Show Me the Child at Seven II: Childhood Intelligence and Later Outcomes in Adolescence and Young Adulthood

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Abstract

Background. There has been ongoing interest in the role of intelligence in longer-term educational and occupational achievement and social adjustment. The aims of this study were to examine the extent to which IQ in middle childhood (8-9 years) was prognostic of future outcomes when due allowance was made for confounding personal and social factors. **Methods.** Data were gathered on (WISC-R) IQ at ages 8-9 years and a range of educational and social adjustment measures over the course of the Christchurch Health and Development Study, a 25-year longitudinal study of a birth cohort of 1265 New Zealand children. **Results.** IQ assessed at ages 8-9 years was related to a range of outcomes: later crime (offending, arrest/conviction); substance use disorders (nicotine dependence, illicit drug dependence); mental health (anxiety, suicidality); sexual adjustment (number of sexual partners, pregnancy); educational achievement (school leaving qualifications, tertiary qualifications) and occupational outcomes (unemployment, income). However, intelligence was largely unrelated to many of these outcomes; crime, mental health, sexual behaviours, and illicit substance dependence after statistical adjustment for early behaviour problems and family background. Strong relationships remained between childhood intelligence and later educational and occupational outcomes. **Conclusions.** Much of the association between early intelligence and later social adjustment is mediated by childhood conduct problems and family social circumstances. However, strong relationships exist between early intelligence and later academic achievement and income independently of these factors.

Keywords. Intelligence, psychosocial adjustment, crime, substance use disorder, mental health, sexual behaviour, educational achievement, longitudinal study.

Introduction

This is the second in a series of two linked papers in which we examine the linkages between personal adjustment in middle childhood (7-9) years and later outcomes in a birth cohort of over 1,000 New Zealand children studied from birth to age 25 years. As the main title of our papers shows our principal concern is to examine the extent to which characteristics in middle childhood are predictive of later development. In the first paper in this series we examined linkages between conduct problems in middle childhood and later outcomes including crime, substance use disorders, mental health, sexual behaviours and educational attainment (Fergusson, Horwood, & Ridder, in press). The results of this analysis suggested that early conduct problems were prognostic of a wide range of outcomes that spanned crime, mental health, substance use and sexual adjustment. However, these problems were not related to longer term academic success when due allowance was made for intelligence and other factors related to early conduct problems. We concluded that aside from intelligence perhaps, early childhood conduct problems exerted the strongest and most pervasive linkages with longer term development. In this second paper we expand on this claim by reporting on a detailed exploration of the linkages between intelligence in middle childhood and longer-term social and educational development. The background to this analysis is developed below.

The measurement of intelligence has a controversial history dating back to the works of Albert Binet, Francis Galton and Charles Spearman (Brody, 2000). Despite debate about the measurement of intelligence (e.g. Gould, 1984), it is now widely accepted that: (a) intelligence tests are positively correlated with each other and measure intelligence well (Gottfredson, 1997); (b) intelligence tests are not culturally biased (Gottfredson, 1997; Herrnstein & Murray, 1994); and (c) intelligence tests measure, amongst other things, a single factor known as general intellectual ability or 'g' (e.g. Jensen, 1999). In turn, there has been a large amount of research that has examined linkages between intelligence and various aspects of personal functioning (e.g. Herrnstein & Murray, 1994; Lynam, Moffitt, & Stouthamer-Loeber, 1993; Moffitt, Gabrielli, Mednick, &

Schulsinger, 1981; Neisser et al., 1996). This research has found that "many social behavior problems including dropping out of school, chronic welfare status, illegitimacy, child neglect, poverty, accident-proneness and crime are negatively correlated with … IQ independently of social class of origin…" (Jensen, 1999).

Perhaps the most comprehensive analysis of this topic was reported in Herrnstein and Murray's book *The Bell Curve* (Herrnstein & Murray, 1994). In this analysis the authors took data from the National Longitudinal Study of Youth and used these data to examine linkages between measured intelligence and a wide range of factors including educational achievement, poverty, schooling, unemployment, welfare dependence, teen pregnancy and crime. In all cases they found that even after control for social and family factors, declining IQ was associated with increasing psychosocial risk. However, a potential limitation of the analyses reported by Herrnstein and Murray was the use of a limited range of control factors that took into account socio-economic and family factors (Neisser et al., 1996). A conspicuous omission from these analyses was measures of other aspects of personal adjustment in childhood. In particular, it has been well documented that IQ is correlated with childhood behavioural adjustment including conduct disorder and attention deficit disorders (e.g. Biederman et al., 1996; Fergusson & Horwood, 1995; Hinshaw, 1992; Rapport, Scanlan, & Denney, 1999). These associations raise the clear possibility that the apparent associations between IQ and later outcomes are, in fact, mediated via childhood externalising behaviours.

The mediation argument implies that when due allowance is made for childhood behavioural adjustment, IQ is no longer associated with later outcomes. In this paper we explore this issue in a study of the relationships between IQ in middle childhood (8-9 years) and measures of psychosocial adjustment in adolescence and young adulthood. The analysis seeks to address two key questions regarding the linkages between intelligence in middle childhood and later psychosocial adjustment:

1. To what extent is intelligence assessed in middle childhood prognostic of later developmental outcomes?

2. To what extent can associations between intelligence in middle childhood and later outcomes be explained by the mediating effects of childhood externalising behaviours?

Method

As explained in paper 1, the data were gathered over the course of the Christchurch Health and Development Study which is a longitudinal study of a birth cohort of 1265 children born in the Christchurch (New Zealand) urban region in 1977. Many of the variables used in the present analysis overlap with the variables used in the previous analysis and in the interests of brevity are summarised only briefly in this paper. An exception to this practice is the description of the measurement of IQ. Since IQ is the variable of central interest we provide an expanded account of the measurement of this variable.

Child IQ (8-9 Years)

Child cognitive ability was assessed at ages 8 and 9 years using the Revised Wechsler Intelligence Scale for Children (WISC-R) (Wechsler, 1974). At each age, children were administered four verbal subscales (information, similarities, arithmetic, vocabulary) and four performance subscales (picture completion, block design, object assembly, coding). The scaled subtest scores were then prorated to provide measures of verbal IQ, performance IQ and total IQ at ages 8 and 9. The total IQ scores were used in the present analysis. The reliabilities of these scores, assessed using split half measures, were .93 at age 8 and .95 at age 9. For the purposes of this analysis the observed WISC-R total IQ scores at age 8 and 9 years were combined by averaging over the years for which IQ scores were available.

It should be noted that for logistical and cost reasons the assessment of child IQ was limited to the sample of children who were resident in the Canterbury region of New Zealand, of which Christchurch is the main urban centre. This sample represented approximately 80% of the total sample of children enrolled in the study at each age. In order to maximize the available sample and

the precision of the data analysis, regression imputation methods were used to provide estimates for missing data on child IQ.

Other Variables

1. *Measures of crime, mental health, substance use disorders and sexual behaviours* were measured using the Methods described in the previous paper (Fergusson et al., in press). However, for the analysis of the effects of IQ a repeated measures design was used examining assessments made at 15-18, 18-21 and 21- 25 years. In contrast, for conduct problems these analyses were limited to the period from 21- 25 years. The principal reason for this difference was that results for conduct disorders prior to 21 had been reported in previous papers (Fergusson & Horwood, 1998; Fergusson & Lynskey, 1998; Fergusson, Woodward, & Horwood, 2000; Woodward & Fergusson, 1999), whereas results for IQ had not.

2. *The measures of educational outcomes* used in this analysis were the same as those described for the previous analysis but there were minor and self-evident differences in the way in which these variables were coded and in the time intervals over which they were assessed.

3. *The covariate factors* used in the previous analysis were included in the present analysis.

Statistical Analysis

Associations between child IQ and outcome measures (Table 1) were tested for significance using the Mantel-Haenszel chi squared test of linear trend for dichotomous outcomes and negative binomial regression for continuous (count) outcomes. The associations were adjusted for confounding by using a generalised estimating equation approach (Liang & Zeger, 1986) in which the repeated observations were pooled over the three measurement periods 15-18, 18-21 and 21-25 years to estimate the population averaged association between IQ and each outcome adjusted for confounding. Associations between child IQ and educational/employment outcomes (Table 4) were tested for statistical significance using the chi squared test of linear trend for dichotomous outcomes and multiple linear regression for mean income. The associations were adjusted for

confounding using logistic regression for dichotomous outcomes and multiple regression for income. In all analyses IQ was classified into five levels as shown in Tables 1, 4. Further analysis (not reported) in which IQ was scored as a continuous variable produced an identical set of conclusions.

Sample Size and Missing Data

The analyses were based on the total samples assessed on outcomes at each age. These samples ranged between 975 and 1052, and represented between 77% to 83% of the original cohort. These samples were compared with the remaining cohort members on a series of socio-demographic factors collected at birth. Comparisons suggested that there were statistically significant ($p<.05$) tendencies for the obtained samples to under-represent children from socially disadvantaged backgrounds characterised by low parental education, low socioeconomic status and single parenthood. To address this, the data weighting methods described by Carlin, Wolfe, Coffey and Patton (1999) were used to examine the possible implications of selection effects arising from the pattern of sample loss. These analyses produced essentially an identical pattern of results to those reported here, suggesting that the conclusions of this study were unlikely to have been influenced by selection bias.

Results

Associations between Child IQ (8-9 years) and Later Personal Adjustment (15-25 years)

Table 1 shows the measure of WISC-R total IQ obtained at ages 8-9 years classified into a series of class intervals ranging from IQ <85 to IQ ≥115. The Table shows measures of social adjustment observed at ages 15-18, 18-21, and 21-25 years. Each comparison is tested for statistical significance using chi square tests of linear association for dichotomous outcomes and negative binomial regression for count measures. The findings lead to the following conclusions:

1. *Crime*: There were consistent trends ($p<.01$) for rates of property/violent offending and rates of arrest/conviction to increase with declining IQ.

2. *Substance dependence*: Associations between IQ and substance use problems varied with the type of substance. IQ was consistently unrelated to alcohol dependence ($p>.40$), and was significantly ($p<.05$) related to illicit drug dependence only in adolescence (15-18 years). However, there was a consistent ($p<.0001$) association between IQ and nicotine dependence, with rates of nicotine dependence decreasing with increasing IQ.

3. *Mental Health*: Associations between IQ and mental health also varied with outcome. The risk of major depression was consistently unrelated to IQ ($p>.35$), but there were consistent tendencies for those of lower IQ to be at greater risk of anxiety disorders. In addition, the rate of suicide attempts was significantly higher ($p<.005$) amongst those of lower IQ, at least up to age 21.

4. *Sexual Behaviours*: There were significant ($p<.001$) tendencies for declining IQ to be associated with increased rates of pregnancy at all ages: these tendencies appeared to be stronger in adolescence than young adulthood. Declining IQ was significantly related to an increased rate of sexual partners in adolescence ($p<.0001$), but not thereafter.

TABLE 1 ABOUT HERE

Covariate Adjustments

Table 2 shows the associations between IQ assessed at ages 8-9 and a series of covariate factors including measures of childhood social and family disadvantage, individual characteristics and behaviour. For a description of these measures see the previous paper (Fergusson et al., in press). Each comparison is tested for statistical significance using linear regression for comparison of means and the chi squared test of linearity for comparison of percentages. The Table indicates that there were clear trends for increasing IQ to be associated with lower rates of childhood conduct problems ($p<.0001$), attentional problems ($p<.0001$) and anxiety withdrawal ($p<.0001$); lower levels

of family socio-economic disadvantage ($p<.0001$); greater family stability ($p<.0001$); lower levels of parental adjustment problems ($p<.0001$); and reduced rates of exposure to child abuse ($p<.01$). These findings raise the possibility that the associations between IQ and later adjustment shown in Table 1 reflected the effects of the social, family and individual factors described in Table 2.

TABLE 2 ABOUT HERE

The associations between IQ and the outcomes in Table 1 were adjusted for confounding covariates using a generalised estimating equation modeling approach. This approach yielded estimates of the population averaged associations between IQ and each outcome pooled over the three measurement periods and adjusted for confounding factors. Table 3 summarises the results of these analyses and shows estimates of the regression coefficients linking IQ to later outcomes: a) prior to adjustment for confounding; b) after adjustment for conduct problems in middle childhood; and c) after adjustment for conduct problems and other family, social and individual factors.

The Table shows that prior to covariate adjustment, IQ was significantly ($p<.001$) related to 6 of the 10 outcomes (property/violent offending, arrest/conviction, nicotine dependence, anxiety disorder, suicide attempt and pregnancy). For these outcomes, adjustment for childhood conduct problems, in most instances, resulted in a substantial reduction in the size of the IQ regression coefficient. However, the adjusted IQ association remained significant in 4 out of 6 cases. The addition of other social, family and related covariates further reduced the IQ associations to the point where 5 of the 6 associations became non-significant. However, a significant ($p<.05$) adjusted association remained between IQ and nicotine dependence, reflecting a modest tendency for those of higher IQ to be less likely to become nicotine dependent even when family social and related factors were taken into account.

TABLE 3 ABOUT HERE

To examine the role of age variations, the analyses in Table 3 were extended to incorporate tests of age by IQ interactions. These analyses showed that for the measures of crime, substance use and mental health there was no evidence to suggest the presence of age related variations in the IQ - outcome association. However, for the measures of sexual behaviour there was evidence of significant ($p<.05$) age by IQ interactions. For pregnancy this interaction appeared to reflect the fact that the IQ association was strongest in adolescence (15-18 years) and declined with age. The estimated adjusted association between IQ and pregnancy remained significant at age 15-18 (B = -.32, se = .12, $p<.01$), and became non-significant thereafter (B = -.12, se = .08, p = .13, 18-21 years; (B = -.04, se = .06, p = .51, 21-25 years). For number of sexual partners, the direction of association changed with age. For age 15-18 there remained a modest negative association with IQ after covariate adjustment (B = -.09, se = .03, $p<.01$), reflecting a higher rate of partnerships amongst those of lower IQ. However, after age 18 there was a modest positive adjusted association with IQ (B = .05, se = .03, $p<.07$, 18-21 years; B = .03, se = .03, p = .26, 21-25 years).

The analyses were further extended to test for gender differences in the association between IQ and each outcome. This analysis revealed only one significant ($p<.05$) gender by IQ interaction for the measure of property/violent offending. For males the estimated covariate adjusted association between offending and IQ was small and negative (B = -.05, se = .03 , $p=.08$), whereas for females the adjusted association was small and positive (B = .10, se = .04, $p<.05$).

Early IQ and Later Educational/Socioeconomic Outcomes

Table 4 shows the associations between IQ at ages 8-9 years and later educational and socioeconomic outcomes. The results suggest:

1. *Educational outcomes*: There were highly significant ($p<.0001$) tendencies for increasing IQ to be associated with increasing educational success, including increased attainment of post school qualifications and higher rates of degree attainment.

2. *Unemployment and income*: There were also significant ($p<.001$) tendencies for declining IQ to be associated with higher levels of unemployment and welfare dependence in young adulthood, and lower income at age 25.

TABLE 4 ABOUT HERE

Covariate Adjustments

The associations between IQ and educational/ socioeconomic outcomes were adjusted for potentially confounding covariates including early conduct problems and family, social and individual factors. The covariate adjusted regression coefficients are shown in Table 5. In the majority of cases (5 out of 6 outcomes) covariate adjustment did not explain the associations between early IQ and later educational and occupational outcomes. For the measures of educational achievement, unemployment and income the associations with child IQ were only partially explained by covariate adjustment. For these outcomes the adjusted associations were consistently stronger than the corresponding adjusted coefficients for psychosocial outcomes observed in Table 2, and all remained significant ($p<.05$). The only exception was for the measure of welfare dependence: the association between child IQ and duration of welfare dependence was totally explained by confounding factors.

The analyses in Table 5 were extended to incorporate gender by IQ interaction terms to test for gender differences in the IQ outcome associations. No significant interactions were detected.

TABLE 5 ABOUT HERE

Discussion

In this paper we have used data gathered over the course of a 25-year longitudinal study to examine the linkages between IQ measured in middle childhood and later educational and psychosocial outcomes. The principal focus of the analysis was on examining the extent to which early IQ was prognostic of later outcomes when due allowance was made for social and individual factors correlated with IQ.

Childhood IQ and Later Personal Adjustment

In agreement with the findings of previous research (Herrnstein & Murray, 1994; Jensen, 1999) there were pervasive, although often modest tendencies, for declining IQ to be associated with increased rates of crime, substance use behaviours, mental health problems, sexual behaviours and early pregnancy. Although these findings are consistent with the view that early IQ exerts a pervasive effect on later personal adjustment, subsequent analysis called that conclusion into question. In particular, adjustment for the effects of correlated conduct problems and social background produced results showing that declining IQ was associated with significant increases in risk for only one outcome: nicotine dependence. For all other outcomes including crime, other substance dependence, mental health and sexual behaviours, the negative associations between these outcomes and IQ could be explained by the correlated effects of early behaviours and social background. The major implications of these findings were that low intelligence in the absence of early conduct problems and social disadvantage was not associated with detectable increases in crime, mental health problems, substance dependence or risky sexual behaviours.

However, further exploration of age and gender interactions suggested some exceptions to these conclusions. Specifically, the analysis suggested that declining intelligence was associated with increased sexual risk-taking (early pregnancy, multiple sexual partners) in those under the age of 18. In addition, there was a weak relationship between crime and declining IQ in males but not females. Despite these exceptions, the weight of the findings suggest that when due allowance was

made for early conduct problems and social background, early IQ was largely unrelated to later crime, substance use disorders, mental health and risky sexual behaviours.

In turn, these results raise important questions about the processes which link early conduct problems and IQ. Three explanations seem possible. First, it may be suggested that the association arises because of common genetic, social and familial processes that are related to both intelligence and conduct problems. This explanation has some support to the extent that the range of factors known to be associated with IQ (e.g. socio-economic status, parental education, family functioning), is similar to and overlaps considerably with the range of factors associated with the development of conduct problems (Farrington, 1995; Fergusson & Horwood, 1995; Loeber, 1990; Maughan & Rutter, 1998).

A second explanation is that the linkage between intelligence and conduct problems arises because a predisposition to conduct difficulties is one consequence of low intelligence. This view also has some plausibility to the extent that intelligence may shape the extent to which the individual is able to make moral judgements and discrimination about socially acceptable and unacceptable behaviours (Gottfredson, 1997; Jensen, 1999).

The final explanation is that conduct problems may influence the measurement of intelligence to the extent that individuals prone to difficult, defiant or oppositional behaviours may perform less well on IQ tests simply as a consequence of these behaviours. However, in contrast to the other explanations outlined above there is little evidence to suggest that early conduct problems play this role in the assessment of IQ (Goodman, Simonoff, & Stevenson, 1995).

Determining which of the explanations above hold true is critical to an understanding of the ways in which conduct problems mediate the association between IQ and later personal adjustment. If the association is explained by common genetic, social, family and related factors then the association between IQ and later adjustment is non-causal and reflects the consequences of common factors. If IQ, in some way, influences predisposition to conduct problems then the effects of IQ on later adjustment are causal and are mediated via early adjustment. Finally, if the association

between IQ and conduct problems arises because conduct problems lead in some way to a lower measured IQ, the association between IQ and later adjustment is non-causal and reflects the common influence of early adjustment on both later adjustment and measured IQ.

Childhood Intelligence and Later Educational Achievement, Employment and Income

Also in agreement with previous research, the findings of this study suggested that intelligence measured in middle childhood has pervasive associations with later educational achievement, university entrance, degree attainment, employment and income (Caspi, Wright, Moffitt, & Silva, 1998; Herrnstein & Murray, 1994; Jensen, 1999). In general, increasing IQ was associated with increasing educational success at school, higher rates of post-school educational/ vocational attainment, degree success, lower rates of unemployment and higher income at age 25. Statistical control for a wide range of factors including early conduct problems and family, social and childhood circumstances failed to explain these associations, supporting the view that intelligence had a direct relationship to later educational, occupational and related outcomes independently of other childhood characteristics and family environment.

The collective findings of this analysis suggest that while childhood intelligence had direct relationships with later educational achievement and occupational success, any association with crime, substance use disorders, mental health or sexual outcomes was largely mediated via childhood conduct problems and other factors.

The Developmental Significance of Conduct Problems and Intelligence in Middle Childhood

Taken together the findings of our analyses suggest that early conduct problems and early IQ play a central but complex role as precursors of longer term development. The relationships between these variables and later outcomes appear to fit what we have described in previous papers (Fergusson & Horwood, 1995; Fergusson, Lynskey, & Horwood, 1997) as a “dual pathway” model. In this model, early conduct problems are precursors of later adjustment including crime,

mental health, substance use and sexual behaviour but are not directly related to later educational or occupational outcomes. Any association between conduct problems and educational outcomes is mediated by the correlated effects of IQ and attentional problems. Conversely, early IQ is a precursor of later educational achievement, employment and earnings. However, early IQ is not directly related to later crime, mental health, substance use and sexual behaviours. Any association between IQ and later adjustment is mediated by the correlated effects of early conduct problems. This dual pathway structure has been evident over the course of this study (see for example, Fergusson & Horwood, 1995; Fergusson & Lynskey, 1998; Fergusson et al., 1997) and appears to reflect a robust developmental relationship between middle childhood and later life. Furthermore, the findings of the central role of early conduct difficulties and early intelligence as precursors of longer term developmental outcomes clearly resonate with the major emphases of much of the childhood prevention literature that has focussed either on modifying or mitigating the adverse longer term consequences of low IQ or conduct difficulties in childhood. The present study provides a clear confirmation of the potential utility of effective interventions in these areas.

Limitations of the Present Study

The present study has a number of limitations that should be borne in mind. The most important limitation of the study was that our findings focus on intelligence in middle childhood (8-9 years of age). It has been well documented that changes in IQ occur throughout childhood and there is also an apparent variation in the heritability of IQ with this increasing in adolescence (e.g. Jensen, 1999; Plomin & Spinath, 2004). The implications of these developmental changes in IQ are that associations between IQ and outcomes may differ for IQ assessed in adolescence and adulthood.

A second limitation relates to the control of confounding factors that were used in this analysis. Although we have controlled a number of confounding factors, it is likely that not all possible confounding factors have been controlled. The likely consequence of failure to control confounding would be to lead to an over-estimation of the effects of early IQ on later outcomes. A

further potential limitation relates to errors of measures in the outcome variables. In most cases these outcomes were based on self-report assessments and as a consequence are unlikely to give completely accurate assessments of outcomes in adolescence and young adulthood.

Finally, the effect of sample attrition raises the possibility that the results may have been adversely affected by sample selection bias. However, as noted in Methods, the use of various approaches to correct for missing data and sample bias suggested that the results were not adversely affected by missing data.

Notwithstanding these caveats, the results of the present analysis suggest two major conclusions about the developmental significance of IQ in middle childhood. First, IQ proves to be relatively strongly prognostic of later educational achievement, occupational outcomes and income. However, early IQ is largely unrelated to later crime, substance use disorders, mental health or sexual behaviours. Any association between IQ and these measures is largely mediated by the associations between IQ and conduct problems in middle childhood.

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Table 1. Associations between child IQ (8-9 years) and measures of crime, substance use, mental health and sexual behaviours (15-18, 18-21, 21-25 years).

	Child IQ (8-9 years)					
	<85	85-94	95-104	105-114	115+	p
Crime						
Property/violent offences (mean)						
15-18 years	10.9	8.7	5.3	4.4	4.3	<.001
18-21 years	5.9	2.0	2.4	1.6	1.6	<.005
21-25 years	1.8	1.1	0.5	0.6	0.5	<.01
Arrested/convicted (%)						
15-18 years	10.8	9.9	7.4	4.1	3.0	<.001
18-21 years	18.7	18.7	14.2	15.6	8.2	<.01
21-25 years	15.8	11.6	10.6	8.7	6.6	<.01
Substance Use						
Nicotine dependence (%)						
18 years	26.4	13.9	14.4	9.5	7.7	<.0001
21 years	36.0	28.3	25.6	19.7	14.6	<.0001
25 years	26.7	30.2	27.8	17.4	10.8	<.0001
Alcohol dependence (%)						
15-18 years	6.8	3.5	8.8	4.1	4.1	.43
18-21 years	4.0	6.6	7.7	5.1	5.3	.97
21-25 years	6.9	5.5	5.1	6.0	4.2	.43
Illicit drug dependence (%)						
15-18 years	8.1	3.5	6.7	3.6	2.4	<.05
18-21 years	5.3	7.1	10.2	6.9	5.3	.88
21-25 years	5.5	7.5	11.7	6.9	6.0	.94
Mental Health						
Major depression (%)						
15-18 years	24.3	23.3	25.0	23.4	23.1	.83
18-21 years	16.7	24.8	27.4	25.7	19.3	.63
21-25 years	22.6	18.1	22.0	21.1	25.2	.38

	Child IQ (8-9 years)					
	<85	85-94	95-104	105-114	115+	p
Anxiety disorder (%)						
15-18 years	35.1	32.7	31.3	25.2	16.0	<.0001
18-21 years	15.3	11.6	15.7	12.8	7.6	.10
21-25 years	23.3	22.1	17.2	15.6	13.8	<.01
Suicide attempts (rate per 100) [1]						
15-18 years	15.5	18.8	6.7	8.6	5.9	<.0001
18-21 years	13.3	6.6	6.2	5.5	3.5	<.005
21-25 years	6.2	6.5	1.8	1.8	4.8	.10
Sexual Behaviour						
Number of sexual partners (mean)						
15-18 years	3.4	3.3	3.0	2.2	2.1	<.0001
18-21 years	4.5	4.8	5.2	5.3	4.8	.40
21-25 years	5.2	5.6	5.7	4.9	6.3	.37
Got pregnant/got partner pregnant (%)						
15-18 years	13.8	7.8	5.9	3.1	2.3	<.0001
18-21 years	26.7	16.2	20.1	11.9	9.9	<.0001
21-25 years	39.0	28.1	31.1	26.6	19.2	<.001

[1] Number of attempts per 100 sample members in each group.

Table 2. Associations between child IQ (8-9 years) and measures of childhood, social and family background, individual characteristics and behaviour

	Child IQ (8-9 years)					
Measure	<85	85-94	95-104	105-114	115+	p
Mean (SD) conduct problems score (7-9 years)	55.3 (10.4)	51.1 (7.8)	49.2 (7.4)	49.0 (6.6)	46.9 (4.4)	<.0001
Mean (SD) attentional problems score (7-9 years)	24.4 (5.9)	21.4 (5.4)	19.5 (4.4)	18.8 (4.1)	17.8 (3.3)	<.0001
Mean (SD) anxiety/ withdrawal score (7-9 years)	28.1 (4.1)	26.3 (3.5)	26.0 (3.7)	25.1 (3.0)	25.5 (3.3)	<.0001
Mean (SD) socio-economic disadvantage score	0.89 (0.72)	0.78 (0.72)	0.57 (0.70)	0.31 (0.57)	0.21 (0.48)	<.0001
Mean (SD) family instability score	1.25 (1.03)	0.86 (0.96)	0.98 (0.99)	0.75 (0.85)	0.66 (0.79)	<.0001
Mean (SD) parental adjustment problems score	0.71 (0.93)	0.55 (0.78)	0.46 (0.72)	0.38 (0.66)	0.37 (0.62)	<.0001
Mean (SD) child abuse score	0.24 (0.51)	0.20 (0.48)	0.21 (0.49)	0.12 (0.36)	0.12 (0.34)	<.01
% Male	51.4	48.7	47.3	48.7	59.0	.19

Table 3. Effects (regression coefficients) of child IQ on later outcomes: a) before adjustment; b) after adjustment for childhood conduct problems; c) after adjustment for all covariates.

	Unadjusted Association		Adjusted for Conduct Problems		Adjusted for All Covariates	
Measure	B (se)	p	B (se)	p	B (se)	p
Crime						
Property/violent offences	-.28 (.02)	<.0001	-.10 (.02)	<.001	.00 (.02)	.87
Arrest/conviction	-.23 (.06)	<.001	-.05 (.06)	.40	-.11 (.07)	.11
Substance Use						
Nicotine dependence	-.28 (.05)	<.0001	-.21 (.05)	<.001	-.19 (.06)	<.01
Alcohol dependence	-.06 (.07)	.42	.02 (.08)	.80	.01 (.09)	.93
Illicit drug dependence	-.06 (.01)	.36	.07 (.07)	.33	.06 (.08)	.44
Mental Health						
Major depression	.02 (.04)	.64	.06 (.04)	.17	.13 (.05)	<.01
Anxiety disorder	-.20 (.04)	<.001	-.17 (.05)	<.001	-.07 (.05)	.18
Suicide attempts	-.28 (.06)	<.001	-.11 (.07)	.13	-.12 (.07)	.11
Sexual Behaviour						
Sexual partners	-.03 (.02)	.13	.04 (.02)	.09	.00 (.02)	.97
Pregnancy	-.25 (.05)	<.0001	-.18 (.05)	<.001	-.10 (.06)	.08

Table 4. Associations between child IQ (8-9 years) and educational, socio-economic outcomes (18-25 years).

	Child IQ (8-9 years)					
Measure	<85	85-94	95-104	105-114	115+	p
Gained school qualifications						
%	41.3	73.1	86.0	95.1	97.7	<.0001
(N)	(155)	(208)	(293)	(224)	(172)	
Gained post-school educational/vocational qualifications (by age 25)						
%	34.3	51.8	60.8	66.5	74.9	<.0001
(N)	(146)	(199)	(273)	(218)	(167)	
Gained university degree (by age 25)						
%	2.1	9.6	22.7	33.5	59.3	<.0001
(N)	(146)	(199)	(273)	(218)	(167)	
Duration of unemployment (18-25 years)						
Mean duration (months)	9.3	6.9	5.2	3.3	4.5	<.0001
(N)	(141)	(190)	(264)	(213)	(167)	
Duration of welfare dependence (21-25 years)						
Mean duration (months)	13.9	8.0	7.9	4.7	6.6	<.001
(N)	(146)	(199)	(273)	(218)	(167)	
Gross income past 12 months (25 years)						
Mean income ($NZ)[1]	23,686	29,588	33,085	32,905	37,433	<.0001
(N)	(145)	(197)	(269)	(216)	(166)	

[1] At the time of writing the exchange rate for the NZ dollar was approximately 1NZD = 0.55 Euros.

Table 5. Effects (regression coefficients) of child IQ (8-9 years) on educational, socio-economic outcomes (18-25 years): a) before adjustment; b) after adjustment for childhood conduct problems (7-9 years); c) after adjustment for all covariates.

	Unadjusted Association		Adjusted for Conduct Problems		Adjusted for All Covariates	
Measure	B (se)	p	B (se)	p	B (se)	p
Gained school qualifications	1.06 (.09)	<.0001	0.95 (.09)	<.0001	0.82 (.10)	<.0001
Gained post-school educational/ vocational qualification (by age 25)	0.40 (.05)	<.0001	0.35 (.06)	<.0001	0.27 (.06)	<.0001
Gained university degree (by age 25)	0.88 (.07)	<.0001	0.80 (.08)	<.0001	0.67 (.08)	<.0001
Duration of unemployment (18-25 years)	-0.22 (.05)	<.0001	-0.18 (.05)	<.0005	-0.14 (.06)	<.05
Duration of welfare dependence (21-25 years)	-0.20 (.06)	<.001	-0.15 (.06)	<.05	-0.01 (.07)	.89
Gross income ($) past 12 months (25 years)	2,966 (562)	<.0001	2,814 (599)	<.0001	1,595 (664)	<.05