Does Money Really Matter? Estimating Impacts of Family Income on Children's Achievement with Data from Random-Assignment Experiments

Pamela Morris
MDRC

Greg J. Duncan
Northwestern University

Christopher Rodrigues
MDRC

February 12, 2004

Abstract

Studies using nonexperimental data have generated little consensus on whether parental income promotes children's achievement. We revisit this issue by using random-assignment-induced variation in family income in four welfare and anti-poverty programs to identify income effects. Our results suggest that family income has a policy-relevant positive impact on the school achievement of preschool but not older children.

Acknowledgments

This paper was completed as part of the Next Generation project, which examines the effects of welfare, antipoverty, and employment policies on children and families. This paper was funded by the Next Generation Project funders: the David and Lucile Packard Foundation, William T. Grant Foundation, the John D. and Catherine T. MacArthur Foundation, and the Annie E. Casey Foundation. We thank the original sponsors of the studies for permitting re-analyses of the data; Beth Clark-Kauffman and Heather Hill for analytical and research assistance; and Joshua Angrist and Robert Moffitt for comments on earlier drafts. Please direct all correspondence regarding this submission to Pamela Morris, MDRC, 16 East 34th Street, New York, New York 10016; e-mail: Pamela.Morris@mdrc.org.

Does Money Really Matter? Estimating Impacts of Family Income on Children's Achievement with Data from Random-Assignment Experiments

I. Introduction

Despite countless studies estimating the association between family income and child development, there is no consensus on how, and even whether, a policy-induced increase in family income would be spent in ways that would boost the achievement of children (Duncan & Brooks-Gunn, 1997; Haveman & Wolfe, 1995; Mayer, 1997). The estimation problem is a familiar one: virtually all studies of income effects are based on nonexperimental data and susceptible to biases from such unmeasured parental characteristics as genetic endowments or parental mental health.

We revisit this issue using data from four welfare-to-work experiments. All four assigned welfare-recipient single parents at random to control groups or to various welfare and employment policy packages. All policy packages had components designed to increase employment and reduce welfare. Some but not all were designed to increase total family incomes. None of these policy packages had components designed to affect outcomes for children directly (e.g., direct child care services to children), nor did any target parents or parenting (e.g., through therapy or parenting services). Children's school achievement was measured in surveys and achievement tests administered two to five years after the point of random assignment. We use the exogenous variation in family income between random assignment and the measurement of child outcomes produced by these experiments to identify the effects of income on child achievement.

Our paper is organized as follows: Section II reviews the literature. Section III describes our analytic approach, while Section IV describes the data and measures used in our analysis. Section V details our results; and a summary and discussion follow in Section VI.

II. Background

An extensive literature examining the relation between family economic resources and child outcomes has developed in economics, developmental psychology and sociology, but few of these studies rely on experimental or quasi-experimental variation in income. Some compelling quasi-experimental data demonstrating that child ability is affected by family socioeconomic status come from an adoption study that compared the pre- vs. post-adoption IQs of children adopted into low-, middle- and high-SES families (Duyme et al., 1999). All of the adopted children had low IQs (in the 60-86 range) prior to adoption and were adopted between ages 4 and 6. IQ prior to adoption was independent of placement-family SES. However, post-adoption IQ growth was strikingly different by SES (defined by father's occupation), with the gains associated with adoption into high- and middle-SES families much larger than the IQ gains for children adopted into low-SES families. But the study was unable to distinguish whether income or some correlated aspect of the family or community environments of higher SES families was responsible for the differential IQ gains.

In four income-maintenance experiments in the 1960s and 1970s, families were randomly assigned to treatment groups that received income supplements or to a control group that received no special income supplements (Institute for Research on Poverty, 1976; Kershaw &

Fair, 1976; U.S. Department of Health and Human Services, 1983; Salkind & Haskins, 1982). However, child outcomes were not measured very well in the evaluation studies. School performance and attendance were affected positively in some sites for elementary-school-age children, but not for high-school-age adolescents. In the two sites reporting high school completion and advanced education, these outcomes were higher for the experimental group.

Numerous nonexperimental studies show that family income has positive associations with outcomes for children, although more so for cognitive outcomes than for child behavior and health (Haveman & Wolfe, 1995; Duncan & Brooks-Gunn, 1997; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Klerman, 1991; Korenman & Miller, 1997). Moreover, the effects of income appear to differ across the childhood age span. Duncan et al. (1998) find that family economic conditions experienced before the age of 5 are more strongly associated with children's failure to complete schooling in adolescence than economic conditions from age 6 to 15. Such results are consistent with theoretical predictions about the developmental malleability of preschool children (Shonkoff & Phillips, 2000) and about the susceptibility of the early childhood period to family influences, as compared with schools, neighborhoods, and peer influences (Bronfenbrenner & Morris, 1998; McCall, 1981).

Research suggests that family economic conditions matter because they enhance the material and social resources available to children (Becker, 1981; Bergstrom, 1997; Coleman, 1988) and may improve family psychological processes (e.g., parental emotional well-being and parenting; Chase-Lansdale & Pittman, 2002; McLoyd, 1990, 1997, 1998; McLoyd, Jayartne, Ceballo, & Borquez, 1994). However, most of these process studies fail to establish convincingly that their estimated effects are due to income rather than preexisting differences between families (Bradley & Corwyn, 2002; Duncan & Brooks-Gunn, 1997; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Mayer, 1997; McLoyd, 1998).

Not all of the studies in the literature conclude that family income is an important input to healthy child development. Mayer (1997) tests for omitted-variable bias and finds large reductions in the estimated impact of parental income, leading her to conclude that much of the estimated effect of income in the literature is spurious. Blau (1999) estimates a number of models relating income and other aspects of parental family background to children's ability and achievement test scores as well as behavior problems. He finds small and insignificant effects of current income and larger (although still modest) effects of long-run income, although he does not investigate whether income effects differ by child age. Shea (2000) estimates the impact of parents' income on their children's labor market outcomes by using parental income variation induced by factors that may reflect luck (i.e. union, industry and job loss experience). His estimates suggest negligible income effects, although, as he points out, some of his instruments may be correlated with unobserved ability.

Prior work using data from seven large-scale random-assignment welfare and anti-poverty studies conducted during the 1990s provides the foundation for the analyses we present here. For children who were preschool and elementary-school age at random assignment, programs that were designed to increase both employment and, through generous earnings supplements, income led consistently to improved achievement and, in some cases, to improved social behavior as well (Morris, Duncan, Huston, Crosby, & Bos, 2001). Programs that required employment but did not offer earnings supplements had few and inconsistent effects on children's development (McGroder et al., 2000; Morris et al., 2001). For children who were adolescents at random assignment, there were some negative impacts on schooling outcomes

(e.g. school achievement, grade repetition), regardless of whether the program included earnings supplements or not (Gennetian, Duncan, Knox, Vargas, Clark-Kauffman, & London, 2002).

A more recent examination of an expanded set of data from these experiments finds that children undergoing developmental transitions appear most sensitive to the changes in families brought about by these policies (Morris, Duncan, & Clark-Kauffman, 2003). In particular, positive effects of welfare and antipoverty policies are most pronounced for children making the transition *into* elementary school, and negative effects of these same policies are most pronounced for children making the transition *into* early adolescence. But these experimental studies focus on program impacts and do not attempt to secure estimates of the separate effects on child achievement of family income and maternal employment. Our current paper is focused precisely on that task.

III. Analytic Approach

We pool microdata from four studies that evaluated eight welfare and antipoverty programs: Connecticut's Jobs First; the Los Angeles Jobs First GAIN; the New Brunswick and British Columbia sites of the Canadian Self-Sufficiency Project (SSP); and the Atlanta, GA, Grand Rapids, MI, and Riverside, CA sites of the National Evaluation of Welfare to Work Strategies (NEWWS). As detailed below, these studies provide us with nearly 20,000 observations of children age 2 to 15 at the time of random assignment.

As detailed below, the programs contributing data to our study represent two different program models with differing effects on employment and income. Programs in the two SSP sites and in Connecticut were designed to increase both work and family income by providing families with monthly work-conditioned cash supplements or by increasing the amount of welfare payments recipients could keep when they went to work. The remaining programs -- the three NEWWS sites and LA GAIN -- had "work first" policies without generous earnings supplements. It was expected that these programs would increase employment by requiring employment activities as a condition of receiving welfare benefits. No direct family or child services were provided by any of these programs, nor did any directly subsidize the use of child care relative to the control group.

Our interest is in using these data to estimate the impact of family income on child achievement:

$$(1)\ Y_i = \beta_0 + \beta_1\ \text{Income}_i + \beta_2\ \text{Employment}_i + \beta_3\ \text{Welfare}_i + \Sigma\gamma_k X_{ki} + e_i$$

where Y_i is achievement of the i^{th} child, Income_i is child i's family income, and X_k are the k other factors that influence child achievement. Because our welfare intervention studies targeted employment and welfare receipt as well as total family income, we also treat the child's mother's employment (Employment) and family welfare receipt (Welfare) as endogenous variables in our structural model (1).

Bias to the estimation of β_1 arises if Xs correlated with income and child achievement are omitted from the estimation equation. Our instrumental-variables approach estimates first-stage equations for our three potentially endogenous determinants of child achievement – family income, maternal employment and welfare receipt. To identify our model, we use the program/control group contrast for the eight program/site combinations in our data. Denoting experimental group dummies as Z_1, $Z_2 \ldots Z_8$, our first-stage equations are:

$$(2)\ \text{Income}_i = \delta_{11} + \delta_{12}\ Z_{i1} + \ldots + \delta_{19}\ Z_{i8} + \Sigma\lambda_1 X_i + \upsilon_{i1}$$

(3) $\text{Employment}_i = \delta_{21} + \delta_{22} Z_{i1} + ...+ \delta_{29} Z_{i8} + \Sigma\lambda_2 X_i + \upsilon_{i2}$

(4) $\text{Welfare}_i = \delta_{31} + \delta_{32} Z_{i1} + ...+ \delta_{39} Z_{i8} + \Sigma\lambda_3 X_i + \upsilon_{i3}$

Will our IV model provide us with unbiased estimation of β_1 (Angrist, Imbens, & Rubin, 1996)? Identification of the IV model requires that we have at least as many instruments (eight in our case) as endogeneous variables (three in our case).[1] A second condition is that the instruments are uncorrelated with the error terms in the first stage equation, which is assured by random assignment. Evaluation reports documented in the following section demonstrate that the randomization process was successful in all of the studies.

A third requirement to assure that our IV model leads to unbiased estimates of β_1 is that the eight experimental group dummies must correlate with income, a fact that we establish in the following section. A fourth assumption is that there are no community effects or displacement effects in the sense that income and child achievement are independent across families. A fifth assumption is that the program effect on income is monotonic, which in the case of income means that the incomes of all families assigned to an income-enhancing program are at least as high as their incomes if they had been assigned to the control group. All of these assumptions are reasonable in light of the programs and their implementation.

The sixth condition is the exclusion restriction -- that our three endogenous variables (family income, maternal employment and welfare income receipt) must capture all of the channels by which the experimental welfare programs affect child achievement. As described above, all of the studies were designed to affect maternal employment and welfare receipt and, in the case of some programs, family income. None of them provided child services, nor did any target parenting. This is not to say that there may not be subsequent family-related or child care-related effects on children of these policies, but any of these effects are likely to have been generated as a result of the program effects on employment, income, and welfare receipt, and not direct effects of the treatment.

IV. Measures

As described above, our data come from four welfare and employment evaluation studies. Below we provide a short description of the program under study in each of these evaluations. In each case, welfare recipients were randomly assigned to the program described below, or to a control group to receive welfare as usual (the AFDC system for the U.S. studies, and Income Assistance (IA) for SSP).

SSP. In SSP, single parent welfare recipients in the provinces of British Columbia and New Brunswick who had been in Canada's welfare program for at least one year were randomly assigned to the SSP program or to receive cash assistance through Canada's Income Assistance Program (Michalopoulos et al., 2002; Morris & Michalopoulos, 2000; 2003). SSP took a pure make-work-pay approach, offering a generous earnings supplement for full-time work (at least 30 hours per week) for up to three years. The earnings supplement was a monthly cash payment available to single-parent welfare recipients who chose to leave welfare for full-time work within a year of being offered the supplement. The amount of the supplement was calculated as half the difference between a recipient's earnings and an earnings benchmark set such that a parent with

[1] Overidentification in our case provides us with opportunities to include additional endogenous variables or to refine the ones we already have (e.g., distinguishing between part and full-time employment). We plan to investigate these in future work.

a full-time minimum-wage job would roughly double her income if she received the supplement. A substudy of the main SSP evaluation was intended to estimate the added effects of providing employment services in addition to the financial incentive on outcomes for children. That study randomly assigned welfare recipients to the SSP-Plus program or to the control group, to receive Income Assistance as usual, for a subset of families in New Brunswick (Quets, Robins, Pan, Michalopoulos, & Card, 1999)[2]. Data on children were collected at 36 and 54 months after parents were enrolled in either the main SSP study or the SSP-Plus substudy.

Connecticut's Jobs First Program. Single-parent welfare recipients were randomly assigned to participate in Connecticut's Jobs First program or to receive welfare through the AFDC system (Bloom et al., 2002). The program combines three key elements of many welfare reforms: time limits, earnings supplements and work requirements. Jobs First limits families to 21 cumulative months of cash assistance unless they receive an extension or exemption. It includes an unusually generous welfare benefit reduction scheme that allowed families to retain their full welfare grant as long as they earn less than the federal poverty level. At the same time, it requires recipients to work or to participate in employment services designed to help them find jobs quickly. Data on children were collected three years after parents were enrolled in the study.

LA GAIN. Like Connecticut's program, single parent welfare recipients were randomly assigned to the LA GAIN program or to be subject to the benefits of the AFDC system (Freedman et al., 2000). LA GAIN is a strict work-first program, imparting a clear work-first message, and requiring that parents' participate in employment-related activities as a condition of receiving their welfare benefits. Sanctions were used to enforce participation. Data on children were collected two years after parents were enrolled in the program.

NEWWS. Operating in three sites (Atlanta, Georgia; Grand Rapids, Michigan; and Riverside, California), NEWWS randomly assigned single parents to the NEWWS labor force attachment (LFA, a jobs-first program) or to the AFDC system (NEWWS, Hamilton et al., 2001; McGroder et al., 2000). The primary objective of this program was to reduce single parents' welfare use and increase their employment. The programs required welfare recipients to participate in employment-related activities as a condition of receiving welfare. Families who failed to meet the participation requirements could receive sanctions. Data on children were collected at two and five years after parents were enrolled in the program.

Our pooled data consist of 18,471 child observations taken from 10,997 children living in 7,631 single-parent families. Children range in age from 2-15 at the point of random assignment.[3] In all studies, families entered the studies at the time of their application or re-determination application for welfare. To allow for differences in income effects for children of different ages, we provide separate estimates for children ages 2-5, 6-9, and 10-15 years at baseline. These age categories were chosen because they are consistent with prior studies on the effects of income by child age (e.g., Duncan et al., 1998), as well as work conducted on these

[2] In fact, the SSP Plus study was originally designed as a three-group design. For the purposes of this pooled analysis, we treat those assigned to the SSP-Plus program as in that program group, and those assigned to the SSP standard program as in that program group, and any in the control group in either the SSP Plus or the standard SSP study as control group members. We do not include contrasts to the two different program streams in these analyses.

[3] There were too few observations on children under the age of 2 at baseline across the studies to enable us to estimate our models for this age group.

same data testing differences in program impacts by child age (Morris et al., 2001, 2003; Gennetian et al., 2002). We have 11,814 child observations for children ages 2-5 years; 4,043 child observations for children 6-9 years of age; and 2,614 observations for children ages 10-15 years. The distribution of the sample across studies is presented in Table 1. Note that children older than age 6 at baseline were not assessed in the NEWWS studies. Since our data contain multiple observations for some children and multiple siblings for some families, we adjust standard errors for lack of independence using Huber-White methods.

Descriptive statistics for all of our measures are presented in Table 2.

School achievement. Children's cognitive performance or school achievement is measured using a parent or teacher report or test scores. The SSP, Connecticut, and LA-GAIN studies included parent reports of children's achievement on a 5-point rating of how well the child was doing in school (in the Connecticut and LA-GAIN studies these are based on a single item measure; in SSP, these are based on an average of children's reported functioning in three academic subjects). Teacher reports of achievement (collected in NEWWS at the five-year follow-up point and Connecticut) were based on items from the Academic Subscale of the Social Skills Rating System (Gresham & Elliot, 1990). On this 10-item measure, the teacher compares the child's performance with that of other students in the same classroom on reading skill, math skill, intellectual functioning, motivation, oral communication, classroom behavior, and parental encouragement (internal consistency alpha = .94). Test scores include the Peabody Picture Vocabulary Test for children ages 4-7 at the 36 month follow-up in SSP, a math skills test containing a subset of items from the Canadian Achievement Tests, Second Edition (CAT/2) for children ages 8-15 at the 36 month follow-up in SSP, the Bracken Basic Concepts Scale for children in NEWWS at the two year follow-up point, and the Math and Reading scores from the Woodcock Johnson tests of achievement for children in NEWWS at the five-year follow-up point, all well validated and reliable tests of children's cognitive performance. To provide comparability in outcomes across studies, we have standardized these achievement outcomes by subtracting study-specific means and dividing by study-specific control-group standard deviations.

Family income. Our key endogenous variable is family income. For all sample members in the three U.S. studies, administrative records provided data on monthly cash assistance and Food Stamp benefits, any cash supplement payments provided by the earnings supplement programs, as well as quarterly earnings in jobs covered by the UI system. For the Canadian SSP samples, administrative records provided information on receipt of Income Assistance and receipt of SSP supplement payments, while the parent survey collected data on earnings from employment. For each year following random assignment, we computed an average annual parent income based on the sum of earnings, AFDC/TANF/IA and supplement payments, and Food Stamp payments. Note that this income measure omits self-employment and informal earnings, other public transfers, private transfers, and earnings from family members other than the sample member. All income amounts have been inflation-adjusted for 2001 prices using the CPI. In the case of the SSP, Canadian dollars are converted to American dollars before being adjusted for inflation. From this information, *average annual income* (in $1000s) and *log average annual income* were computed over the time between random assignment and the assessment of child achievement.

Employment. Unemployment Insurance (UI) records provide employment and earnings information for all years of the follow-up period in U.S. studies. These data provide information

about earnings of mothers in the state in which the study took place, but do not include earnings from other states nor from jobs not reported to the state's UI system. For the Canadian SSP, earnings were collected via the parent surveys, computed from reports on hourly wages, hours worked per week, and weeks worked per month. *Average employment* per quarter was computed for all years of the follow-up using these earnings data. Sample members were coded as being employed in a quarter if their earnings for that quarter were greater than zero. Our employment measure is the average employment rate across all quarters of the follow-up period.

Welfare receipt. Quarterly welfare receipt from public assistance records was collected for all years of the follow-up period for each study. *Average welfare receipt* per quarter was computed for all years of the follow-up using these data. Sample members were coded as having received welfare in a quarter if their welfare payments for that quarter were greater than zero. Our welfare variable is the average welfare receipt rate across all quarters of the follow-up period.

Other control variables. Covariates included in the first and second stage models include baseline parental and family characteristics. Administrative data provided comparable pre-random-assignment measures of length of receipt of cash assistance in the year prior to baseline, and average earnings in the year prior to baseline and its square. Baseline surveys taken just prior to random assignment provide comparable measures of whether the parent was employed in the year prior to baseline; whether the parent has a high school degree or GED; whether the parent was a teenager at the time of the child's birth; the marital status of the parent; the number of children in the family; the age of the youngest child in the family; and the race/ethnicity of the parent. We also include controls for length of follow-up and type of achievement assessment, as well as dummy variables representing site/study controls.

V. Results

Estimates of baseline differences in parent and family characteristics were examined for each of the studies included in these analyses. These results are presented in Table 3, and show that, as expected because of random assignment, baseline differences between program and control groups were not common. Of the 112 experimental/control group contrasts shown in Table 3, eleven were statistically significant at the .05 level.

Individual study estimates. For each study, we used Ordinary Least Squares regression analyses to estimate the impacts of experimental group assignment on the adult economic and child achievement outcomes. These are presented in Table 4. Pre-random assignment parental and family characteristics are included as control variables in these models. Program effects across age groups are very similar—with increases in employment and reductions in welfare receipt in most programs, but income increases concentrated in the programs (SSP, SSP-Plus, and Connecticut Jobs First) that provided generous earnings supplements.

Significant increases in employment are found in almost all program models and sites, and for virtually all age groups of children (the exception being LA-Gain for the youngest and middle childhood children). However, effect sizes vary across sites and age groups. For the youngest children, significant program impacts on the percentage of quarters spent employed range from a 5-percentage-point increase in NEWWS Atlanta to an 13-percentage-point increase in SSP Plus-New Brunswick. Effect sizes are in the same range for young school-age children (from 3 to 17 percentage points), and slightly larger for the oldest children (from 9 to 27 percentage points).

Consistent with the goals of these program models, program impacts on welfare receipt are generally negative. The sizes of these negative effects are generally larger for the programs with the largest positive impacts on employment. An exception is the Connecticut Jobs-First program, which *increased* welfare receipt as it *increased* employment. This is consistent with this program model—families were allowed to keep their full welfare benefits as they went to work.

While almost all of the programs increased employment and reduced welfare receipt, increases in family income are concentrated in the three programs with the generous earnings supplement policies – SSP, SSP-Plus, and Connecticut Jobs First. Increases in income for these programs ranged from $810 to $2200 annually for the youngest children; from approximately $1600 to $2100 for the 6-9 year old children, and from nearly $1400 to nearly $2300 for the 10-15 year olds. By comparison, estimated program impacts on family income for the work-first program models were mostly non-significant (the only exception is the Atlanta program, a work-first program that produced small but statistically significant increases in log, but not annual, income).

The final columns of the table show the IV estimate of the effects of annual income on child achievement when income is taken to be the only endogenous variable.[4] These results amount to the ratio of the program impacts on annual income and the program impacts on child achievement. None of the coefficients for the youngest children are negative (and in fact, coefficients in the generous earnings supplement programs all are positive in sign), while most of the point estimates for adolescents are negative. Many of these coefficients are estimated very imprecisely, particularly those in the non-income-boosting programs. All in all, the results suggest broadly similar age-related patterns of income impacts on child achievement across sites and provide a justification for pooling across studies for more efficient IV estimates.

First stage models. Table 5 shows the first-stage coefficients on the $Z_1,...,Z_8$ experimental group dummy variables in the average annual income, log income, average quarterly employment and average quarterly welfare receipt models. Estimated impacts on income, employment and welfare are virtually identical to those presented in Table 4, as might be expected since the two sets of estimating equations differ only in that the study-by-study estimates allow for study-specific coefficients on control variables, while the pooled model constrains control coefficients to be identical across studies and sites.

Second stage estimates. Table 6 presents the second stage IV estimates from models estimating the effects of annual income and log income with and without the inclusion of instrumented employment and welfare in the model. We also present estimates from comparable OLS models.

For the youngest but not older children, the OLS models show positive and statistically significant effects of income on child achievement. Coefficient estimates are small, however, with an additional $1,000 of family income associated with a .01 standard deviation increase in child achievement. IV estimates are also statistically significant and considerably larger – a .06 standard unit change in child achievement associated with every $1,000 increase in annual income. The size of this coefficient changes little when employment and welfare receipt are

[4] These and all other IV estimates in this paper are based on STATA's ivreg procedure, with a cluster adjustment to account for the fact that in some cases there are multiple achievement reports per child and multiple children per family.

considered to be endogenous variables in the system. A log unit increase in family income is estimated to increase achievement by .46 to .60 of a standard deviation, depending on whether the employment and welfare predictions are included.

The pattern of effects for the older age groups is much different than that found for the youngest children, with generally non-significant effects of income in the OLS and IV models, at least when employment and welfare receipt are considered alongside income. For the children who are 6-9 years at study entry, the effects of both annual income and log income are nonsignificant in both the OLS and IV models. Effects do not change when employment and welfare receipt are included in the model. In the case of children who are 10-15 at study entry, annual income is found to have a positive effect in the OLS model (when employment and welfare receipt are considered as well), but not in the corresponding IV model. In this case, welfare receipt is found to have a large, negative effect on child achievement. These results show a 1.5 standard-deviation change in child achievement associated with increasing by 1.0 the proportion of quarters when welfare was received.[5] Similar results emerge using the log transformation of income (with a log-unit increase in income associated with a 1.7 standard deviation reduction in child achievement), at least with regard to the IV model.

That greater predicted receipt of welfare income was associated with lower teen achievement is consistent with several nonexperimental studies (Gottschalk, 1992; Duncan & Yeung, 1995) and with theories suggesting that teens are more likely than younger children to model the behavior of their parents, and may be more negatively affected than their younger peers by the stigma associated with receiving welfare.

Robustness Tests

A series of tests were conducted to test the sensitivity of the model, and the robustness of our conclusions, to differing specifications. We first investigated whether results were sensitive to the parent vs. test score source of child achievement (there were too few programs that included data on teacher report to conduct our full analysis using only this outcome measure of child achievement). Second, we added in a set of random-assignment programs we had excluded at the outset that represented either 1) child care assistance programs (had policies intended to directly affect the type of child care parents could purchase for their children) or 2) education-first programs (had policies intended to increase parents' participation in educational activities as a means to encourage the transition from welfare into employment). The primary analyses reported above exclude these programs because they fail to meet the exclusion restriction in that they had direct targets beyond income, employment, and welfare receipt (there was insufficient data across studies and sample members to model child care use for all children and education activity participation for all parents).

The results from these robustness tests are presented in Table 7. For the 2-5 year olds, they show surprising consistency in results across specifications, especially for models that include income as the sole endogenous variable. The first two columns of Table 7 shows that parent reports of children's achievement produce an estimated IV model effect of a .06 standard deviation increase in achievement for every $1,000 annual income increase. This effect size is identical to that reported in Table 6. Similar effect sizes are estimated using the teacher report measure. In both cases, these coefficients are statistically significant. Estimates using log

[5] Note in Table 2 that a one-unit increase in the proportion of quarters when welfare was received amounts to a three standard deviation change.

income are also statistically significant and are .50 using test score data and .65 using parent report data. Adding welfare and employment as endogenous variables changes coefficient estimates somewhat but increases the standard errors considerably. There appears to be insufficient information to disentangle employment, welfare receipt and income effects when either parent-reported or test score data are considered separately (that is probably due to the reduced set of studies available for both of these sets of analyses).

Estimates in the final pair of columns are based on the larger set of programs for which data are available—welfare reform policy experiments in which the primary targets include welfare receipt, employment, and income, as well as educational activities participation and child care use for the children. These findings are also consistent with those presented in our primary analyses in Table 6. More specifically, single-variable income IV models find a .05 standard deviation change in achievement associated with a $1,000 increase in income, a .44 standard deviation change associated with a log-unit increase in income, for the 2-5 year old children. Here effects for annual income remain significant with the inclusion of welfare receipt and employment in the model, although effects for log income fall just short of statistical significance. (Findings for *only* those programs that included multiple components are considerably weaker than those reported here, with the single-variable income IV model with a coefficient of .014 for annual income (*se* = .010; *p*=.143) for the 2-5 year old children, and the model including employment and welfare receipt along with income with a coefficient of -.008 (*se* = .023; *p* =.736)).

Finally, we examined the sensitivity of the estimates to a reduced set of instruments that enable us to test a just-identified model (not shown in table). We group our programs into three categories: generous earnings supplement programs with no time limits or mandates; the single time limited welfare program (that also includes generous earnings supplements); and mandatory work-first programs. We use the experimental-control contrast in each of these categories as instruments in our first stage equations. Our single-variable income IV model finds almost identical results to those shown here, with significant and positive effects of income for younger children (with a coefficient of .06). Consistent, albeit weaker, results are found in the model including employment and welfare receipt along with income, with a coefficient of .04 (*se* = .04; *p* = .26) for the income effects on achievement for the younger children.

IV. Summary and Conclusion

We find noteworthy but decidedly selective effects of family income on school achievement. In particular, income effects are positive and significant for the youngest group of children in all of our instrumental-variable models. But for children in middle childhood and adolescence, we find no significant effects of income on child achievement. This pattern of effects across child age is consistent with some of the nonexperimental work in this area as well as developmental theories suggesting that children's development is most malleable and most susceptible to family influences during the preschool period.

Our IV estimates for preschool children suggest that a $1,000 increase in annual income sustained for between two and five years boosts child achievement by 6 percent of a standard deviation and that a log unit increase in annual income increases child achievement by about half a standard deviation. Translated into an IQ-type scale, 6% of a standard deviation amounts to about one point, half a standard deviation amounts to 8 points. Translated into an SAT-type scale

these effect sizes are 6 and 50 points. Translated into one of the achievement tests we use -- the Bracken Test of School Readiness -- these effect sizes translate into almost one and six additional correct answers to a 61-question test regarding colors, letters, numbers/counting, comparisons and shapes. The earnings supplement programs in our study boosted family income for younger children by between $800 and nearly $2,200 per year, which corresponds to achievement effect sizes ranging from 5 to 12 percent of a standard deviation.

How to put our effect sizes into a policy perspective? Experimental studies of early preschool intervention programs offering very high levels of quality provide one point of reference. Treatment effect sizes on IQ were 1.0 standard deviations at 3 years and .75 at age 5 for the Abecedarian Project, and .60 for the Perry Preschool Project. But at $40,000 and $15,000, respectively, these large effect sizes came at great cost. For $7,500, the Tennessee class size experiment showed that smaller K-3 class sizes increased achievement by about .2 of a standard deviation (Krueger & Whitmore, 2001).

By comparing income supplementation and early-education policy effect sizes, we do not mean to imply that the two kinds of programs serve the same purpose. Child development is the explicit target of educational interventions, but only one of many possible goals for income redistribution policies. Ensuring school readiness for all children probably requires that some receive preschool education intervention programs, independent of whatever income redistribution program might be present. But our results suggest that child impacts should figure into the cost/benefit calculus of income transfer programs.

The fact that the achievement of preschool but not school-aged children appears to be affected by family income has interesting implications for income support policies. Perhaps child tax credits or child allowances should be geared to the age of children, with larger credits for the youngest children, if improving child achievement is a goal of policymakers (Duncan & Magnuson 2003). France's Allocation de Parent Isolé (API) has this feature, with generous income supplement extended only to single-parent families with children under the age of three.

The usual caveats apply to our study. Our data are drawn from children growing up in single-parent low-income families, precluding our ability to generalize to other family types and socioeconomic levels. In pooling our data across sites, we assume similarity in the ways in which income affects children across our studies and sites, although the patterns of site-specific effects for income-enhancing programs appear to be consistent with results from the pooled sample. Finally, by using earnings supplement programs to generate our effects of income on child achievement, our findings are likely most germane to income-boosting policies that link increases in income to increases in employment. While we control for employment participation in all of these models, there may be emotional benefits to increases in earned but not other sources of income. To the extent that these psychological benefits are part of our income effects, our results are most relevant to income increases arising from earnings supplements as opposed to policies providing cash grants not tied to work (like child allowances).

That said, we end by emphasizing the size of our elasticity estimates. In terms of our sample's $10,000 average income, our income elasticity estimates for young children are about .6. This elasticity estimate, and the statistically insignificant estimate for older children, can be compared with the .04 to .20 range in income elasticities cited in the Haveman and Wolfe (1995) literature review. But none of their reviewed studies distinguished children by age, and few allowed for income elasticities to differ between low and higher-income families. Distinguishing

income effects among children of different ages, and basing them on exogenous sources of income variability, produces impact estimates that are highly relevant for policy.

REFERENCES

Angrist, J. D., Imbens, G. W., & Rubin, D. B. (1996). Identification of causal effects using Instrumental Variables. *Journal of the American Statistical Association, 91*, 444-455.

Becker, G. S. (1981). *A treatise on the family*. Cambridge MA: Harvard University Press.

Bergstrom, T. (1997). A survey of theories of the family. In *handbook of family and household economics*. Ann Arbor, MI: University of Michigan.

Blau, D. M. (1999). The effect of income on child development. *The Review of Economics and Statistics, 8,* 261-276.

Bloom, D., Scrivener, S., Michalopoulos, C., Morris, P., Hendra, R,. Adams-Ciardullo, D., & Walter, J. (2002). *Jobs First: Final report on Connecticut's welfare reform initiative*. New York: MDRC.

Bradley, R. H., & Corwyn, R. (2002). Socioeconomic status and child development. *Annual Review of Psychology, 53*, 371-399.

Bronfenbrenner, U., & Morris, P. (1998). The ecology of developmental processes. In R. M. Lerner (Ed.), *Theoretical Models of Human Development.* Vol. 1 of the *Handbook of Child Psychology (5th ed.)* (pp. 993-1028). Editor-in-chief: William Damon. New York: Wiley.

Chase-Lansdale, L., & Pittman, L. (2002). Welfare reform and parenting: Reasonable expectations. *Future of Children, 12*, 1867-186.

Coleman, J.S. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*, S95-S120.

Duncan, G. & Brooks-Gunn, J. Eds. (1997). *Consequences of growing up poor.* New York: Russell Sage.

Duncan, G. , & Yeung, J. (1995). Extent and Consequences of Welfare Dependence Among America's Children. *Children and Youth Services Review*, 17 (1/2), 1-26.

Duncan, G., & Magnuson, K. (2003). Promoting the healthy development of young children. In I. Sawhill (Ed.), *One Percent for Kids* (pp. 16-39), Washington, D.C.: Brookings Institution.

Duncan, G., Brooks-Gunn, J., Yeung, J., & Smith, J. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*, 406-423.

Duyme, M., Dumaret, A. C., & Tomkiewicz, S. (1999). How can we boost IQs of "dull children"? A late adoption study. *Proceedings of the National Academy of Sciences*, 96, 8790-8794.

Freedman, S., Knab, J., Gennetian, L.A., & Navarro, D. (2000). *The Los Angeles Jobs-First GAIN Evaluation: Final report on a work first program in a major urban center*. New York: MDRC.

Gennetian, L., Duncan, G., Knox, V. W., Vargas, W., Clark-Kauffman, E., & London, A. S. (2002). *How welfare and work policies for parents affect adolescents.* New York: Manpower Demonstration Research Corporation.

Gottschalk, P. (1992) "The intergenerational transmission of welfare participation: Facts and causes." *Journal of Policy Analysis and Management 11*, 254-272.

Gresham, F., & Elliott, S. (1990). *Social skills rating system*. Circle Pines, MN: American Guidance Service.

Hamilton, G., Freedman, S., Gennetian, L.A., Michalopoulos, C., Walter, J., Adams-Ciardullo, D., Gassman-Pines, A., McGroder, S., Zaslow, M., Brooks, J., & Ahluwalia, S. (2001). *How effective are different welfare-to-work approaches? Five-year adult and child impacts for eleven programs*. Washington, DC: U.S. Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation and Administration for Children and Families, and U.S. Department of Education.

Haveman, R., & Wolfe, B. (1995). The determinants of children's attainments: A review of methods and findings. *Journal of Economic Literature, 23*, 1829-1878.

Institute for Research on Poverty (1976). *The rural income maintenance experiment.* Madison WI: University of Wisconsin, Author.

Kershaw, D. & Fair, J. (1976). *The New Jersey Income Maintenance Experiment.* New York: Academic Press.

Klerman, L. (1991). "The Health of Poor Children: Problems and Programs." In A. Huston (Ed.), *Children and poverty*. Cambridge, Eng., and New York: Cambridge University Press.

Korenman, S., & Miller, J.E. (1997). Effects of long-term poverty on physical health of children in the National Longitudinal Survey of Youth. In G. J. Duncan & J. Brooks-Gunn (Eds.), *Consequences of growing up poor* (pp. 70–99). New York: Russell Sage Foundation.

Krueger, A., & Whitmore, D. (2001). The Effect of Attending a Small Class in the Early Grades on College-Test Taking and Middle School Test Results: Evidence from Project STAR, *Economic Journal, 11*, 1-28.

Mayer, S. (1997). *What money can't buy: The effect of parental income on children's outcomes*. Cambridge, MA: Harvard University Press.

McCall, R. B. (1981). Nature-nurture and the two realms of development: A proposed integration with respect to mental development. *Child Development, 52*, 1-12.

McGroder, S. M., Zaslow, M. J., Moore, K. A., & LeMenestrel, S. M. (2000). *National evaluation of welfare-to-work strategies impacts on young children and their families two years after enrollment: Findings from the child outcomes study.* Washington, CD: United States Department of Health and Human Services Office of the Assistant Secretary for Planning and Evaluation Administration for Children and Families.

McLoyd, V. C. (1990). The impact of economic hardship on black families and children: psychological distress, parenting and socioemotional development. *Child Development, 61,* 311-346.

McLoyd, V. C. (1997). The impact of poverty and low socioeconomic status on the socioemotional functioning of African American children and adolescents: Mediating affects. In R. D. Taylor & M. C. Wang (Eds.), *Social and emotional adjustment and family relations in ethnic minority families.* (pp. 7-34). Mahwah, NJ: Lawrence Erlbaum.

McLoyd, V. C. (1998). Children in poverty, development, public policy, and practice. In I. E. Siegel & K. A. Renninger (Eds.), *Handbook of child psychology* (4th ed.), New York: Wiley.

McLoyd, V. C., Jayartne, T. E., Ceballo, R., & Borquez, J. (1994). Unemployment and work interruption among African-American single mothers, effects on parenting and adolescent socioemotional functioning. Child Development, 65, 562–589

Michalopoulos, C., Tattrie, D., Miller, C., Robins, P. K., Morris, P., Gyarmati, D., Redcross, C., Foley, K., Ford, R. (2002). *Making work pay: Final report on the Self Sufficiency Project for long-term welfare recipients.* Ottawa: SRDC.

Morris, P. A., Huston, A. C., Duncan, G. J., Crosby, D. A., & Bos, J. M. (2001). *How welfare and work policies affect children: A synthesis of research*. New York: MDRC.

Morris, P., & Michalopoulos, C. (2000). *The Self Sufficiency Project at 36 Months: Effects on Children of a Program that Increased Employment and Income*. Ottawa: SRDC.

Morris, P., & Michalopoulos, C. (2003). Findings from the Self Sufficiency Project: Effects on children and adolescents of a program that increased employment and income. *Applied Developmental Psychology, 24,* 201-239.

Morris, P., Duncan, G. J., & Clark-Kauffman, E. (2003). Child well-being in an era of welfare reform: The sensitivity of transitions in development to policy change. Unpublished manuscript, MDRC.

Quets, G., Robins, P., Pan, E., Michalopoulos, C., Card, D. (1999). *Does SSP Plus increase employment? The effect of adding services to the Self Sufficiency Project's Financial Incentives.* Ottawa: SRDC.

Rowe, D. C. & Rodgers, J. L. (1997). Poverty and behavior: Are environmental measures nature and nurture? *Developmental Review*, 17,358-375.

Salkind, N. J., & Haskins, R. (1982). Negative income tax: The impact on children from low-income families. *Journal of Family Issues*, 3, 165-180.

Shea, J. (2000) Does parents' money matter? *Journal of Public Economics*, 77, 2, 155-184.

Shonkoff, J. P. & Phillips, D. A. (Eds.)(2000). *From neurons to neighborhoods: The science of early childhood development*. Washington, DC: National Academy Press.

U.S. Department of Health and Human Services, Office of Income Security Policy (1983). *Overview of the Seattle-Denver Income Maintenance Experiment Final Report*. Washington, D.C.: U.S. Government Printing Office.

Table 1: Sample Sizes by Child's Age at Baseline and by Study and Site

	2-5 Year Olds	6-9 Year Olds	10-15 Year Olds
Connecticut's Jobs-First	1,521	1,397	832
Self-Sufficiency Project (SSP)			
New Brunswick - SSP	1,844	970	525
New Brunswick - SSP Plus	471	202	116
British Columbia - SSP	2,131	1,052	702
Los Angeles Jobs-First GAIN	169	422	439
National Evaluation of Welfare-to-Work Strategies (NEWWS)			
Atlanta	2,324	0	0
Grand Rapids	1,458	0	0
Riverside	1,896	0	0
Total	11,814	4,043	2,614

Table 2: Means and Standard Deviations (in parentheses for continuous measures only) of Baseline Sample Characteristics and Other Measures

	2-5 Year Olds		6-9 Year Olds		10-15 Year Olds	
Outcome Measures						
Child achievement scores	.02	(.99)	.07	(.98)	-.23	(1.01)
Endogenous Measures						
Average yearly income ($)	10,902	(5,214)	11,999	(5,935)	12,316	(6,400)
Log yearly income	9.17	(.61)	9.27	(.61)	9.28	(.64)
Average quarterly employment rate	41.36	(36.23)	43.65	(39.02)	43.56	(40.09)
Average quarterly welfare rate	71.23	(32.96)	74.69	(32.40)	75.32	(32.28)
Parent Characteristics						
Under age 18 at time of child's birth	9.1		8.0		10.3	
Race						
Black	33.4		19.4		20.5	
White	47.6		56.2		50.2	
Latino	10.9		14.9		18.4	
Other	8.2		9.6		10.9	
Marital Status						
Never married	61.6		48.4		39.7	
Separated/divorced	36.2		49.2		57.7	
Married	1.6		1.9		2.2	
Parent Education, Employment, and Income						
High school graduate	55.4		50.6		49.1	
Employed in year prior to random assignment	35.6		37.2		36.8	
Earnings in year prior to random assignment ($)	1,596	(4,012)	1,892	(4,470)	2,159	(5,273)
AFDC receipt prior to random assignment						
None	1.4		3.6		4.1	
1 month to 2 years	22.2		14.0		16.1	
More than 2 years	76.4		82.5		79.7	
Family Composition						
Age of youngest child in family (in years)	3.19	(1.35)	5.61	(2.52)	8.21	(3.64)
Number of children in family	2.10	(1.07)	2.43	(1.14)	2.55	(1.22)
Achievement Report Source						
Parent	36.23		70.10		79.99	
Teacher	10.22		4.65		.00	
Test	53.56		25.25		20.01	
Follow-up Length						
Length of follow-up (in years)	3.77	(1.19)	3.05	(.51)	2.94	(.53)
Sample sizes	11,814		4,043		2,614	

Table 3: Baseline Characteristics by Experimental Group Status and by Study and Site

	CT Job First		LA-GAIN		SSP British Columbia		SSP Plus New Brunswick		SSP New Brunswick		NEWWS Atlanta		NEWWS Grand Rapids		NEWWS Riverside	
	Control	Exp	Control	Exp	Control	Exp	Control	Exp	Control	Exp	Control	Exp	Control	Exp	Control	Exp
Parent Characteristics (%)																
Under age 18 at time of child's birth	11.89	12.67	10.33	9.07	5.43	4.94	11.02	10.55	10.03	11.00	7.02	3.82 **	15.62	13.74	7.42	5.80
Race																
Black	45.26	42.66	28.87	34.71	2.90	1.19 ***	1.88	2.64	0.55	1.23	95.92	95.18	39.18	42.03	19.88	15.75
White	29.41	35.11 **	11.28	12.62	66.47	66.50	88.71	89.93	87.65	89.27	3.27	3.46	50.82	48.90	43.08	43.28
Latino	24.94	21.66	58.13	49.11 *	3.06	3.75	1.08	0.00 ***	0.55	0.21	0.41	0.91	7.26	6.87	34.65	38.31
Other	0.39	0.57	1.72	3.55 *	27.62	28.85	8.60	7.43	11.46	9.56	0.41	0.45	2.74	2.20	2.40	2.65
Marital status																
Never married	66.30	64.32	40.54	46.55	42.45	39.82	61.29	56.59	56.96	57.55	71.43	76.34 *	59.04	60.85	42.38	42.95
Separated/divorced	32.65	34.59	49.33	47.73	54.76	57.61	36.83	42.21	40.59	40.04	27.18	23.11	38.77	34.89	55.53	54.89
Married	0.77	0.62	9.37	4.93 *	1.50	1.68	1.61	0.96	1.91	0.69 **	1.39	0.55	2.19	4.26	2.09	2.16
Parent Education, Employment, and Income																
High school graduate(%)	61.78	60.34	34.03	41.62 *	43.58	50.10 **	51.88	53.72	47.68	47.62	65.63	61.87	58.22	61.81	50.81	57.55 *
Employment in year prior to random assignment																
Employed (%)	51.21	45.14 **	34.42	37.87	25.26	26.04	31.72	32.13	30.22	31.66	37.47	33.30	60.96	51.65 **	31.01	27.20
Earnings ($)	3,203	2,604 *	1,882	2,690 *	1,232	1,207	842	823	1,213	1,033	1,324	1,116	2,728	2,113 *	1,876	1,723
AFDC receipt prior to random assignment	2.72	2.69	2.56	2.61	2.75	2.78	2.87	2.87	2.89	2.88	2.76	2.78	2.74	2.76	2.67	2.67
Family Composition																
Youngest child age (yrs)	4.89	5.05	6.46	6.45	4.49	4.67	4.46	4.5731	4.35	4.70 **	3.79	3.82	3.04	2.97	3.56	3.49
Number of children	2.59	2.66	2.82	2.64	2.06	2.14	1.89	1.9113	2.05	1.91 **	2.20	2.26	2.12	2.12	2.14	2.32 **
Sample size	1,816	1,934	523	507	1,861	2,024	372	417	1,466	1,873	1,225	1,099	730	728	1,293	603

NOTES: Exp = Experimental group

Two-tailed t-tests were applied to differences between the experimental and control groups.

*p < .10 **p < .05 ***p < .01.

Table 4: Individual Study Impacts on Employment, Welfare Receipt, Income, and Child Achievement

	Dependent Variables										IV Model Results	
	Average Quarterly Employment		Average Quarterly Welfare		Average Annual Income (in $1,000s)		Log Average Annual Income		Child Achievement		Effects of Income on Child Achievement	
Child Age 2 - 5												
Earning Supplement Programs												
Self Sufficiency Project												
British Columbia (n=2,131)	.076	(.019) ***	-.056	(.016) ***	1.62	(.27) ***	.147	(.025) ***	.113	(.047) **	.069	(.033) **
New Brunswick (n=1,844)	.134	(.019) ***	-.142	(.019) ***	1.91	(.22) ***	.192	(.028) ***	.124	(.049) **	.065	(.030) **
SSP-Plus-New Brunswick (n=471)	.113	(.040) ***	-.167	(.035) ***	2.20	(.37) ***	.236	(.058) ***	.055	(.100)	.025	(.052)
Connecticut's Jobs First (n=1,521)	.053	(.021) **	.038	(.020) *	.81	(.36) **	.074	(.041) *	.033	(.054)	.041	(.070)
Work First Programs												
NEWWS LFA program												
Atlanta (n=2,324)	.047	(.019) **	-.022	(.018)	.34	(.24)	.046	(.025) *	.067	(.052)	.198	(.227)
Grand Rapids (n=1,458)	.104	(.022) ***	-.074	(.023) ***	.07	(.38)	-.045	(.051)	.035	(.062)	.484	(3.136)
Riverside (n=1,896)	.120	(.023) ***	-.078	(.024) ***	.10	(.43)	-.039	(.064)	.010	(.061)	.094	(.799)
Los Angeles Jobs-First GAIN (n=169)	-.004	(.062)	.009	(.045)	-1.05	(.88)	-.112	(.096)	.000	(.157)	.000	(.150)
Child Age 6 - 9												
Earning Supplement Programs												
Self Sufficiency Project												
British Columbia (n=1,052)	.028	(.032)	-.043	(.024) *	1.70	(.43) ***	.122	(.034) ***	.011	(.074)	.007	(.044)
New Brunswick (n=970)	.170	(.030) ***	-.147	(.030) ***	2.12	(.32) ***	.228	(.049) ***	.011	(.071)	.005	(.034)
SSP Plus-New Brunswick (n=202)	.144	(.066) **	-.203	(.059) ***	1.63	(.69) **	.138	(.085)	.002	(.144)	.001	(.088)
Connecticut's Jobs First (n=1,397)	.120	(.023) ***	.015	(.031) ***	1.73	(.37) ***	.121	(.042) ***	.023	(.060)	.013	(.035)
Work First Programs												
Los Angeles Jobs-First GAIN (n=422)	.067	(.042)	-.082	(.028) ***	-.51	(.59)	-.147	(.092)	.064	(.102)	-.127	(.256)
Child Age 10 - 15												
Earning Supplement Programs												
Self Sufficiency Project												
British Columbia (n=702)	.085	(.033) **	-.037	(.026)	1.37	(.49) ***	.130	(.046) ***	-.082	(.081)	-.060	(.064)
New Brunswick (n=525)	.171	(.034) ***	-.147	(.040) ***	1.67	(.40) ***	.176	(.070) **	.107	(.095)	.064	(.059)
SSP Plus-New Brunswick (n=116)	.265	(.071) ***	-.265	(.072) ***	2.31	(.59) ***	.209	(.053) ***	-.151	(.161)	-.066	(.071)
Connecticut's Jobs First (n=832)	.123	(.028) ***	.023	(.025)	2.08	(.47) ***	.178	(.056) ***	-.240	(.078) ***	-.115	(.046) **
Work First Programs												
Los Angeles Jobs-First GAIN (n=439)	.168	(.047) ***	-.014	(.031)	.45	(.60)	-.020	(.067)	-.056	(.101)	-.125	(.281)

NOTES: Standard errors in parentheses.

Separate regression equations are conducted for each study impact.

The regressions also include the following covariates measured at baseline: earnings in the prior year, earnings in the prior year squared, amount of time mother was on welfare, employed in prior year, mother had no high school degree or equivalent, mother's marital status, number of children in the family, age of youngest child, mother's race/ethnicity; elapsed time between study entry and follow-up (when applicable), type of achievement report (e.g. parent or test/teacher), and whether the child's parents age was less than 18 at the time of their birth.

*p < .10 **p < .05 ***p < .01 (two-tailed).

Table 5: 1st Stage Instrumental Variables Model Results

	Dependent Variables			
	Average Quarterly Employment Over Study Follow-Up	Average Quarterly Welfare Over Study Follow-Up	Average Annual Income Over Study Follow-Up (in $1,000s)	Log Average Annual Income Over Study Follow-Up
Child Age 2 - 5				
Earning Supplement Programs				
In SSP program- British Columbia	.081 (.013) ***	-.054 (.013) ***	1.59 (.20) ***	.144 (.025) ***
In SSP program- New Brunswick	.119 (.014) ***	-.146 (.013) ***	2.02 (.20) ***	.198 (.025) ***
In SSP Plus program- New Brunswick	.179 (.022) ***	-.161 (.022) ***	2.46 (.33) ***	.267 (.041) ***
In Connecticut's Jobs First program group	.057 (.016) ***	.034 (.015) **	.75 (.24) ***	.066 (.029) **
Work First Programs				
In NEWWS LFA program- Atlanta	.044 (.013) ***	-.019 (.012)	.33 (.19) *	.043 (.024) *
In NEWWS LFA program- Grand Rapids	.110 (.016) ***	-.078 (.016) ***	.16 (.24)	-.037 (.030)
In NEWWS LFA program- Riverside	.123 (.015) ***	-.074 (.015) ***	.21 (.23)	-.029 (.028)
In LA Jobs-First GAIN program	-.005 (.048)	-.002 (.046)	-.85 (.71)	-.109 (.088)
F (instruments)	34.67 ***	27.11 ***	25.09 ***	15.80 ***
Model R-Squared	.267	.179	.22	.121
Model F	142.68 ***	85.64 ***	113.63 ***	54.19 ***
Child Age 6 - 9				
Earning Supplement Programs				
In SSP program- British Columbia	.034 (.020) *	-.042 (.018) **	1.73 (.31) ***	.119 (.034) ***
In SSP program- New Brunswick	.163 (.020) ***	-.155 (.018) ***	1.99 (.31) ***	.197 (.034) ***
In SSP Plus program- New Brunswick	.214 (.033) ***	-.187 (.030) ***	3.05 (.51) ***	.326 (.057) ***
In Connecticut's Jobs First program group	.121 (.017) ***	.013 (.016)	1.73 (.27) ***	.118 (.030) ***
Work First Programs				
In LA Jobs-First GAIN program	.057 (.032) *	-.080 (.028) ***	-.35 (.49)	-.154 (.054) ***
F (instruments)	27.56 ***	21.08 ***	26.41 ***	17.44 ***
Model R-Squared	.313	.211	.30	.176
Model F	76.25 ***	44.77 ***	70.65 ***	35.75 ***
Child Age 10 - 15				
Earning Supplement Programs				
In SSP program- British Columbia	.072 (.026) ***	-.022 (.022)	1.40 (.37) ***	.152 (.044) ***
In SSP program- New Brunswick	.143 (.028) ***	-.150 (.024) ***	1.44 (.41) ***	.129 (.049) ***
In SSP Plus program- New Brunswick	.308 (.047) ***	-.232 (.040) ***	3.46 (.68) ***	.389 (.081) ***
In Connecticut's Jobs First program group	.131 (.024) ***	.017 (.020)	2.05 (.34) ***	.166 (.041) ***
Work First Programs				
In LA Jobs-First GAIN program	.163 (.032) ***	-.019 (.028)	.29 (.47)	-.047 (.056)
F (instruments)	23.28 ***	11.13 ***	15.88 ***	10.61 ***
Model R-Squared	.305	.208	.42	.177
Model F	49.35 ***	29.52 ***	80.78 ***	24.27 ***

NOTES: Standard errors in parentheses.

The regressions also include the following covariates measured at baseline: earnings in the prior year, earnings in the prior year squared, amount of time mother was on welfare, employed in prior year, mother had no high school degree or equivalent, mother's marital status, number of children in the family, age of youngest child, mother's race/ethnicity; also included were the following additional covariates: study/site dummies, elapsed time between study entry and follow-up, type of achievement report (e.g. parent or test/teacher), and whether the child's parents age was less than 18 at the time of their birth.

*p < .10 **p < .05***p < .01 (two-tailed).

Table 6: OLS and Second-stage IV estimates of the effects of Endogenous Variables on Child Achievement

	2-5 Year Olds				6-9 Year Olds				10-15 Year Olds			
	Average Annual Income (1,000s)		Log Average Annual Income		Average Annual Income (1,000s)		Log Average Annual Income		Average Annual Income (1,000s)		Log Average Annual Income	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Model 1												
Income	.008 ***	.063 ***	.046 **	.603 ***	.002	-.001	.013	-.074	.004	-.043 *	.015	-.345
	(.002)	(.017)	(.020)	(.177)	(.004)	(.019)	(.031)	(.214)	(.004)	(.024)	(.038)	(.241)
Model 2												
Income	.006 **	.061 *	.046 *	.463 *	.003	.005	.046	-.195	.009 *	-.078	.045	-.476
	(.003)	(.033)	(.025)	(.269)	(.005)	(.048)	(.041)	(.392)	(.005)	(.069)	(.050)	(.537)
Average Quarterly Employment Rate	.053	-.012	.054	.204	-.038	-.089	-.060	.188	-.127	-.073	-.090	-.545
	(.047)	(.536)	(.048)	(.506)	(.072)	(.819)	(.073)	(.617)	(.084)	(.933)	(.085)	(.692)
Average Quarterly Welfare	-.098 **	-.035	-.119 ***	-.064	-.119 *	.008	-.148 **	-.007	-.026	-1.488 *	-.037	-1.684 **
	(.041)	(.592)	(.045)	(.595)	(.065)	(.563)	(.072)	(.563)	(.080)	(.800)	(.088)	(.841)

NOTES: Standard errors in parentheses.
The regressions also include the following covariates measured at baseline: earnings in the prior year, earnings in the prior year squared, amount of time mother was on welfare, employed in prior year, mother had no high school degree or equivalent, mother's marital status, number of children in the family, age of youngest child, mother's race/ethnicity; also included were the following additional covariates: study/site dummies, elapsed time between study entry and follow-up, type of achievement report (e.g. parent or test/teacher), and whether the child's parents age was less than 18 at the time of their birth.
*p < .10. **p < .05. ***p < .01 (two-tailed).

Table 7: IV Results of the Effects of Income on Child Achievement using Alternative Model Specifications

	By Outcome Measure				Adding Studies with Other Components[c]	
	Parent Report[a]		Test Score[b]			
	Average Annual Income (1,000s)	Log Average Annual Income	Average Annual Income (1,000s)	Log Average Annual Income	Average Annual Income (1,000s)	Log Average Annual Income
			2-5 Year Olds			
Model 1						
Income Only	.064 ***	.648 ***	.058 ***	.498 **	.052 ***	.439 ***
	(.022)	(.235)	(.022)	(.225)	(.015)	(.147)
Model 2						
Income controlling for Employment & Welfare	.100	.734	.040	.278	.043 *	.293
	(.121)	(1.253)	(.043)	(.324)	(.026)	(.210)
Sample size	*4,280*	*4,280*	*6,327*	*6,327*	*18,667*	*18,667*
			6-9 Year Olds			
Model 1						
Income Only	-.003	-.084	-	-	.008	.052
	(.022)	(.248)			(.017)	(.179)
Model 2						
Income controlling for Employment & Welfare	-.037	-.319	-	-	.006	-.105
	(.057)	(.427)			(.040)	(.370)
Sample size	*2,834*	*2,834*			*7,194*	*7,194*
			10-15 Year Olds			
Model 1						
Income Only	-.053 *	-.436	-	-	.000	-.133
	(.028)	(.288)			(.003)	(.211)
Model 2						
Income controlling for Employment & Welfare	-.097	-.717	-	-	-.016	.236
	(.079)	(.682)			(.050)	(.342)
Sample size	*2,091*	*2,091*			*4,449*	*4,449*

NOTES: Standard errors in parentheses.

The regressions include covariates measured at baseline as in analyses presented in Table 6.

[a]Analyses include: Connecticut, LA-GAIN, SSP, and SSP Plus programs.

[b] Analyses include: NEWWS , SSP , and SSP Plus programs. Insufficient programs were available to conduct analyses for children 6-15 at baseline.

[c] Analyses include: Connecticut, FTP, LA-GAIN, MFIP, New Hope, NEWWS, SSP, and SSP Plus programs.

*p < .10 **p < .05 ***p < .01 (two-tailed).