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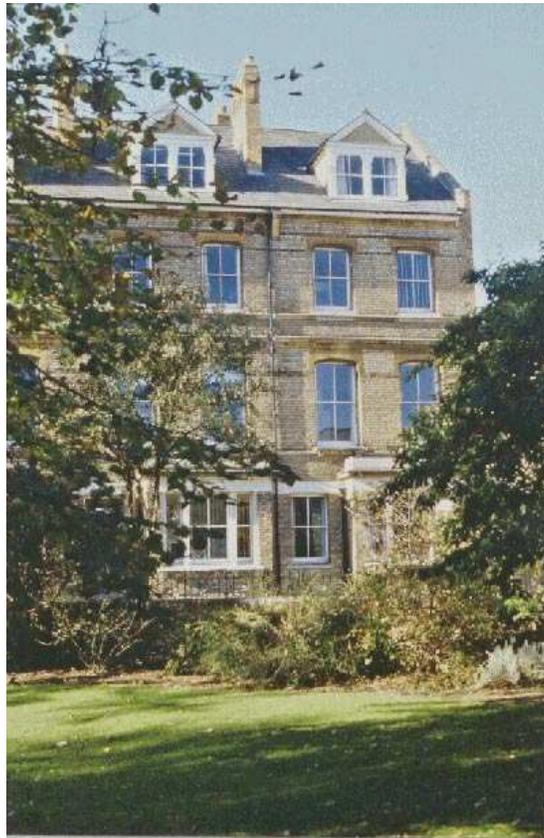


**BARNETT PAPERS IN
SOCIAL RESEARCH**

Greg J. Duncan

Early Childhood Poverty and Later Attainment

1/2009



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This Barnett Paper is the revised manuscript of the 2008/2009 Sidney Ball Lecture, which was given by Professor Greg Duncan (University of California, Irvine) on Thursday, 26 February 2009 at 5 p.m. in the Nissan Lecture Theatre, St. Antony's College.

The Sidney Ball Memorial Lectures were established after the First World War in memory of Sidney Ball who was a philosophy fellow at St John's College, Oxford. Sidney Ball was both a political radical and 'an energetic university reformer' concerned that contemporary social and economic problems should be studied at Oxford. He was the first President of Barnett House at its foundation in 1914.

The memorial lectures were to address 'modern social, economic or political questions' and were given annually until the 1940s, and then intermittently in the post war period. They were given by some very distinguished speakers, including GM Trevelyan (1923), JM Keynes (1924), Mrs Webb (1927), AC Pigou (1929), William Beveridge (1930 & 1940), RH Tawney (1934) and many others.

The annual series was revived in 2006/2007 with the first lecture given by Professor Neil Gilbert (Chernin Professor of Social Welfare, University of California, Berkeley). The title of the lecture was [*The Opt Out Revolution: Motherhood and Social Policy.*](#) Professor Paul Pierson, also from the University of California, Berkeley, gave the 2007/2008 lecture on '*Winner-Take-All Politics: Policy and Inequality in the New American Political Economy*'.

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Abstract:

Most poor children achieve less, exhibit more problem behaviors and are less healthy than children reared in more affluent families. I look beyond correlations such as these to a recent set of studies that attempt to assess the causal impact of childhood poverty on later attainment. I pay particular attention to the potentially harmful effects of poverty early in childhood, and to links between early poverty and such adult outcomes as earnings, work hours, criminal arrests and health status. Evidence suggests that early poverty has substantial detrimental effects on a number of adult earnings and work hours but on neither general health nor such behavioral outcomes as out-of-wedlock childbearing and arrests.

Introduction

If we define poverty as an income of less than half of the national median, some 1.4 of Great Britain's 12.6 million children lived in poverty in 2006 (Department for Work and Pensions, 2008). If housing costs are deducted from the income measure, this poverty count increases to 2.5 million.¹ For a single mother with two children, this meant that total income was less than £226; many poor families had income well below that amount.

It is likely that children growing up in poverty have unhappier childhoods than more affluent children. Today, however, I shall focus on a different question: What is the *causal role* of low income in childhood, particularly early childhood, for educational and occupational success later in life? In terms of public policy, the question is this: How might the adult attainment of children be affected by a policy that provided the families of poor children with more income, but did not directly change any other characteristic of their parents or family environments?

I shall begin with a brief discussion of the definition of poverty and a review of the conceptual and empirical literatures on poverty impacts. This will be followed by a summary of emerging research based on newly available data that link poverty measured as early as the prenatal year to adult outcomes measured in the middle of the fourth decade of life.

The Definition of Poverty

Social scientists disagree on how poverty should be defined and measured. Townsend (1992, p. 10) described poverty as income insufficient to enable individuals to "play the roles, participate in the relationships, and follow the customary behavior which is expected of them by virtue of their membership of society" and directed his research toward determining income levels that correspond to low scores on a "deprivation index". Other researchers (e.g., Mack and Lansley, 1985) have defined poverty directly in terms of deprivation indicators such as lack of access to a telephone and appliances, or wearing used rather than new clothing, without regard to income.

The official U.S. definition of poverty is based on a comparison of a household's total household income with a threshold level of income that varies with family size and inflation. The U.K. and most cross-national work (e.g., Gottschalk and Smeeding, 1997) also base their poverty definitions on insufficient family income, but typically define poverty thresholds as some fraction (e.g., 40%, 50% or 60%) of a country's median income. An income-based poverty definition finesses the difficult task of developing a definitive list of deprivation indicators. Pegging a poverty threshold to national median income automatically adjusts it to keep pace with changes in the general living standards of the population. However, one of the disadvantages of this approach is that it assumes that family income is spent efficiently and shared across family members. Despite these limitations, I will adopt an income-based definition of poverty and vary the poverty threshold to suit the country from which my data are drawn.

Child Poverty in the U.K. and Beyond

How does poverty among young British children compare with child poverty in other countries? Comparative data collected around the year 2000 were recently compiled by Gornick and Jantti (2009) and appear in Figure 1. If the poverty line is drawn at 40% of a given country's disposable income and the population is defined to include children under the age of 6, it is clear that young children in the U.K. compare very favorably to their counterparts in the United States and Poland, are roughly on par with Canadian and German children, and are poorer than Scandinavian children.

But where one draws the line matters a great deal. Moving the line up to 50% of median disposable income pushes the U.K. poverty rate to over 20%, second highest among the countries displayed in Figure 1. Many young children in the U.K. are close to, but not below, the 40%-of-median poverty line.

Why Poverty May Hinder Development

What are the consequences of growing up in a poor household? Duncan and Brooks-Gunn (1997) have taken the broadest look at the possible longer-run consequences of childhood poverty. Twelve groups of researchers working with 10 different non-experimental but longitudinal data sets estimated longitudinal models of childhood income effects on later attainment, behavior, and health. On the whole, the results suggest that family income has substantial, albeit selective associations with children's subsequent attainments. First, family income had consistently larger associations with measures of children's cognitive ability and achievement than with measures of behavior, mental health and physical health. Second, family economic conditions in early childhood appeared to be more important for shaping ability and achievement than did such conditions during adolescence. And third, the association between income and achievement appeared to be non-linear, with the largest impacts at the lowest levels of income.

Ermisch and his coauthors (2001) found that British children who had spent their adolescent years in a poor household: left home earlier than their peers; were less likely to achieve A-level or higher qualifications (males only); were more likely to be economically inactive as young adults; and, in the case of females, were more likely to bear children at a young age. There are no British studies linking early childhood poverty to adult outcomes.

What is it about poverty that might produce these associations?

Economists, developmental psychologists and neuroscientists emphasize different pathways by which poverty might compromise children's development. Economic models of child development (e.g., Becker, 1981) focus on what money can buy. They view families with greater economic resources as being better able to purchase or produce important "inputs" into their young children's development (e.g., nutritious meals; enriched home learning environments and childcare settings outside the home; safe and stimulating neighbourhood environments), and, with older children, higher-quality schools and university education. The degree to which these inputs are purchased is presumed to vary with their cost, the family's household income, and parents' preferences for purchases that meet their own versus their children's needs. The efficiency with which parents and children are able to translate inputs into positive

developmental outcomes is presumed to vary with both the innate and the acquired abilities of parents, for example through their formal schooling (Michael, 1972).

Psychologists point out that higher incomes may improve family psychological processes such as parental emotional well-being and childrearing skills (Chase-Lansdale and Pittman, 2002; McLoyd, 1990; McLoyd, Jayartne, Ceballo and Borquez, 1994). A long line of research (reviewed in McLoyd, 1990) has found that low-income parents, as compared with middle-class parents, are more likely to use an authoritarian and punitive parenting style and less likely to provide their children with stimulating learning experiences in the home. Poverty and economic insecurity take a toll on a parent's mental health, which may be an important cause of low-income parents' non-supportive parenting. As described by Zahn-Waxler, Duggal, and Gruber (2002), depression and other forms of psychological distress can profoundly affect parents' interactions with their children.

Why Early Poverty May Matter the Most

A major theme of my talk today is that the *timing* of child poverty may matter a great deal and that poverty *early* in a child's life may be particularly harmful. As mentioned above, Duncan and Brooks-Gunn (1997) found that family income in early childhood was most closely correlated with children's achievement. Conceptually, the greater malleability of children's development and the overwhelming importance of the family (as opposed to school or peer contexts) for very young children suggest that economic conditions in early childhood may be much more important for shaping children's ability and achievement than conditions later in childhood (Bronfenbrenner and Morris, 1998; Shonkoff and Phillips, 2000).

Emerging evidence from human and animal studies highlights the critical importance of early childhood for brain development and for establishing the structures that will shape future cognitive, social, emotional, and health outcomes (Sapolsky, 2004; Knudsen et al., 2007). Two recent neuroscientific studies show strong correlations between socioeconomic status and various aspects of brain function (Farah et al., 2006; Kishiyama et al. 2009).

Cunha, Heckman, Lochman, and Masterov (2005) propose an economic model of development in which preschool cognitive and socio-emotional capacities are key ingredients for human capital acquisition during the school years. In their model, "skill begets skill" and early capacities can affect the productivity of school-age human capital investments. Economic deprivation in early childhood could create disparities in school readiness and early academic success that persist or widen over the course of childhood.

Support for the idea that children's preschool years are a fruitful time for intervention comes from a number of intensive programs aimed at providing early care and education experiences for high-risk infants and toddlers at risk. The best known are the Abecedarian Program, which provided a full-day, center-based, educational program for children who were at high risk for school failure, starting in early infancy and continuing until school entry, and the Perry Preschool Program, which provided one or two years of an intensive center-based education program for preschoolers (Karoly, 2001). Both of these programs have been shown to generate impressive long-term improvements in either poverty or adult outcomes that are strongly associated with poverty.

Methods for Assessing Causal Impacts of Poverty

The associations found by Duncan and Brooks-Gunn (1997) and Ermisch et al. (2001) between childhood poverty and later outcomes do not prove that poverty itself is the cause of these differences. Perhaps some correlated third factor is to blame, such as inadequate parental education or lone-parent family structure. Indeed, Ermisch and colleagues also found that British children of more highly educated parents themselves attained a higher level of education, had a lower likelihood of economic inactivity and, for females, a lower chance of giving birth by age 21. Living in a non-intact family during childhood was also associated with worse outcomes. If parental education or family structure is key, then eliminating child poverty, but failing to boost parental schooling or promote two-parent family structures, would not improve the life chances of the children involved. Indeed, some studies find large reductions in the estimated impacts of income once adjustments for omitted-variable bias are implemented (Blau, 1999; Mayer, 1997).

The causal role of inadequate income for the life chance of children continues to be heatedly debated. Three recent studies use sophisticated methods to tie child outcomes directly to government program-induced income changes.

Dahl and Lochner (2008) take advantage of the fact that the United States increased the generosity of its Earned Income Tax Credit (EITC) program during the 1990s. The EITC provides a refundable tax credit to low-income working families. The maximum size of the annual credit is now quite substantial -- \$4,400 – and it increased by about \$2,100 in the mid-1990s. Dahl and Lochner estimate that a \$3,000 increase in family income in early and middle childhood boosts reading achievement by about one-tenth of a standard deviation and math achievement by about half that amount. These effects were two to three times as large, however, for children of non-white, unmarried, and less-educated mothers, which supports another key conclusion in Duncan and Brooks-Gunn (1997) – namely, that income effects are non-linear and stronger at lower income levels.

A second study draws data from a series of random-assignment welfare reform evaluation studies that were undertaken in the United States and Canada during the 1990s (Morris, Huston, Duncan, Crosby and Bos, 2001). Collectively, these studies gathered data on the school achievement of more than 30,000 children. Analyses of these data by Morris et al. (2001) revealed that welfare reforms that both increased work and provided financial supports for working families generally promoted children's achievement and positive behaviour, although children's achievement appeared to improve more than their behaviour. In contrast, welfare reforms that mandated work but did not support it financially had few impacts – positive or negative – on children. Thus, it appeared that merely increasing maternal employment had no effect on children's achievement, but increasing both work and income had a positive impact. For these young children, family income gains of roughly \$3,000 per year translated into program effects of about one-fifth of a standard deviation (Duncan, Morris and Rodrigues, 2008). This effect size is larger than Dahl and Lochner's (2008) overall estimates, but quite similar to the income effects they estimate for children in disadvantaged families.

Milligan and Stabile (2008) take advantage of variation across Canadian provinces in the generosity of the National Child Benefit program to estimate income impacts on child outcomes observed in the National Longitudinal Study of Children and Youth. Among children residing in low-income families, income had a positive and significant correlation with on both math and vocabulary scores. Their estimated effect sizes are in line with the Duncan et al. (2008) and

Dahl and Locher (2008) estimates for disadvantaged children: a \$3,000 increment to income produces more than a one-fifth standard deviation increase in both kinds of test scores. Interestingly, it was also found that higher income was associated with a drop in maternal depression, which suggests a possible pathway for the effects.

Linking Early Poverty to Adult Outcomes

None of this past income literature has been able to relate family income early in a child's life to adult attainments. More recently, however, Duncan et al. (forthcoming) make this link using 1968-2005 data from the Panel Study of Income Dynamics, which has followed a nationally representative sample of U.S. families and their children since 1968 (<http://psidonline.isr.umich.edu>). They select children observed in the PSID between their prenatal year and at least age 25; a number of their outcomes are drawn from the 2005 interview, in which individuals ranged from ages 30 to 37.

They measure income in every year of a child's life from the prenatal period through age 15, distinguishing income early in life (prenatal through 5th year) from income in middle childhood and adolescence. Their analyses relate an array of adult achievement, social assistance, health and behavior measures to these childhood stage-specific measures of income.

Table 1 shows striking differences in these outcomes, depending on whether childhood income prior to age six was below, close to, or well above the poverty line, which is about \$20,000 for a family of four. Compared with children whose families had incomes of at least twice the poverty line during their early childhood, poor children completed two fewer years of schooling, earned less than half as much, worked 451 fewer hours per year, received \$826 per year more in food stamps as adults, and are nearly three times more likely to report poor overall health. Poor males are more than twice as likely to be arrested. For females, poverty is associated with a more than five-fold increase in the likelihood of bearing a child out of wedlock prior to age 21.

Duncan et al. (forthcoming) then provide the series of unadjusted and regression-adjusted correlations shown in Table 2.² The first row shows correlations between each adult outcome and 15-year average childhood income. The directions of all of the correlations are as expected – positive for “good” outcomes and negative for “bad” ones – and statistically significant for each outcome. The largest correlations, all in the .3 to .4 range, are found for schooling, adult earnings and nonmarital births.

In the second row, these correlations are adjusted for an extensive set of background control variables, all of which are measured either before or near the time of birth. All of the correlations become smaller (in absolute value); in the case of poor health and arrests, the correlations drop to the point of statistical insignificance. Thus, it appears that a substantial portion of the simple correlation between childhood income and most adult outcomes can be accounted for by the disadvantageous conditions associated with birth into a low-income household.

Our focus is on children growing up in poor families. To assess whether increasing low incomes may matter more than increments to the incomes of children growing up in middle-class or affluent families, the adjusted correlations shown in the third row of Table 2 relate the adult outcomes to the *natural logarithm* of the 17-year average childhood income. Whereas the two

sets of correlations shown in rows one and two assume that, say, a £1,000 increment to a poor family's annual income has the same beneficial effect on a child's adult outcomes as a £1,000 increment to an affluent family's income, the logarithmic transformation assumes equal percentage effects. So, for example, the logarithmic model presumes that a 50% (and £5,000) increase in average childhood income from £10,000 to £15,000 has the same effect as the 50% (but £50,000) increase from £100,000 to £150,000. Higher adjusted correlations (in absolute value) in logarithmic as opposed to linear models would suggest that money may matter more for the developmental outcomes of children reared in lower-income households than for more affluent children.

As shown in the third (Model 3) row of Table 2, the adjusted correlations for logarithmic income are uniformly higher than correlations for linear income (Model 2) in the case of all but nonmarital births. Despite the adjustments for the extensive set of controls, all of these correlations once again pass the threshold of statistical significance.

To address the issue of the childhood stage-specificity of income effects, the final (Model 4) analyses in Table 2 replace the single 17-year average log childhood income measure with three stage-specific measures of log income. As before, adjustments are made for the effects of the extensive list of background controls. With each childhood stage accounting for approximately one-third of childhood, we would expect that the three correlations should (approximately) sum to the all-childhood correlations presented in Model 3. If childhood income mattered equally across all three stages, the three correlations should be roughly the same size and about one-third the magnitude of the Model 3 correlations.

In the case of adult earnings and work hours, early childhood income appears to matter much more than later income. The adjusted correlation for work hours and the prenatal-to-age-five log average income (.20) is every bit as large as the Model-3 coefficient on all-childhood log average income, suggesting little role for income beyond age 5. Early income also has a statistically significant coefficient in the case of completed schooling, but in this case adolescent income has a considerably larger standardized coefficient. Nonmarital births have strong associations with childhood income, but only with income during adolescence.

In the more extensive analysis carried out by Duncan et al. (forthcoming), the two adult outcomes that proved to have the strongest links to early childhood income were among the most important: earnings and work hours. The researchers' estimates suggest that an additional \$10,000 per year of family income between the prenatal year and the child's fifth birthday is associated with an increase of 68% in the natural logarithm of adult earnings. In contrast, increments to early-childhood income for higher-income children (i.e., annual average family incomes above \$25,000) were not significantly associated with higher adult earnings. Nor were estimated increments to incomes in middle childhood and adolescence statistically significant, even among low-income children.

Results for work hours are broadly similar to those for earnings – a highly significant estimated impact of early childhood but not later childhood income. In this case, a \$10,000 annual increase in the prenatal to age-five income of low-income families is associated with more than 500 additional work hours per year after age 25.

Translating this to a more policy-relevant size, the coefficients imply that a \$3,000 annual increase in income between a child's prenatal year and fifth birthday is associated with 19% higher earnings and a 135-hour increase in work hours. Moreover, most of the childhood-

income effects on earnings appear to be accounted for by differences in annual work hours, suggesting that the results for work hours are particularly important to understand.

Summary and policy implications

My review of the conceptual and empirical literature points to early childhood as a particularly sensitive period in which economic deprivation may compromise children's life chances. Although this was the conclusion of synthetic studies published over a decade ago (e.g., Duncan and Brooks-Gunn (1997)), three recent developments have strengthened our confidence in the causal nature of the income/development linkages.

First, emerging evidence in neuroscience (e.g., Farah et al., 2006; Kishiyama, forthcoming) documents a growing list of brain functions that differ between children raised in high and low socioeconomic circumstances. Second, studies employing unusually rigorous methods for estimating causal relationships between income early in life and achievement test scores produce remarkably similar results: a \$3,000 annual income increment for several years appears to boost children's achievement by about one-fifth of a standard deviation.³

Translated into an IQ-type scale, 20 per cent of a standard deviation amounts to about 3 points. Translated into a common achievement test for preschoolers – the Bracken Test of School Readiness – these effect sizes translate into four additional correct answers to a 61-question test regarding colours, letters, numbers/counting, comparisons and shapes.

The third development is very recent research linking poverty early in childhood to adult earnings and work hours (Duncan et al., forthcoming). Although not as rigorous methodologically as the aforementioned studies of child achievement, the study's key finding, that income early in childhood appears to matter much more than income later in childhood is strikingly consistent with the achievement studies.

It would be valuable to replicate these analyses with data drawn outside the North American policy and cultural context. If the basic conclusions indeed replicate, then this recent research suggests that policy attention should focus primarily on situations involving deep and persistent poverty occurring early in childhood. In terms of indicators, it is crucial to track rates of poverty among children -- especially deep poverty occurring early in childhood -- to inform policy discussions regarding children's well-being.

In the case of welfare policies, we should take care to ensure that sanctions and categorical provisions do not deny benefits to families with very young children. Not only do young children appear to be most vulnerable to the consequences of deep poverty, but mothers with very young children are also least able to support themselves through work in the labor market.

More radical would be income transfer policies that provided more income to families with young children. This could take the form of adding to the existing child allowance or benefit levels for such families or, if budget constraints are binding, reducing the allowances or benefits for families with older children in order to finance the higher benefits for families with young children.

Interestingly, several European countries gear time-limited benefits to the age of children in their assistance programs. In Germany, a modest parental allowance is available to a mother

working fewer than 20 hours per week until her child is 18 months old. France guarantees a modest minimum income to most of its citizens, including families with children of all ages. Supplementing this basic support is the Allocation de Parent Isolé (API) program for lone parents. Eligibility for generous income-tested API payments to families with children is limited to the period between the child's birth and third birthday, even if low-income status persists beyond that point. In effect, the API program acknowledges a special need for income support during this period, especially if a parent wishes to care for very young children and forgo income from employment. The elaborate state-funded system in France for providing childcare beginning at age three alleviates the problems associated with a parent's transition into the labor force.

In emphasizing the potential importance of income in early childhood, I do not mean to imply that focusing on this area is the only policy path worth pursuing. Economic logic requires a comparison of the costs and benefits of the various programs that seek to promote the development of disadvantaged children. In this context, expenditures on income-transfer and service-delivery programs should be placed side by side and judged by the benefits they produce relative to their costs.

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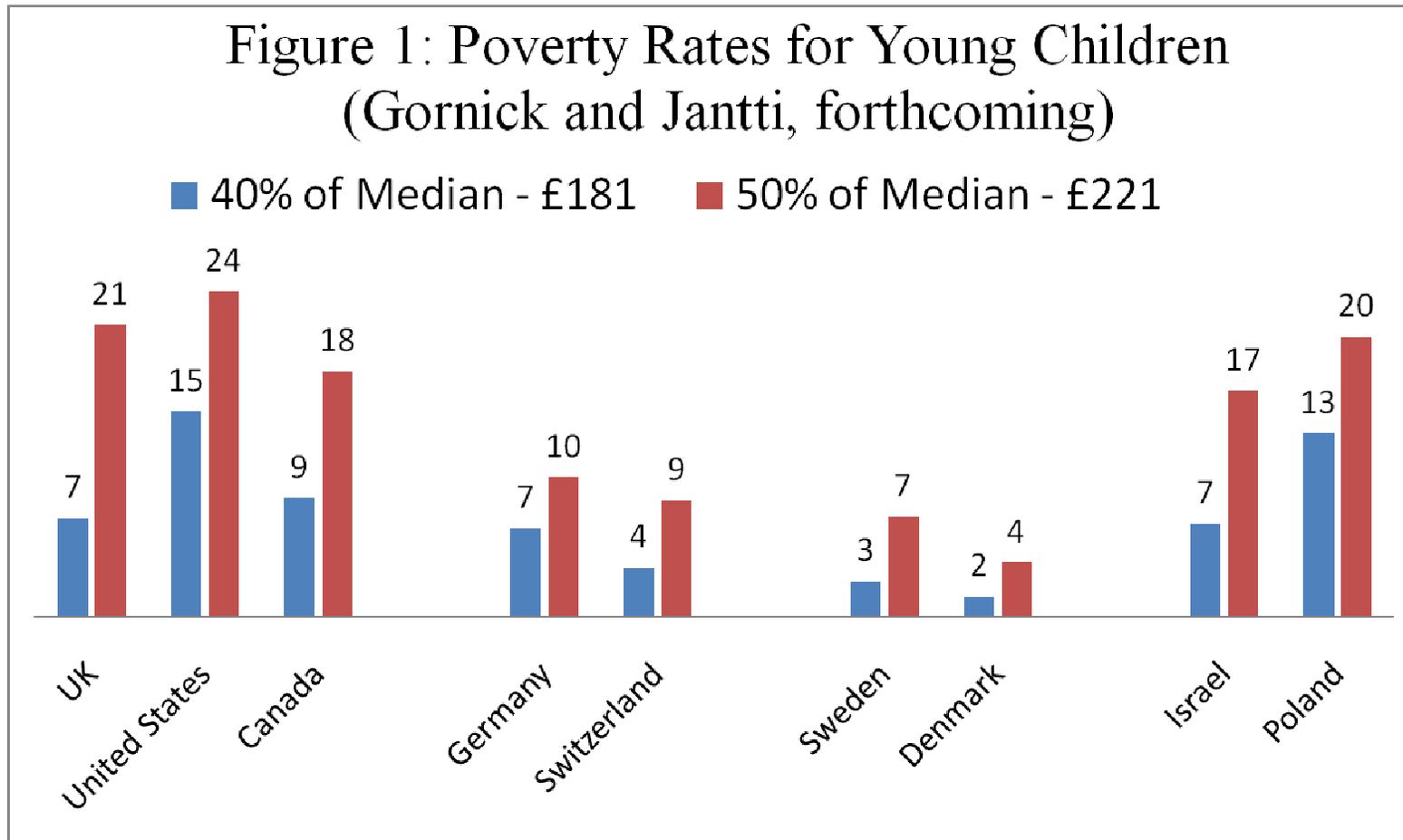


Table 1: Adult Outcomes by Poverty Status between the Prenatal Year and Age 5

	Income below the official U.S. poverty line	Income between one and two times the poverty line	Income more than twice the poverty line
	<i>Mean or %</i>	<i>Mean or %</i>	<i>Mean or %</i>
Completed schooling	11.8 yrs	12.7 yrs	14.0 yrs
Earnings (\$10,000)	\$17.9	\$26.8	\$39.7
Annual work hours	1,512	1,839	1,963
Food stamps	\$896	\$337	\$70
Poor health	13%	13%	5%
Arrested (men only)	26%	21%	13%
Nonmarital birth (women only)	50%	28%	9%

Note: Earnings and food stamp values are in 2005 dollars.

Table 2: Unadjusted and Adjusted Correlations between Childhood Income and Adult Outcomes

	Income measure	Schooling (years)	Annual earnings	Annual work hours	Food stamps	Poor Health	Arrested	Non-marital birth
Model 1: <i>Average childhood income</i>	Prenatal to age 15	.34**	.31**	.15**	-.25**	-.13**	-.17*	-.38**
Model 2: <i>Average childhood income, with background controls</i>	Prenatal to age 15	.14**	.23**	.11**	-.08*	-.02	-.09	-.26**
Model 3: <i>Natural logarithm of average childhood income, with background controls;</i>	Prenatal to age 15	.22**	.37**	.20**	-.24**	-.08*	-.13†	-.18**
Model 4: <i>Natural logarithm of average stage-specific childhood income, with background controls;</i>	Prenatal to age 5	.10*	.27**	.20**	-.08†	.07	-.11	.02
	Age 6 to 10	-.04	.06	-.03	-.12*	-.05	.11	.07
	Age 11 to 15	.18**	.08	.06	-.06	-.11†	-.17†	-.27**

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

“Background controls” consist of birth year, race, sex, whether the child’s parents were married and living together at the time of the birth, mother’s age at birth, region, number of siblings, parent schooling, parent test score, cleanliness of the house, parent’s expectations for child, parent achievement motivation, parent locus of control and parent risk avoidance.

¹ Increasing the poverty threshold from 50% to 60% of median income nearly doubles the estimated proportion of children in pre-housing-cost poverty in 2006-07 (from 11% to 20%) and increases the proportion of post-housing-cost poor children from 19% to 29% (Department for Work and Pensions, 2007, page 21.)

² Among the many approaches to estimating the causal impacts of childhood income on adult outcomes, the Duncan et al. (forthcoming) methods are more sophisticated than some but less sophisticated than others. Theirs is the first study to link high-quality income data across the entire childhood period with adult outcomes measured as late as age 37. On the other hand, the incomes we observe are determined, in part, by the actions of parents and other family members, which leaves them open to omitted-variable bias. Their list of control variables includes a parent's test scores (as well as schooling), which helps reduce bias. More important, and unusual for studies such as these, is that their estimates of the impacts of early childhood income control for income in middle childhood and adolescence. It is difficult to think of omitted variables correlated strongly with our outcomes and with early childhood income that would not also correlate with income at other stages. The usual suspects, such as genetic influences, are as likely to affect later and early childhood income, and thus be controlled, in some degree, by our inclusion of income in other childhood stages. Nevertheless, the possibility of lingering omitted-variable bias remains.

³ These effect sizes are based on the full samples used in Milligan and Stabile (2008) and Duncan et al. (2008) and the low-income subsample used in Dahl and Lochner (2008).