-1.17		0.77
Early income>$25,000 & <=$40,000	---			-1.22		0.80
Early income >$45,000 & <=$60,000	---			-0.61		0.95
Early income >$60,000 & <=$75,000	---			-1.29		0.98
Early income >$75,000	---			-0.86		1.01
Middle income >$15,000 & <=$25,000	---			-0.94		0.74
Middle income>$25,000 & <=$40,000	---			-0.07		0.82
Middle income >$45,000 & <=$60,000	---			0.18		0.89
Middle income >$60,000 & <=$75,000	---			-0.43		0.98
Middle income >$75,000	---			-1.39		0.99
Instability in early childhood	---			0.68		0.48
Instability in middle childhood	---			-0.25		0.42
Average growth in early childhood	---			0.00		0.01
Average growth in middle childhood	---			0.01		0.00
Constant	30.05	***	2.14	29.92	***	2.10
Number of observations	1,302			1,302		
F-Test	5.08	***		4.18	***	
R-Squared	0.08			0.09		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 2 cont.

	Internalizing Behavior					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	0.40		0.37	0.37		0.37
Owns home	0.22		0.26	0.25		0.27
Low birth weight	0.18		0.40	0.24		0.41
Head employed	-0.22		0.36	-0.13		0.37
Head high school education or less	0.11		0.24	0.11		0.24
Primary caregiver age	-0.02		0.02	-0.02		0.02
PCG Passage comprehension	-0.02		0.03	-0.02		0.03
Cleanliness of home	-0.48	***	0.13	-0.51	***	0.13
Average daily hours spent cleaning	0.01		0.06	0.01		0.06
Boy	-0.06		0.21	-0.06		0.21
Age (years)	0.06		0.04	0.08	*	0.04
White	0.89	**	0.29	0.89	**	0.28
Lifetime income >$15,000 & <=$25,000	-0.65		0.57	---		
Lifetime income>$25,000 & <=$40,000	-0.86		0.52	---		
Lifetime income >$45,000 & <=$60,000	-1.25	**	0.55	---		
Lifetime income >$60,000 & <=$75,000	-1.05	*	0.63	---		
Lifetime income >$75,000	-1.29	**	0.59	---		
At least 50% drop once	-0.01		0.30	---		
At least 50% drop more than once	0.61		0.40	---		
Average income growth	0.00		0.00	---		
Early income >$15,000 & <=$25,000	---			-0.83		0.55
Early income>$25,000 & <=$40,000	---			-1.23	**	0.52
Early income >$45,000 & <=$60,000	---			-1.18	*	0.63
Early income >$60,000 & <=$75,000	---			-1.21	*	0.66
Early income >$75,000	---			-1.23	*	0.67
Middle income >$15,000 & <=$25,000	---			-0.81	*	0.46
Middle income>$25,000 & <=$40,000	---			-0.41		0.51
Middle income >$45,000 & <=$60,000	---			-0.23		0.58
Middle income >$60,000 & <=$75,000	---			-0.63		0.63
Middle income >$75,000	---			-0.55		0.64
Instability in early childhood	---			0.51		0.33
Instability in middle childhood	---			-0.23		0.29
Average growth in early childhood	---			0.00		0.00
Average growth in middle childhood	---			0.00		0.00
Constant	18.21	***	1.50	17.98	***	1.47
Number of observations	1,296			1,296		
F-Test	2.81	***		2.69	***	
R-Squared	0.06			0.06		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 3

Regression Analyses: Cognitive Assessments

	Letter-Word					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-1.55		1.41	-1.25		1.38
Owns home	0.58		1.09	0.39		1.11
Low birth weight	-1.18		1.75	-1.48		1.71
Head employed	-0.09		1.38	-0.11		1.37
Head high school education or less	-4.04	**	1.16	-4.05	**	1.17
Primary caregiver age	0.12		0.07	0.11		0.07
PCG Passage comprehension	0.58	***	0.11	0.59	***	0.11
Cleanliness of home	2.15	***	0.48	2.18	***	0.48
Average daily hours spent cleaning	0.19		0.21	0.18		0.21
Boy	3.74	***	0.95	3.74	***	0.96
Age (years)	-0.42	**	0.18	-0.47	**	0.18
White	3.96	**	1.44	4.17	**	1.43
Lifetime income >$15,000 & <=$25,000	2.59		1.69	---		
Lifetime income>$25,000 & <=$40,000	5.12	**	1.70	---		
Lifetime income >$45,000 & <=$60,000	5.03	**	2.23	---		
Lifetime income >$60,000 & <=$75,000	5.52	**	2.68	---		
Lifetime income >$75,000	7.78	**	2.45	---		
At least 50% drop once	0.47		1.29	---		
At least 50% drop more than once	-3.24	*	1.66	---		
Average income growth	0.02		0.02	---		
Early income >$15,000 & <=$25,000	---			4.14	**	1.92
Early income>$25,000 & <=$40,000	---			3.36	*	1.98
Early income >$45,000 & <=$60,000	---			4.88	**	2.48
Early income >$60,000 & <=$75,000	---			6.67	**	2.95
Early income >$75,000	---			8.52	**	2.87
Middle income >$15,000 & <=$25,000	---			1.20		1.84
Middle income>$25,000 & <=$40,000	---			1.83		2.18
Middle income >$45,000 & <=$60,000	---			0.32		2.60
Middle income >$60,000 & <=$75,000	---			0.22		2.93
Middle income >$75,000	---			-0.91		3.08
Instability in early childhood	---			-3.84	**	1.26
Instability in middle childhood	---			-1.14		1.23
Average growth in early childhood	---			0.01		0.02
Average growth in middle childhood	---			0.02		..01
Constant	78.56	***	5.68	79.46	***	5.63
Number of observations	1,207			1,207		
F-Test	18.89	***		15.43	***	0.26
R-Squared	0.25			0.26		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 3 cont.

	Passage Comprehension					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-3.63	**	1.16	-3.50	**	1.17
Owns home	0.14		0.82	-0.02		0.84
Low birth weight	-1.05		1.58	-1.03		1.58
Head employed	0.15		1.12	0.34		1.07
Head high school education or less	-2.86	**	0.87	-2.86	**	0.88
Primary caregiver age	0.03		0.06	0.03		0.06
PCG Passage comprehension	0.56	***	0.09	0.56	***	0.09
Cleanliness of home	1.32	***	0.39	1.22	**	0.39
Average daily hours spent cleaning	0.05		0.15	0.03		0.15
Boy	2.70	***	0.75	2.82	***	0.75
Age (years)	-0.96	***	0.14	-1.01	***	0.14
White	3.50	**	1.10	3.63	**	1.11
Lifetime income >$15,000 & <=$25,000	0.12		1.48	---		
Lifetime income>$25,000 & <=$40,000	1.09		1.73	---		
Lifetime income >$45,000 & <=$60,000	-0.63		1.87	---		
Lifetime income >$60,000 & <=$75,000	0.30		2.21	---		
Lifetime income >$75,000	2.60		2.14	---		
At least 50% drop once	-0.65		0.95	---		
At least 50% drop more than once	-3.48	**	1.42	---		
Average income growth	0.01		0.02	---		
Early income >$15,000 & <=$25,000	---			2.81	*	1.56
Early income>$25,000 & <=$40,000	---			1.31		1.55
Early income >$45,000 & <=$60,000	---			-0.33		1.90
Early income >$60,000 & <=$75,000	---			2.26		2.21
Early income >$75,000	---			1.71		2.17
Middle income >$15,000 & <=$25,000	---			-0.02		1.54
Middle income>$25,000 & <=$40,000	---			-0.81		1.67
Middle income >$45,000 & <=$60,000	---			-1.02		2.03
Middle income >$60,000 & <=$75,000	---			0.80		2.67
Middle income >$75,000	---			0.83		2.56
Instability in early childhood	---			-2.73	**	0.97
Instability in middle childhood	---			-2.09	**	0.92
Average growth in early childhood	---			0.01		0.01
Average growth in middle childhood	---			0.00		0.01
Constant	93.41	***	4.43	94.20	***	4.30
Number of observations	1,199			1,199		
F-Test	25.23	***		20.58	***	
R-Squared	0.29			0.29		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 3 cont.

	Applied Problems					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-1.97	*	1.14	-1.85		1.14
Owns home	-0.71		0.86	0.39		0.87
Low birth weight	-2.00		1.55	-2.29		1.57
Head employed	-1.28		1.16	-1.33		1.14
Head high school education or less	-2.89	**	0.94	-2.64	**	0.91
Primary caregiver age	0.05		0.08	0.04		0.07
PCG Passage comprehension	0.43	***	0.10	0.42	***	0.10
Cleanliness of home	1.89	***	0.43	1.83	***	0.43
Average daily hours spent cleaning	0.10		0.19	0.09		0.18
Boy	-1.49	*	0.76	-1.55	**	0.76
Age (years)	-1.13	***	0.16	-1.08	***	0.16
White	6.72	***	1.12	6.85	***	1.12
Lifetime income >$15,000 & <=$25,000	0.13		1.57	---		
Lifetime income>$25,000 & <=$40,000	2.20		1.61	---		
Lifetime income >$45,000 & <=$60,000	1.78		1.81	---		
Lifetime income >$60,000 & <=$75,000	2.43		2.22	---		
Lifetime income >$75,000	6.08	**	2.12	---		
At least 50% drop once	0.77		1.07	---		
At least 50% drop more than once	-1.27		1.35	---		
Average income growth	0.00		0.01	---		
Early income >$15,000 & <=$25,000	---			1.25		1.71
Early income>$25,000 & <=$40,000	---			0.20		1.64
Early income >$45,000 & <=$60,000	---			1.05		2.06
Early income >$60,000 & <=$75,000	---			0.64		2.36
Early income >$75,000	---			3.46		2.40
Middle income >$15,000 & <=$25,000	---			1.23		1.58
Middle income>$25,000 & <=$40,000	---			3.03	*	1.78
Middle income >$45,000 & <=$60,000	---			1.11		1.92
Middle income >$60,000 & <=$75,000	---			2.56		2.34
Middle income >$75,000	---			5.41	**	2.43
Instability in early childhood	---			-0.36		1.09
Instability in middle childhood	---			-0.88		0.96
Average growth in early childhood	---			0.00		0.01
Average growth in middle childhood	---			-0.01		0.01
Constant	99.37	***	5.13	101.38	***	5.10
Number of observations	1,200			1,200		
F-Test	28.86	***		23.23	***	
R-Squared	0.33			0.34		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 3 cont.

	Digit Span					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-0.64	*	0.34	-0.58	*	0.34
Owns home	-0.15		0.25	-0.15		0.26
Low birth weight	-0.12		0.43	-0.10		0.43
Head employed	-0.10		0.32	-0.10		0.33
Head high school education or less	-0.49		0.29	-0.52	*	0.29
Primary caregiver age	0.02		0.02	0.03		0.02
PCG Passage comprehension	0.10	***	0.03	0.10	***	0.03
Cleanliness of home	0.21	*	0.13	0.24	*	0.13
Average daily hours spent cleaning	-0.08		0.05	-0.07		0.06
Boy	0.35		0.22	0.34		0.22
Age (years)	0.38		0.05	0.39		0.05
White	0.04		0.32	0.08		0.33
Lifetime income >$15,000 & <=$25,000	0.76	*	0.45	---		
Lifetime income>$25,000 & <=$40,000	0.32		0.46	---		
Lifetime income >$45,000 & <=$60,000	0.09		0.53	---		
Lifetime income >$60,000 & <=$75,000	0.75		0.65	---		
Lifetime income >$75,000	1.25	**	0.61	---		
At least 50% drop once	-0.45		0.31	---		
At least 50% drop more than once	0.10		0.39	---		
Average income growth	0.00		0.00	---		
Early income >$15,000 & <=$25,000	---			0.45		0.49
Early income>$25,000 & <=$40,000	---			-0.17		0.51
Early income >$45,000 & <=$60,000	---			0.18		0.62
Early income >$60,000 & <=$75,000	---			0.42		0.68
Early income >$75,000	---			0.57		0.70
Middle income >$15,000 & <=$25,000	---			0.35		0.46
Middle income>$25,000 & <=$40,000	---			0.30		0.47
Middle income >$45,000 & <=$60,000	---			0.14		0.55
Middle income >$60,000 & <=$75,000	---			0.20		0.67
Middle income >$75,000	---			0.56		0.67
Instability in early childhood	---			0.14		0.31
Instability in middle childhood	---			-0.09		0.28
Average growth in early childhood	---			0.00		0.00
Average growth in middle childhood	---			0.00		0.00
Constant	7.49	***	1.43	6.96	***	1.43
Number of observations	1,201			1,201		
F-Test	12.38	***		9.14	***	
R-Squared	0.18			0.17		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 4

Regression Analyses: Child Health Outcomes

	Child Health					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-0.02		0.07	-0.02		0.07
Owns home	0.02		0.05	0.02		0.05
Low birth weight	0.22	**	0.08	0.23	**	0.08
Head employed	0.12	*	0.07	0.13	*	0.07
Head high school education or less	0.13	**	0.05	0.14	**	0.05
Primary caregiver age	0.01	*	0.00	0.01	*	0.00
PCG Passage comprehension	0.00		0.01	0.00		0.01
Cleanliness of home	-0.06	**	0.03	-0.07	**	0.03
Average daily hours spent cleaning	0.00		0.01	0.00		0.01
Boy	0.06		0.04	0.06		0.04
Age (years)	0.00		0.01	0.00		0.01
White	-0.08		0.06	-0.08		0.06
Lifetime income >$15,000 & <=$25,000	-0.20	*	0.11	---		
Lifetime income>$25,000 & <=$40,000	-0.31	**	0.11	---		
Lifetime income >$45,000 & <=$60,000	-0.40	***	0.12	---		
Lifetime income >$60,000 & <=$75,000	-0.51	***	0.13	---		
Lifetime income >$75,000	-0.53	***	0.13	---		
At least 50% drop once	0.04		0.06	---		
At least 50% drop more than once	0.13	*	0.08	---		
Average income growth	0.00		0.00	---		
Early income >$15,000 & <=$25,000	---			-0.19	**	0.10
Early income>$25,000 & <=$40,000	---			-0.18	**	0.11
Early income >$45,000 & <=$60,000	---			-0.31	**	0.12
Early income >$60,000 & <=$75,000	---			-0.33	**	0.13
Early income >$75,000	---			-0.31		0.14
Middle income >$15,000 & <=$25,000	---			-0.11		0.10
Middle income>$25,000 & <=$40,000	---			-0.11		0.11
Middle income >$45,000 & <=$60,000	---			-0.18		0.12
Middle income >$60,000 & <=$75,000	---			-0.11		0.13
Middle income >$75,000	---			-0.25	*	0.14
Instability in early childhood	---			0.08		0.07
Instability in middle childhood	---			0.01		0.06
Average growth in early childhood	---			0.00		0.00
Average growth in middle childhood	---			0.00		0.00
Constant	1.36	***	0.29	1.39	***	0.29
Number of observations	1,305			1,305		
F-Test	6.38	***		5.13	***	
R-Squared	0.11			0.11		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Table 4 cont.

	Poor Child Health					
	Model 1			Model 2		
	B		SE	B		SE
Single mother at birth	-0.02		0.03	-0.01		0.30
Owns home	0.02		0.02	0.02		0.02
Low birth weight	0.12	**	0.04	0.13	**	0.04
Head employed	0.05		0.03	0.05		0.03
Head high school education or less	0.07	**	0.02	0.08	**	0.02
Primary caregiver age	0.00		0.00	0.00		0.00
PCG Passage comprehension	0.00		0.00	0.00		0.00
Cleanliness of home	-0.03	**	0.01	-0.04	**	0.01
Average daily hours spent cleaning	0.00		0.00	0.00		0.00
Boy	0.01		0.02	0.01		0.02
Age (years)	0.00		0.00	0.00		0.00
White	-0.01		0.03	-0.01		0.03
Lifetime income >$15,000 & <=$25,000	-0.10	*	0.05	---		
Lifetime income>$25,000 & <=$40,000	-0.11	**	0.05	---		
Lifetime income >$45,000 & <=$60,000	-0.17	**	0.06	---		
Lifetime income >$60,000 & <=$75,000	-0.17	**	0.06	---		
Lifetime income >$75,000	-0.17	**	0.06	---		
At least 50% drop once	0.00		0.03	---		
At least 50% drop more than once	0.04		0.04	---		
Average income growth	0.00		0.00	---		
Early income >$15,000 & <=$25,000	---			-0.05		0.05
Early income>$25,000 & <=$40,000	---			-0.09	*	0.05
Early income >$45,000 & <=$60,000	---			-0.14	**	0.06
Early income >$60,000 & <=$75,000	---			-0.13	**	0.06
Early income >$75,000	---			-0.10	*	0.06
Middle income >$15,000 & <=$25,000	---			-0.04		0.05
Middle income>$25,000 & <=$40,000	---			0.01		0.05
Middle income >$45,000 & <=$60,000	---			-0.03		0.05
Middle income >$60,000 & <=$75,000	---			0.02		0.06
Middle income >$75,000	---			-0.04		0.06
Instability in early childhood	---			0.05		0.03
Instability in middle childhood	---			-0.02		0.03
Average growth in early childhood	---			0.00		0.00
Average growth in middle childhood	---			0.00		0.00
Constant	0.14		0.13	0.16		0.13
Number of observations		1,305			1,305	
F-Test	4.22	***		3.78	***	
R-Squared	0.08			0.09		

Note: * $p < .10$; ** $p < .05$; *** $p < .01$

Appendix

Lowest income groups

	Externalizing	Internalizing	Letter-Word	Passage Comp	Applied Prob	Digit Span	Health	Poor health
<u>Model 1</u>								
More than 50% drop once								
More than 50% drop more than once		1.49	-4.90	-4.07			0.26	0.11
Average income growth								
<u>Model 2</u>								
Instability in early childhood		1.11	-4.24	-2.95				
Instability in middle childhood								
Average growth in early childhood								
Average growth in middle childhood				-0.03	-0.05			

Middle income groups

	Externalizing	Internalizing	Letter-Word	Passage Comp	Applied Prob	Digit Span	Health	Poor health
Model 1								
More than 50% drop once								
More than 50% drop more than once								
Average income growth								
Model 2								
Instability in early childhood								
Instability in middle childhood				-2.95				
Average growth in early childhood								
Average growth in middle childhood			0.05					

Highest income groups

	Externalizing	Internalizing	Letter-Word	Passage Comp	Applied Prob	Digit Span	Health	Poor health
Model 1								
More than 50% drop once						-1.82	0.23	
More than 50% drop more than once				-7.12			0.24	
Average income growth				0.05				
Model 2								
Instability in early childhood	2.02				5.22		0.49	0.21
Instability in middle childhood					-4.77			-0.08
Average growth in early childhood	-0.03							
Average growth in middle childhood							-0.01	-0.01