Childhood family income and life outcomes in adulthood: Findings from a 30-year longitudinal study

Sheree J. Gibb, David M. Fergusson*, L. John Horwood

Christchurch Health and Development Study, University of Otago, Christchurch School of Medicine and Health Sciences, PO Box 4345, Christchurch 8140, New Zealand

*Corresponding author. Tel: þ64 3 372 0406; fax: þ64 3 372 0407. E-mail: dm.fergusson@otago.ac.nz

Abstract

The aims of this study were to use data gathered over the course of a 30 year longitudinal study to examine the linkages between economic circumstances in childhood and subsequent developmental outcomes spanning educational achievement; economic circumstances; crime; mental health; and teenage pregnancy. All of these outcomes have been linked with childhood economic conditions and it is frequently argued that reducing income inequalities will mitigate psychosocial risks of children reared in families facing economic hardship. Alternatively it may be suggested that the associations between childhood family economic circumstances and later outcomes are mediated by individual, family and social factors that are correlated with low family income and contribute to later outcomes. To examine these issues data were drawn from a birth cohort of New Zealand children born in 1977 and followed to age 30.

Declining childhood family income was associated with a range of negative outcomes in adulthood, including: lower educational achievement; poorer economic circumstances; higher rates of criminal offending; higher rates of mental health problems; and higher rates of teenage pregnancy. After covariate adjustment childhood family income remained significantly associated with educational achievement and economic circumstances, but was no longer significantly associated with the mental health, offending and teenage pregnancy outcomes. These findings suggest that, after due
allowance has been made for social, family and individual contextual factors, low family income during childhood is associated with a range of educational and economic disadvantages in adulthood but is not directly related to increased risks of crime, mental health problems or teen pregnancy.

**Keywords:** Childhood poverty; income; economic conditions; educational achievement; mental health; offending; longitudinal research; New Zealand

**Introduction**

In recent years, there has been growing concern and debate about the adverse effects of childhood poverty and economic deprivation on longer term health and development. This research has been stimulated by findings suggesting that in many developed countries a substantial fraction of children are exposed to poverty or economic deprivation and that the gap between the rich and the poor may be widening. New Zealand is a case in point with recent estimates suggesting that in the region of 15% of New Zealand children are reared in conditions of relative poverty (Organisation for Economic Co-Operation and Development, 2011).

Such findings raise important issues about the extent to which exposure to childhood poverty and/or economic deprivation may have adverse effects on the individual’s longer term education, income and psychosocial adjustment. There is now increasing evidence which suggests that exposure to childhood poverty and economic deprivation is frequently a precursor to longer term disadvantage in a number of areas including:

1) Educational achievement: A series of studies has found that children reared in conditions of poverty or material deprivation are at increased risks of educational underachievement in adolescence and young adulthood (Duncan et al., 2011; Duncan et al., 1998; Fergusson et al., 2008; Melby et al., 2008). For example, Duncan, Yeung, Brooks-Gunn and Smith (1998) examined the associations between childhood family income and later educational achievement using longitudinal panel data from the United States and found that lower family incomes during childhood were
associated with lower rates of completed schooling. Similarly, Melby et al (2008) reported that lower family income during early to mid-adolescence was significantly associated with fewer years of completed education at age 26.

2) Economic circumstances: Closely related to findings on educational achievement, a number of studies have shown that exposure to low family income in childhood is associated with lower earnings and shorter working hours in adulthood (Duncan et al., 2009; Duncan et al., 2010; Hobcraft & Kiernan, 2001). For example, Duncan et al (2009) used data from both the United States and Norway and reported that, in both countries, low family income in childhood was associated with lower earnings and shorter work hours in adulthood. Similarly, Hobcraft and Kiernan (2001) found that childhood poverty was associated with poorer economic circumstances at age 33, including lower income and a greater likelihood of living in social housing.

3) Adverse psychosocial outcomes: Exposure to childhood poverty and limited material circumstances has also been associated with increased risks of a number of adverse psychosocial outcomes in adolescence and adulthood. These outcomes include higher rates of crime and delinquency (Bjerk, 2007; Jarjoura et al., 2002); higher rates of mental health problems (Dearing, 2008; Lundberg, 1997; McLeod & Shanahan, 1996); and early pregnancy and parenthood (Duncan et al., 1998; Hobcraft & Kiernan, 2001). For example Jarjoura et al (2002) reported that individuals who experienced poverty during childhood and early adolescence had higher levels of adolescent delinquent behaviours including theft, vandalism, and assault than individuals who were not exposed to poverty. In addition a number of previous studies have examined the associations between childhood poverty and mental health using measures that are associated with income, such as socioeconomic status and living conditions, and have reported that impoverished socioeconomic conditions in childhood are associated with a range of mental health problems in adulthood, including depression and substance dependence (McLaughlin et al., 2011; Melchior et al., 2007; Poulton et al., 2002).
It is clear from the above brief review that the evidence suggests that children reared in poverty or in deprived economic circumstances are an at risk population for later adverse educational, economic and psychosocial outcomes. In turn these findings raise important issues about the underlying processes that lead to these continuities between exposure to childhood economic adversity and later outcomes.

The most widely accepted and influential account of these linkages have been provided by materialist or neo-materialist explanations that that assume that poverty and material deprivation lead to a series of barriers that limit the healthy development and life course opportunities of those reared in poverty (for example see Barbarin et al., 2006; Bradley & Corwyn, 2002; Dearing, 2008; for example, see Williamson et al., 2005). This explanation implies that independently of other individual, family school or related factors, individuals reared in low income families are at an inherent disadvantage that places them at increased risks of: later educational under-achievement; lower income; mental health problems; and related outcomes. The important implication of the materialist and neo-materialist models is that by reducing income inequality it is possible to reduce rates of the adverse psychosocial outcomes associated with income inequalities.

An alternative explanation of the linkages between income and psychosocial development is that these linkages arise from the individual, family and social contexts associated with low income rather than from the direct effects of income upon psychosocial development. For these reasons it is important to examine the associations between childhood family incomes and later outcomes, adjusted for the effects of mediating social, family and individual factors.

To address these issues, this paper reports the results of a 30 year study of the associations between childhood family income and development in young adulthood. The key aims of this analysis are:
1) To document the associations between childhood family income (age 0-10 years) and later: educational achievement; economic circumstances; crime; mental health; and teenage pregnancy.

2) To adjust the associations between childhood family income and later outcomes for a wide range of individual, social and contextual factors that may mediate the relationships between childhood family income and later outcomes.

The principal focus of the analysis is to examine the extent to which childhood family income is directly related to psychosocial outcomes in adulthood and the extent to which these associations are mediated by individual, family and related factors.

Methods

Participants and data

Data were drawn from the Christchurch Health and Development Study, a longitudinal study of a birth cohort of 1265 individuals born in Christchurch in 1977 and followed to age 30. Participants have been followed up at birth, 4 months, 1 year, annually to age 16, then at ages 18, 21, 25 and 30 using a combination of semi-structured interviews, standardised testing, and teacher and parent interviews. The methodology and major findings of the study have been reviewed previously (Fergusson & Horwood, 2001; Fergusson et al., 1989). At age 30 the cohort consisted of 987 individuals representing 79% of the remaining live sample (see ‘Sample loss and sample bias’, below, for information about sample loss and sample bias). All data were collected with the signed consent of study participants and all phases of the study have been subject to ethical review by the regional Health and Disability Ethics Committee.

Childhood economic conditions

To assess childhood family income and material circumstances, three indicator measures were constructed:
Childhood family income (0-10 years)

As part of the annual follow-up interviews from age 1 to age 10, participants’ parents were asked to specify their current gross weekly incomes from paid employment, welfare benefits and other sources. These incomes were summed to provide an estimate of the family’s total gross weekly income at each age. To provide a measure of the family’s average income rank during the participant’s childhood, the weekly income values for each year were first standardised (to mean zero and variance one) to place them on a common metric and then averaged over all non-missing values over the 10 year period. For the purposes of the present analysis families were classified into quintile groups based on the distribution of the averaged family income rank estimate. This was the primary measure used in the analysis.

Low equivalised family income (0-10 years)

To provide an alternative measure that was focussed more on assessing relative childhood poverty, the family income estimates for each year were transformed to equivalised family incomes, with weights defined using the modified form of the Michelini equivalence scales described by (Easton & Carson, 2002). Based on the OECD (2011) estimate that 15% of New Zealand children are reared in relative poverty, families were classified as being in poverty at each year from age 1 to 10 years if they fell into the lowest 15% on the distribution of equivalised income for that year. A measure of the extent of relative childhood poverty was then derived based on a count of the number of years in which the family was classified as being in poverty.

Interviewer assessments of family living standards (0-10 years)

At each follow-up interview from age 1 to 10, survey interviewers rated the family’s economic living standards on a five point scale where ‘1’ was ‘family obviously affluent and well-to-do’ and ‘5’ was ‘family obviously poor or very poor’. Ratings were made on the basis of the interviewer’s impression of the house, the respondent’s replies, and any other useful information obtained during
the interview. A further measure of relative childhood poverty was constructed based on a count of the number of years up to age 10 in which the family was rated as having a below average standard of living.

Life outcomes to age 30

To assess developmental outcomes during young adulthood a series of measures was selected from the database of the study spanning educational, economic, crime, mental health and pregnancy outcomes to age 30.

Educational achievement by age 30

Three measures were used to assess educational achievement by age 30.

a) Attainment of high school qualifications. At each interview from age 16 to age 21, participants were questioned about whether they had left school, and what high school qualifications they had obtained. Overall 80.8% of the sample had attained a recognized high school qualification.

b) Attended university. At ages 18, 21, 25 and 30, participants were asked whether they had attended a university during the period since the last follow-up interview. Those who reported attending a university at any point were classified as having attended university by age 30 (45.3% of sample).

c) Degree attainment. At ages 18, 21, 25 and 30 participants were asked if they had attained a Bachelors or higher degree from a university or other degree granting institution. Overall 29.0% of participants had attained a degree by age 30.
Economic outcomes at age 30

Four measures were used to assess economic outcomes at age 30.

a) Gross personal annual income. At age 30, participants were asked to report their personal gross income from all sources over the previous 12 months as one of the following income bands: zero income or loss; 1-5,000; 5,001-10,000; 10,001-15,000; 15,001-20,000; 20,001-25,000; 25,001-30,000; 30,001-40,000; 40,001-50,000; 50,001-70,000; 70,001-100,000; 100,001 or more. These responses were converted to single point estimates by taking the mid-point of the relevant income band. Incomes in the top band were set to $120,000. Incomes reported in currencies other than New Zealand dollars were converted to New Zealand dollars using Purchasing Power Parities (Organisation for Economic Co-Operation and Development, 2007). After currency conversion, incomes above NZ$120,000 were truncated to NZ$120,000. Annual incomes had a median of $35,000 and a standard deviation of $32,350.

b) Welfare dependence. At age 30 participants were asked whether they currently received any social welfare benefits (sickness, invalid’s, unemployment, domestic purposes). Overall 8.4% of participants were currently receiving a welfare benefit.

c) Economic hardship. At age 30 participants were questioned about their economic living standards using the short form of the Economic Living Standards Index (ELSI) (Jensen et al., 2005). ELSI is a direct measure of living standards based on measures of ownership, consumption and economising. The scale has been shown to have good reliability and validity as a measure of living standards (Jensen et al., 2005). Total ELSI scores were calculated according to the manual. Participants who had a total ELSI score of 16 or below were classified as experiencing economic hardship (scores of 16 or less cover the categories of ‘some hardship’, ‘moderate hardship’ and ‘severe hardship’ specified in the ELSI manual (Jensen et al., 2005)). Overall, 7.8% of participants were classified as experiencing economic hardship at age 30.
d) Working in paid employment. Participants who reported working in paid employment for at least one hour per week at the age 30 interview were classified as being in paid employment (83.2% of sample).

Criminal offending age 18-30

Two measures were constructed to assess involvement in criminal offending from age 18-30.

a) Property/violent offending. At ages 21, 25 and 30 participants were questioned about their involvement in criminal offending since the previous interview including property offences (theft, burglary, vehicle conversion, shoplifting; receiving stolen goods, property damage, vandalism, fire setting) and violent offences (assault, fighting, carrying an offensive weapon, threatening behaviour, cruelty). Overall, 22.3% of participants reported committing at least one violent or property offence between age 18-30.

b) Arrest/conviction. At ages 21, 25 and 30, participants were asked whether they had been arrested or convicted of any crime since the last follow-up interview. Overall 21.0% of participants reported an arrest or conviction from age 18-30.

Mental health age 18-30

At ages 21, 25 and 30 participants were questioned about their mental health since the previous assessment, using components of the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1993) to assess DSM-IV diagnostic criteria (American Psychiatric Association, 1994) for a range of mental disorders. These data were used to derive four measures of mental health problems from age 18-30.

a) Major depression. Participants were classified as having major depression if they met DSM-IV criteria for a major depressive episode from age 18-30 (43.2% of participants).
b) **Anxiety disorder.** Responses to the CIDI were used to assess a range of anxiety disorders including: generalised anxiety disorder, social phobia, specific phobia, agoraphobia, panic disorder. Participants were classified as having an anxiety disorder if they met criteria for at least one of these disorders from age 18-30 (33.3% of participants).

c) **Substance dependence.** CIDI items were used to assess dependence criteria for a range of substances including alcohol, cannabis and other illicit drugs. Overall, 20.3% of participants met criteria for at least one substance dependence disorder from age 18-30.

d) **Number of mental health problems.** To provide a measure of the total extent of mental health problems experienced from age 18 to age 30, the three measures above (major depression, anxiety disorder, substance dependence) were summed across measures and across ages to provide an estimate of the total number of mental health problems experienced from age 18 to age 30. This measure had a median of 1.0 and a standard deviation of 1.7.

While the disorder prevalence rates described above may seem high in comparison to similar lifetime prevalence estimates from cross-sectional studies, these rates are nevertheless consistent with the prevalence estimates from other similar longitudinal studies such as the Dunedin Multidisciplinary Health and Development Study (Fergusson et al., 2004).

**Teenage pregnancy**

At each follow-up interview from age 15 to 30, participants were asked whether they had become pregnant, or made a partner pregnant, since the last follow-up interview and the timing of any pregnancy. These data were cross-checked against a full pregnancy history taken at age 30. Participants who reported becoming pregnant or getting a partner pregnant before age 20 were classified as having a teenage pregnancy (16.2% of sample).

**Covariate measures**
A wide range of covariate factors were selected from the database of the study to control the associations between childhood family economic circumstances and later outcomes. Covariates were selected on the basis that they were known from previous research to be correlated with the measures of childhood economic circumstances and to be predictive of at least one life course outcome to age 30. The selected covariates spanned two broad domains:

a) Pre-existing background factors reflecting socio-demographic characteristics of the family at the time of the cohort member’s birth. These factors included measures of parental education, maternal age, family socioeconomic status, pregnancy planning, parental church attendance, ethnicity, and family type (single parent/two parent family).

b) Covariates assessed concurrently with the assessment of family income. These factors reflected childhood personal characteristics and behaviours as well as the social and family context in which the child was raised, and included measures of childhood IQ, teacher-rated academic progress, childhood attentional and conduct problems, childhood exposure to physical and sexual abuse, family instability and conflict, parental alcohol and drug use, and criminal offending.

A detailed description of all background and concurrent covariates can be found in the supplementary online Appendix.

**Statistical methods**

Associations between childhood economic conditions and life outcomes were tested for statistical significance using multiple linear regression models (for the continuous outcome: income), Poisson regression models (for the count outcome: number of mental health problems), or multiple logistic regression models (for the dichotomous outcomes) in which the life outcome was modelled as a function of childhood economic conditions. For continuous outcomes the model fitted was of the form:

\[ Y_i = B_0 + B_1X_i + U_i \]
where $Y_i$ was the score on life outcome $Y$ for the $i$th individual, $X_i$ was childhood economic circumstances for the $i$th individual, and $U_i$ was the disturbance term. In this model $B_1$ represents the effect of childhood economic circumstances on the life outcome.

For the count measure the model fitted was of the form:

$$\log(Y_i) = B_0 + B_1X_i$$

where $\log(Y_i)$ was the logarithm of the rate of the life outcome for the $i$th individual and all other variables have interpretations similar to those in the model above.

For the dichotomous measures the model was of the form:

$$\logit(Y_i) = B_0 + B_1X_i$$

where $\logit(Y_i)$ was the log odds of life outcome $Y$ for the $i$th individual and the interpretations of all other variables are similar to those described above. For all models the coefficient $B$ has the interpretation of the change in the expected value of the outcome measure - $E(f(Y_i))$ - for a one quintile change in childhood family income.

In all cases, associations between childhood economic conditions and life outcomes were tested for linearity using a Mantel-Hanzsel chi-squared test (for the dichotomous measures) or one-way analysis of variance (for the continuous and count measures). These tests revealed a significant ($p<.05$) linear component to all associations.

The regression models were then extended to control for covariate factors (Table 2). Two models were fitted for each outcome. The first model included all covariates. The second was a reduced model including only significant covariates. Significant covariates were identified by methods of forwards and backwards variable elimination to identify a stable and well-fitting model. Reduced models were used to reduce risks of over-adjustment bias (Schisterman et al., 2009). To allow for possible inflation of Type 1 errors due to multiple significance testing, the tests of
significance for the effect of childhood family income in each series of regressions were also
examined against a Bonferroni adjusted p-value \((p = .006)\). The adjusted p-value was calculated
taking into account the size of the average correlation between the outcome measures. All
associations between childhood family income and outcomes were tested for non-linearity, and in
all cases a linear model was found to be adequate. For those outcomes that remained significantly
related to childhood family income after covariate adjustment, estimates of the adjusted
associations (Table 3) were obtained using the methods described by (Lee, 1981).

Finally, a series of supplementary analyses was conducted to examine the implications for
study conclusions of (a) varying the age of assessment of childhood family income, and (b) using the
two alternative measures of childhood economic circumstances reflecting relative childhood poverty
(number of years equivalised family income in lowest 15% of families; number of years family had
below average living standards).

Sample loss and sample bias

The analyses in this paper are based on sample sizes ranging from 938 to 1009 reflecting
variations in the numbers of participants observed on childhood family income and on each
outcome. These samples represent between 74% to 80% of the initial cohort. This raises questions
about the extent to which the results of this paper may be influenced by sample selection bias due
to non-random sample loss. Comparison of the analysis samples with the remainder of the cohort on
a series of measures collected at birth showed evidence of consistent and significant \((p<.05)\)
tendencies for the analysis samples to under-represent participants from more socio-economically
disadvantaged backgrounds (low parental education, low SES, low income, single parent family) and
males. To address this issue a series of supplementary analyses was conducted to correct for
possible selection bias. Three approaches were examined: (a) multiple imputation of missing data
(Rubin, 1987; Schafer, 1999); (b) the use of a Heckman correction (Heckman, 1979); and (c) the data
weighting methods described by Carlin et al. (1999). In all cases these analyses produced findings
that were not substantively different to those of the original analyses and led to the same conclusions.

Results

Bivariate associations

Table 1 shows the measure of mean family income 0-10 years subdivided into quintiles and related to a series of outcome measures assessed up to the age of 30. These measures span: educational outcomes; economic outcomes; crime; mental health and early pregnancy. Each association is tested for linear trend using linear regression methods. All associations are adjusted for family size (see Methods).

The Table shows clear and consistent trends for increasing childhood family income to be associated with significant changes in: educational achievement by age 30; economic situation at 30; crime; mental health problems and early pregnancy. As a general rule increasing childhood family income was associated with increasing educational and economic advantage and declining risks of adverse psychosocial outcomes. With one exception (substance dependence) all associations between childhood family income and later outcomes were statistically significant (p < 0.05), with 11 of the 14 comparisons meeting the modified Bonferroni significance level of p < 0.006 (see Methods).

Regression adjustments

To take into account possible confounding and selection processes, the associations between childhood family income and later outcomes shown in Table 1 were adjusted for a series of covariate factors. These factors included measures of family background assessed at birth and factors that
were assessed concurrently with the assessment of family income. Table 2 summarises the results of these regression adjustments and shows the estimated regression coefficients and standard errors for the effect of family income on each outcome for three models:

a) A baseline model in which the associations between childhood family income and later outcomes were adjusted for family size only

b) A full regression model adjusting for all covariates

c) A reduced regression model containing only statistically significant covariates (see Methods).

The Table also reports the covariates that were statistically significant in each reduced model. Inspection of the Table leads to the following conclusions:

1) In both the full and reduced models covariate adjustment produced substantial reductions in the size of model coefficients with the result that there were no significant associations between childhood family income and later crime, mental health and early pregnancy after adjustment for covariates.

2) For educational and economic outcomes, there was evidence suggesting that increasing childhood income was associated with increasing later advantage. These results were most clearly evident for the reduced models which showed evidence of significant associations between childhood family income and: a) attaining high school qualifications ($p < 0.001$); b) attending university ($p < 0.05$); c) gaining a university degree ($p < 0.05$); d) mean annual income at age 30 ($p < 0.0001$) and e) risks of financial hardship based on the ELSI scale ($p < 0.005$), with three of these results meeting the modified Bonferroni $p$-value of 0.006. The findings for the full models containing all covariates show a similar pattern of results but the $p$ values for the full model are more conservative because of increases in model standard errors coupled with small to moderate reductions in model coefficients for most outcomes.
Covariate adjusted results

Table 3 shows the covariate adjusted relationships between childhood family income and the educational and economic outcomes having significant adjusted associations in Table 2. These findings show that compared to those in the lowest quintile of the family income distribution those in the highest quintile: i) had rates of attainment of high school qualifications that were 1.2 times higher; ii) had rates of university enrolment that were 1.3 times higher; iii) had rates of degree attainment that were 1.5 times higher; iv) earned NZD 11,750 more per annum at age 30; and v) were 3.1 times less likely to be facing economic hardship.

In general these findings clearly suggest an intergenerational transmission of educational and economic privilege in which increasing childhood family income was associated with increasing educational and economic privilege even after adjustment for a wide range of childhood, family and related factors.

Supplementary analyses

To confirm and strengthen the findings shown in Tables 1-3 a number of supplementary analyses were conducted:

a) Variation in the age range for assessing childhood family income. To examine the extent to which study findings were sensitive to the period over which childhood family income was assessed the results were re-analysed classifying family income over the period from 0-5 and 0-14 years. All analyses produced results that were consistent with the findings presented above: childhood family
income, however measured, was associated with educational and economic outcomes at age 30 but not with crime, mental health and early pregnancy.

b) Assessing childhood poverty. To provide an alternative perspective on the data the income data were transformed to an equivalised income scale using the Michelin scaling methods (Easton & Carson, 2002) and families falling into the lowest 15% of families on the distribution of equalised income at any year were classified as being in poverty. A measure of childhood exposure to poverty was constructed by counting the number of years the child’s family had been exposed to poverty. Analysis using this measure as a predictor of later outcomes produced similar conclusions to the analysis of family income: increasing exposure to family poverty was associated with declining educational and economic outcomes at 30. However, poverty was unrelated to later psychosocial outcomes after adjustment for covariates. A further analysis was conducted using interviewer ratings of family living standards based on a count of the number of years that the families’ living standards had been rated as “below average”. This approach produced results that were similar to those of other measures of childhood economic circumstances.

Discussion

The findings of this study lead to two sets of general conclusions about the linkages between childhood family income and subsequent life outcomes.

Childhood family income and educational/economic achievement

First, there was generally consistent evidence to suggest that increasing childhood family income was associated with greater educational achievement and more positive economic outcomes at age 30, even after extensive covariate adjustment. When compared with children in the lowest income quintile, those in the highest quintile were: more likely to leave school with qualifications; more likely to enrol in university; more likely to obtain a university degree by 30; earned NZD 11,750 more per annum at age 30; and had rates of economic hardship that were less
than a third those of young people in the lowest quintile (see Table 3). These findings were confirmed using measures of poverty based on equivalised income and measures of family living standards based on interviewer assessments. The results of this study are also consistent with previous research which has found linkages between childhood family income and later educational and academic outcomes (Duncan et al., 2011; Duncan et al., 2009; Duncan et al., 1998; Duncan et al., 2010; Fergusson et al., 2008; Hobcraft & Kiernan, 2001; Melby et al., 2008). The weight of the evidence suggests the presence of robust and replicable linkages between childhood family economic circumstances and later education and economic achievement.

It is unlikely that these findings can be explained by differences in the cognitive and academic abilities of children from different income quintiles since these differences persisted after control for measures of childhood cognitive ability. It is also possible that the model parameters may under-estimate the total causal effects of childhood family income on later outcomes since some of the covariates used in the analysis may have been variables that intervened between family income and later outcomes. If this is the case, the fitted models may be subject to over-adjustment (Schisterman et al., 2009) and provide a conservative estimate of the causal effects of childhood family income on later educational and economic outcomes (see also below).

An interesting feature of the data was that there were generally linear associations between the levels of childhood family income and later outcomes, suggesting that these associations did not merely reflect the adverse effects of poverty on later outcomes. Rather, the evidence suggests a process in which there is an intergenerational transmission of educational achievement and economic achievement in which increasing levels of childhood family income are associated with increasing levels of educational and economic success independently of contextual factors. The processes which lead to these associations between income and later success net of individual, family and related factors are not clear. However, it may be proposed that increasing levels of family income may be associated with a series of factors that encourage later educational and economic
success. These factors may include income-related differences in parental values and attitudes regarding educational and economic success; the availability of economic resources for investing in education and future careers; neighbourhood and peer effects; all of which may combine to place children from high income backgrounds at an advantage when compared with children from low income backgrounds.

**Childhood family income and psychosocial outcomes**

Parallel to the findings on educational and economic outcomes, there were generally consistent findings showing that increasing childhood family income was associated with declining rates of later crime, mental health problems and early pregnancy. However, in contrast to the findings for educational and economic outcomes, there was little evidence to suggest that childhood family income was related to these outcomes when due allowance was made for background and concurrent covariates. These findings were confirmed using measures of poverty based on equivalised income and measures of family living standards based on interviewer assessments.

These results are complex and require careful interpretation. Specifically, the findings suggest:

1) Childhood family income does not appear to have a direct causal effect on a number of psychosocial outcomes including crime, mental health and teen pregnancy.

2) Any association between childhood family income and these outcomes is mediated by a series of correlated covariates which span childhood and family psychosocial circumstances.

3) While it is possible to identify the class of likely factors that mediate the association between childhood family income and later psychosocial outcomes, the nature of the causal linkages between the mediating factors and family income is unclear and likely to be complex. If the childhood and family factors act as confounders, the results suggest a lack of both direct and indirect causal effects of childhood family income on the psychosocial outcomes of interest. If the childhood and family factors act as intervening variables, then there are indirect but not direct causal pathways
from childhood family income to the psychosocial outcomes. Since we cannot be sure which of these explanations is correct, claims that reducing poverty will lead to reductions in crime and other psychosocial outcomes related to income should be approached with caution. Assuming that the statistical model is well specified, the only circumstances in which changing family income will lead to reductions in later crime and related outcomes is if the covariate factors act as intervening variables that are influenced by family income and in turn influence psychosocial outcomes.

4) These considerations suggest that it should not be assumed that reducing income inequality will lead to reductions in crime, mental health problems and teen pregnancy unless further evidence can be produced to show that changes in the income distribution lead to parallel changes in the social, family and individual factors that mediate the associations between childhood family income and later psychosocial outcomes. Because of the ambiguous causal relationship between childhood family income, adverse child/family circumstances and later outcomes, the most robust and prudent approach to addressing the issues raised by the linkages between childhood family income and psychosocial outcomes is through the development of multi compartmental policies that attempt to reduce both childhood exposure to poverty and the complex psychosocial problems faced by many poor families.

Strengths and limitations

The present study has a number of strengths and limitations. Strengths include a well-studied cohort measured on a wide range of relevant variables with high retention rates over a 30 year period. This database provides an ideal opportunity to explore the complex linkages between childhood family income and later outcomes. Additional strengths of the analysis include the use of alternative measures of childhood family economic circumstances, using measures of poverty and family living standards, and the use of multiple methods for addressing possibility of sample selection bias. What these results show is that, irrespective of the way data were analysed, the same pattern of findings was evident.
Limitations of the study include the fact that the findings reflect the experiences of a single cohort of young people studied in a particular social context and over a specific historical period. There is no guarantee that these findings will generalise to other cohorts, times and contexts.

Despite these limitations, the study findings provide clear evidence of robust linkages between childhood family income and later educational and economic outcomes. The findings also suggest that the linkages between childhood family income and later psychosocial outcomes are mediated by a series of social, individual and family factors raising complex and unresolved issues about the causal pathways linking childhood family income, childhood adversity to later crime, mental health and teen pregnancy.
References


### Table 1. Associations between childhood family income (age 0-10) and life outcomes (age 18-30).

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<th>Outcomes age 18-30</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
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<td></td>
<td></td>
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<td>% Attained high school qualifications</td>
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<td>82.3</td>
<td>90.4</td>
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<td>35.6</td>
<td>40.3</td>
<td>52.4</td>
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<td>&lt;0.0001</td>
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<td>% University degree by age 30</td>
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<td>22.8</td>
<td>37.6</td>
<td>54.1</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td><strong>Economic advantage</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mean gross personal annual income age 30 (NZD)</td>
<td>967</td>
<td>38,610</td>
<td>44,060</td>
<td>45,055</td>
<td>52,060</td>
<td>60,300</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>% Welfare dependent age 30</td>
<td>973</td>
<td>20.2</td>
<td>7.9</td>
<td>8.5</td>
<td>3.4</td>
<td>4.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>% Economic hardship (ELSI) age 30</td>
<td>973</td>
<td>18.5</td>
<td>7.9</td>
<td>6.5</td>
<td>5.8</td>
<td>1.5</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>% In paid employment age 30</td>
<td>973</td>
<td>73.6</td>
<td>82.0</td>
<td>82.6</td>
<td>88.4</td>
<td>87.9</td>
<td>&lt;0.0001</td>
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<tr>
<td><strong>Offending</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Property/violent offending, age 18-30</td>
<td>938</td>
<td>33.3</td>
<td>24.3</td>
<td>21.3</td>
<td>18.4</td>
<td>16.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>% Arrest/conviction age 18-30</td>
<td>938</td>
<td>27.9</td>
<td>22.7</td>
<td>18.8</td>
<td>17.9</td>
<td>19.1</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td><strong>Mental health problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Depression age 18-30</td>
<td>938</td>
<td>52.7</td>
<td>45.3</td>
<td>38.6</td>
<td>35.3</td>
<td>44.9</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>% Anxiety disorder age 18-30</td>
<td>938</td>
<td>43.6</td>
<td>34.8</td>
<td>31.0</td>
<td>29.4</td>
<td>29.9</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>% Substance dependence age 18-30</td>
<td>938</td>
<td>22.4</td>
<td>22.7</td>
<td>18.3</td>
<td>20.9</td>
<td>19.1</td>
<td>&gt;0.30</td>
</tr>
<tr>
<td>Mean number of mental health problems age 18-30</td>
<td>938</td>
<td>1.8</td>
<td>1.6</td>
<td>1.3</td>
<td>1.3</td>
<td>1.5</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Teenage pregnancy</td>
<td>973</td>
<td>31.5</td>
<td>15.9</td>
<td>11.9</td>
<td>15.1</td>
<td>9.6</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

^1 Adjusted for family size
### Table 2. Estimated regression coefficients for the effect of childhood family income on life course outcomes adjusted for: a) family size only; b) all covariates; c) the reduced set of significant covariates

<table>
<thead>
<tr>
<th>Outcome</th>
<th>a) Family size only</th>
<th>b) All covariates</th>
<th>c) Significant covariates only</th>
<th>Significant covariates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B (SE)</td>
<td>p</td>
<td>B (SE)</td>
<td>p</td>
</tr>
<tr>
<td><strong>Educational achievement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attained high school qualifications</td>
<td>.59 (.07)</td>
<td>&lt;0.0001</td>
<td>.25 (.10)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Attended university by age 30</td>
<td>.44 (.05)</td>
<td>&lt;0.0001</td>
<td>.12 (.07)</td>
<td>&gt;0.05</td>
</tr>
<tr>
<td>University degree by age 30</td>
<td>.60 (.06)</td>
<td>&lt;0.0001</td>
<td>.17 (.08)</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td><strong>Economic advantage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal gross annual income age 30</td>
<td>5289 (667)</td>
<td>&lt;0.0001</td>
<td>2332 (839)</td>
<td>&lt;0.006</td>
</tr>
<tr>
<td>Welfare dependence age 30</td>
<td>-.50 (.09)</td>
<td>&lt;0.0001</td>
<td>-.17 (.13)</td>
<td>&gt;0.15</td>
</tr>
<tr>
<td>Economic hardship (ELSI) age 30</td>
<td>-.54 (.10)</td>
<td>&lt;0.0001</td>
<td>-.40 (.14)</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>In paid employment age 30</td>
<td>.26 (.06)</td>
<td>&lt;0.0001</td>
<td>.15 (.09)</td>
<td>&gt;0.10</td>
</tr>
<tr>
<td><strong>Offending</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Property/violent offending age 18-30</td>
<td>-.23 (.06)</td>
<td>&lt;0.0001</td>
<td>-.08 (.08)</td>
<td>&gt;0.30</td>
</tr>
<tr>
<td>Arrest/conviction age 18-30</td>
<td>-.14 (.06)</td>
<td>&lt;0.05</td>
<td>.02 (.09)</td>
<td>&gt;0.70</td>
</tr>
<tr>
<td><strong>Mental health problems</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>-.11 (.05)</td>
<td>&lt;0.05</td>
<td>-.01 (.07)</td>
<td>&gt;0.80</td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td>-.15 (.05)</td>
<td>&lt;0.005</td>
<td>-.07 (.07)</td>
<td>&gt;0.30</td>
</tr>
<tr>
<td>Substance dependence</td>
<td>-.06 (.06)</td>
<td>&gt;0.30</td>
<td>.02 (.09)</td>
<td>&gt;0.80</td>
</tr>
<tr>
<td>Number of mental health problems</td>
<td>-.06 (.02)</td>
<td>&lt;0.005</td>
<td>.02 (.05)</td>
<td>&gt;0.60</td>
</tr>
<tr>
<td><strong>Pregnancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teenage pregnancy</td>
<td>-.33 (.07)</td>
<td>&lt;0.0001</td>
<td>-.04 (.09)</td>
<td>&gt;0.60</td>
</tr>
</tbody>
</table>

Background covariates: 1 = maternal education; 2 = paternal education; 3 = maternal age; 4 = family socio-economic status; 5 = pregnancy planning; 6 = parental ethnicity; 7 = single parent family; 8 = family church attendance; 9 = family size; Concurrent covariates: 10 = parental history of offending; 11 = parental history of illicit drug use; 12 = parental history of alcohol problems; 13 = changes of parents age 0-10; 14 = inter-parental conflict age 0-10; 15 = child conduct problems age 7-9; 16 = child attentional problems age 7-9; 17 = child IQ age 8/9; 18 = childhood sexual abuse (<16 years); 19 = childhood physical abuse (<16 years); 20 = teacher rated academic progress age 7-10
Table 3. Adjusted associations between childhood family income (age 0-10) and measures of educational achievement, economic advantage.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Family income quintile age 0-10</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Educational achievement</strong></td>
<td></td>
</tr>
<tr>
<td>% Attained high school qualifications</td>
<td>76.4</td>
</tr>
<tr>
<td>% Attended university by age 30</td>
<td>39.9</td>
</tr>
<tr>
<td>% University degree by age 30</td>
<td>22.6</td>
</tr>
<tr>
<td><strong>Economic advantage</strong></td>
<td></td>
</tr>
<tr>
<td>Mean gross personal annual income age 30</td>
<td>42,534</td>
</tr>
<tr>
<td>% Economic hardship (ELSI) age 30</td>
<td>11.7</td>
</tr>
</tbody>
</table>