PART V
ROUTES TO AND FROM DEPRIVATION

13 Statistical indicators

Introduction

The previous chapters describe the effects of family deprivation on the children. We wished also to study:

1 The effects of living conditions and occupational status upon the families and to do this we used analysis of variance which allowed us to compare differences within and between groups of families.
2 Whether there were patterns of prediction to the Red Spots themselves from their parents, and later patterns between the Red Spots and their own children. Allied to this was the question of the relative effects of the various explanatory variables used in different combinations. For this we used multiple regression analysis (MRA). We tried to use similar sets of explanatory variables and types and numbers of performance measures when studying prediction across the two generations but we could not obtain precise comparability.
3 The susceptibility of children falling into different categories to these influences – for instance, differences in susceptibility of boys and girls.
4 The effects of different factors on performance when the data were presented as proportions in various categories rather than exact measurements. To do this we used log linear analysis.
5 The patterns revealed by MRA, which were revealed using path analysis – an extension of regression techniques.

The effects of pairs of explanatory factors using analysis of variance

We had no difficulty in determining significant differences in the functioning of children experiencing various degrees of deprivation in their families of origin – that is in showing the effects of a single explanatory variable. But we were often

confronted with the problem of determining whether, and to what extent, each of two explanatory variables had an independent effect. An example of this was our desire to understand how much the performance of the Red Spots was influenced by deprivation in early life and how much by occupational class of the family. For this we used two-factor analysis of variance which shows the significant separate effects of each of a pair of explanatory variables and whether there is interaction between them.

Analysis of variance is used to determine whether the average score of a particular measure of performance varies between different groups in a population to a greater extent than by chance. A population may be assessed in several different ways and this allows a determination of whether measures of performance are affected by different influences considered separately or in combination. If there is no interaction between the factors, the measured variance is the sum of the contributions from each factor together with those from other unidentified sources. However, if there is a significant interaction, the effect of each factor is dependent on the value of the other and is therefore not well defined, nor is it possible to simplify the structure of the data. Further, if the explanatory factors are correlated, it is more difficult to determine the effects of individual factors (Iverson and Norpoth, 1976). Ideally there should be equal frequencies of individuals in each of the groups, but in epidemiological research, in contrast to experimental studies, there is less control over numbers. Group frequencies were unequal in our study, thus complicating analyses.

Effects of family deprivation and other factors

Analyses were undertaken to determine the contribution of a range of explanatory factors studied in pairs. The measures of performance or outcome used were ability, achievements, school attendance, behaviour and growth.

Family of origin: deprivation and occupational status

Outcome: ability and achievements We examined various ways of classifying these two explanatory variables, but the overall picture remained the same. We therefore divided the data to give substantial numbers in each category. The

occupational status of the parents of the Red Spots was split into two categories by combining strata: higher status consisted of social classes I, II, and III, while IV and V plus were grouped as lower status. Deprivation in the family of origin was categorized as nil (zero); some (score 1); more severe (score of 2 or more). This division did not coincide with that used in the earlier simple analyses, but was necessary to ensure sufficient numbers in the categories. The data were analysed for boys and girls separately.

The first analysis was of intelligence at the 11-plus examination (Table 13.1). The mean scores of sub-groups varied from 87.8 to 105.3 for boys and 90.5 and 104.4 for girls. For boys there was an evident decrease in mean IQ from families of higher to lower occupational status but this was less clear in girls. However, the decrease in mean IQ across the categories of deprivation was equally steep for both girls and boys.

Table 13.1 IQ of Red Spots at 11-plus examination

	Males			Females		
	Family Occupational Status			Family Occupational Status		
	I, II, III Higher Status	IV, V Lower Status	Total	I, II, III Higher Status	IV, V Lower Status	Total
Deprivation in Family of Origin						
a. Non-deprived	105.3 (n=157)	100.1 (n=40)	104.3	104.4 (n=189)	103.5 (n=26)	104.3
b. One criterion	97.3 (n=38)	92.6 (n=36)	95.0	96.3 (n=47)	96.7 (n=24)	96.5
c. Two or more criteria	92.7 (n=35)	87.8 (n=50)	89.8	92.8 (n=24)	90.5 (n=51)	91.2
Total	102.1	93.1		101.9	95.3	
Analysis of Variance						
Main effects		$p < .001$			$p < .001$	
Effects of explanatory variables due to:						
deprivation		$p < .001$			$p < .001$	
occupational class		$p < .001$			$p < .05$	
interaction		NS			NS	
Residual mean square		158.28			156.22	

This analysis showed that measured intelligence was significantly related to both occupation and family deprivation. Further, the effects of deprivation in boys was similar to that in girls, but parental occupation had a lesser effect for girls. There was no interaction between occupational class and family deprivation, so that the pattern of association between intelligence and parental occupation was similar within all the levels of deprivation.

The second analysis concerned the measure of English ability. In males the findings were similar to those for intelligence, but in females the effects of the explanatory factors were not so clearly defined; the data suggest that there was a strong effect in the case of deprivation in the family, but the effects of parental occupation are complex.

Similar effects were found with arithmetic at the 11-plus, with reading and spelling as rated by the class teacher and with Raven's Matrices and the Mill Hill Vocabulary Test undertaken during the twelfth year. These last two tests, when repeated at 15 years, were significantly affected by deprivation but not by occupational class.

We concluded that deprivation in the pre-school years had a powerful and lasting effect on mental ability and scholastic achievement in both boys and girls. Occupational status of the breadwinner had an important effect on boys but less so on girls, and its effects mostly disappeared by mid-adolescence.

Outcome: school attendance in the last year at school (Table 13.2) The mean attendance of both boys and girls fell as deprivation increased. Boys showed a smaller, but significant, decrease in attendance rate in relation to lower occupational status; however, in girls, this was not statistically significant. Thus deprivation in the pre-school period had a greater effect than occupational status on the school attendance of both boys and girls during their 15th year.

Outcome: teacher ratings of behaviour and temperament; and growth in the secondary school years (Table 13.3) Temperament can be viewed as the manner in which a person behaves, as distinct from the behaviour itself. Deprivation proved to be strongly associated with temperamental qualities of concentration, persistence and initiative and of

Table 13.2 Scho
child

Deprivation in Family of Origin	
Non-Deprived	Mean
One criterion	Mean
Two or more criteria	Mean
Total	Mean
Analysis of Variance	
Main effect	
Effect of explanator variables due to:	
deprivation	
occupational st	
interaction	
Residual mean squar	

Table 13.3 Classr
during
of var

Concentration at age of 15	
Persistence at age of 15	
Initiative at age of 15	
Criminality Index	
Height at age of 13	

Note: Interaction was n

Table 13.2 School attendance of the Red Spot children: last year at school

		Males			Females		
		Family Occupational Status			Family Occupational Status		
		I, II, III Higher Status	IV, V Lower Status	Total	I, II, III Higher Status	IV, V Lower Status	Total
Deprivation in Family of Origin							
Non-Deprived	Mean %	94	93	94	92	89	91
	n	129	34	163	130	46	176
One criterion	Mean %	92	90	91	85	87	86
	n	32	31	63	37	27	64
Two or more criteria	Mean %	87	83	85	81	84	84
	n	31	42	73	21	54	75
Total	Mean %	93	88		90	86	
	n	192	107		188	127	
Analysis of Variance							
Main effect			$p < .01$			$p < .01$	
Effect of explanatory variables due to:							
deprivation			$p < .01$			$p < .01$	
occupational status			$< .05$			NS	
interaction			NS			NS	
Residual mean squares			54.84			85.18	

Table 13.3 Classroom temperament and behaviour during secondary school years: analysis of variance

		Main Effects	Deprivation in Pre-School Years	Occupational Status of Parents
Concentration at age of 15	Boys	$p < .01$	$p < .01$	NS
	Girls	$p < .01$	$p < .01$	NS
Persistence at age of 15	Boys	$p < .01$	$p < .01$	NS
	Girls	$p < .05$	$p < .05$	NS
Initiative at age of 15	Boys	$p < .01$	$p < .05$	NS
	Girls	$p < .01$	$p < .01$	NS
Criminality Index	Boys	$< .01$	$< .01$	NS
Height at age of 13	Boys	$< .01$	$< .01$	$< .01$
	Girls	$< .01$	NS	NS

Note: Interaction was not significant in any of the analyses.

delinquent and criminal behaviour in males during both secondary school years and in early adulthood, whereas occupational status had no effect. Neither deprivation nor occupational status had an effect on emotional stability as rated when the boys were 12 years of age. While deprivation exerted a small, but significant, effect on height of boys at age 13, none was apparent in girls, and occupational status as we have grouped it had no effect.

Deprivation in family of origin at five and 10 years of age in relation to performance in adolescence

An important question was whether family deprivation before five years of age exerted effects independent of deprivation continuing during the child's junior school years. However, we appreciated that, as these variables were correlated, the analysis could only provide clues about their relative importance. The effects are summarized in Table 13.4 where it appears that deprivation in the pre-school years was the more important factor overall for temperament,

Table 13.4 Summary of effects of deprivation at five and ten years on later mental abilities and behaviour: analysis of variance

		Main Effects	Effects Due to Deprivation at 5 Years	Effects Due to Deprivation at 10 Years
IQ at 11+ examination	Boys	$p < .01$	$p < .01$	NS
	Girls	$< .01$	$< .01$	NS
Reading at 11+	Boys	$p < .01$	$< .01$	NS
	Girls	$< .01$	$< .05$	NS
Concentration at 15	Boys	$< .01$	$< .01$	NS
	Girls	$< .01$	$< .05$	NS
Criminality	Boys	$< .01$	$< .05$	NS
Height at 13	Boys	$< .01$	$< .05$	NS
	Girls	$< .05$	NS	$< .05$
Mill Hill Vocabulary at 15 years	Boys	$< .01$	$< .01$	$< .01$
	Girls	$< .01$	$< .01$	NS
Prog. Matrices at 15 years	Boys	$< .01$	$< .01$	NS
	Girls	$< .01$	$< .05$	$< .01$
School attendance at at 15 years	Boys	$< .01$	$< .01$	$< .01$
	Girls	$< .01$	$< .01$	NS

Notes: 1. Interaction never significant.
2. Persistence and concentration gave patterns similar to concentration.

criminality and growth. However, later deprivation had important effects on intellectual ability measured in the fifteenth year, Mill Hill scores in boys and Raven's Matrices in girls, and also on school attendance of boys.

Deprivation at five and 10 years in relation to functioning in adult life
The areas studied were:

1 social factors: unemployment (males only);
2 physical factors: growth (height only);
3 vocabulary ability at age 33;
4 behaviour: dysphoric mood, worries, fears.

There were few positive findings and they have not been tabulated. In men the only significant effect of pre-school deprivation was in relation to vocabulary ability ($p < .05$). In women there were two significant results: pre-school deprivation related to vocabulary quotient ($p < .05$) and to worry about many family problems in adult life ($p < .05$). When all the women (Red Spots and spouses) were studied, adult height was significantly and adversely affected by deprivation before five years of age.

Family deprivation and occupational status (in 1952) in relation to the functioning of children in adult life
Again there were few positive findings. In male Red Spots, deprivation had only one significant effect, in relation to vocabulary scores. In women, deprivation in the pre-school years had significant effects on vocabulary scores, height, and an index of the worries of wives about family stress. Occupational status, as we have defined it, has no such effect.

Deprivation in both family of origin and formation and adult performance in the family of formation
This analysis was confined to the following four features of psychological functioning in adults:

1 an index of 'worry';
2 an index reflecting depressed mood in women;
3 an index of 'fear' in women (not tabulated);
4 vocabulary ability.

In women, deprivation in the family of origin always had a lesser effect than deprivation in the family of formation. While the effect of the former was significant only in relation to vocabulary ability ($p < .05$), the effect of the latter was highly significant in relation to worrying and depressed mood ($p < .01$) but less so in relation to vocabulary ability ($p < .05$). On measures of psychological functioning in men there was either a lack of significant effects or there was interaction so that the effects of the explanatory variables were not well defined. Yet, on the Mill Hill vocabulary measure, the effects of deprivation in both families of origin and formation were significant ($p < .01$).

Deprivation and other factors in relation to the third generation

The behaviour, growth and ability of the first-born children of school age in the families of formation were studied in relation to the following factors:

1 deprivation in the family of formation;
2 deprivation in the family of origin;
3 occupational status;
4 recent life events;
5 an index of parental vocabulary level (the average of the father's and mother's score for each child (see Tables 13.5 and 13.6).

The pictures for boys and girls were similar and have been combined.

Table 13.5 summarizes the effects on behaviour at home (parental report of antisocial behaviour) and at school (Rutter antisocial scale), reading ability and vocabulary and non-verbal quotients. None of the factors had a significant effect on growth and this has been omitted. Deprivation in the family of formation was the most important factor affecting reading, verbal and non-verbal intelligence and behaviour, at home but not at school; occupational status and parental vocabulary level had some effect, particularly in relation to the cognitive variables and parental occupational status in relation to antisocial behaviour at home for boys, but not for girls. Deprivation in the family of origin and recent life events had no effects.

Table 13.5 Influence of deprivation and other factors on children of family of formation (analysis of variance)

Explanatory Factors	Antisocial Behaviour Home	Antisocial Behaviour School	Reading	Non-Verbal Quotient	Vocabulary Quotient
1. Deprivation at 33	> .05	NS	< .01	< .01	< .01
Deprivation at 5	NS	NS	NS	NS	NS
2. Deprivation at 33	< .01	NS	< .01	< .01	< .01
Life Events at 33	NS	NS	NS	NS	NS
3. Deprivation at 33	< .05	NS	< .01	< .01	< .01
Occupational class 32	NS	< .05	< .01	NS	NS
4. Deprivation at 33	< .05	NS	< .01	< .01	< .01
Parents Vocabulary level at 33	NS	NS	< .05	< .01	NS
5. Deprivation at 33	NS	NS	< .01 [interaction]	< .05	< .01
Occupational class 32	NS	NS	< .01 [interaction]	NS	NS
Parents Vocabulary level at 33	NS	NS	< .05	< .01	NS

Note: None of the explanatory factors had a significant effect on growth.

Table 13.6 Reading ability of children: family of formation

		Deprivation in Family of Origin			
	Non-Deprived	0	1	2 or more	Total
Deprivation in Family of Formation	One criterion	112.8	109.8	101.9	109.1
	Two or more criteria	96.3	103.6	94.8	97.0
	Much	99.3	92.0	91.7	92.9
	Total	104.5	100.1	94.2	

Not surprisingly, all the significant effects of deprivation in the children of the third generation were in relation to their own families' recent deprivation. Thus antisocial behaviour increased from no deprivation to multiple deprivation less in relation to the family of origin than to that of formation. More impressive was the drop in the mean reading quotient (Table 13.6) being 10.3 points in relation to deprivation in the family of origin but 16.2 in relation to the family of formation. While recent deprivation significantly explained antisocial behaviour within the home, educational achievements and vocabulary level, occupational class of parents explained antisocial behaviour and achievements. Finally, parental vocabulary level explained the children's educational achievements and the non-verbal intelligence but, surprisingly, not their vocabulary level.

So far, we have considered only the first-born children in the families of formation, and it is known that the eldest child may differ significantly from subsequent siblings. We therefore repeated the analyses using the average of the scores of all the school age children in each family as a single outcome variable. The most important effect of this change was in relation to antisocial behaviour of boys at school (Rutter scale). The average scores were higher than for the eldest boys (Table 13.7) and deprivation in both the families of origin and formation had significant effects ($p < .05$).

Table 13.7 Mean 'antisocial' scores and degree of deprivation

	Eldest Boys	All Boys
No deprivation at 33	0.88	1.06
One criterion at 33	1.08	1.38
Two or more criteria at 33	1.85	2.19

Prediction by multivariate analyses

Some theoretical considerations

This section is concerned with the relationship between a

group of explanatory variables and a number of performance variables. The association of these variables can be studied by calculating correlation coefficients between each of the explanatory variables and each of the measures of performance. However, prediction of performance is better studied by multiple regression analysis.[1]

Multiple regression analyses were carried out using selected sets of explanatory variables to predict a range of measures of subsequent performance. Stepwise regression was used to identify the most important predictors within the set of explanatory variables in relation to each measure of performance and to compute the proportion of the total variance accounted for by each of these. These proportions were summed for each predictor across the complete set of performance measures to give an indication of the relative importance overall of the various predictors within the set. These totals are shown in graphical form in Figures 13.1 to 13.4. While such visual presentations of data have a degree of imprecision and roughness, they facilitate comparison without any grave distortions.

The interpretation of the results of multiple regression analysis is complex for several reasons. First, there is likely to be some variation in numbers of children studied – for example, some of the children may have been ill on the day of the 11-plus examination and must therefore be excluded from that analysis. While the quantity of missing data may be slight it may give rise to some distortion in the findings. Second, a high proportion of the total predictive power may be contained in a few of the variables employed, and so selection from all available predictive measures will be necessary. However, it is occasionally possible to combine groups of related variables so that a group may be represented by one overall score. Third, high correlation between the various explanatory variables, ('multi-collinearity'), may give rise to serious estimation problems (Iverson and Norpoth, 1976). There are two possible solutions i.e. either combining highly correlated predictive variables or discarding one or more of the variables. Interpretation is therefore not straightforward.[2]

Findings: prediction of performance of the Red Spots in childhood

Analysis including all available families (the total group) It proved possible to use the maximal samples of 560 to 780 families and their children – the numbers being dependent on the completeness of the data (Figures 13.1 and 13.2). There were maximally 14 explanatory and 13 performance variables as follows:

A. 14 Explanatory Variables: 'Red Spot' Families, 1952

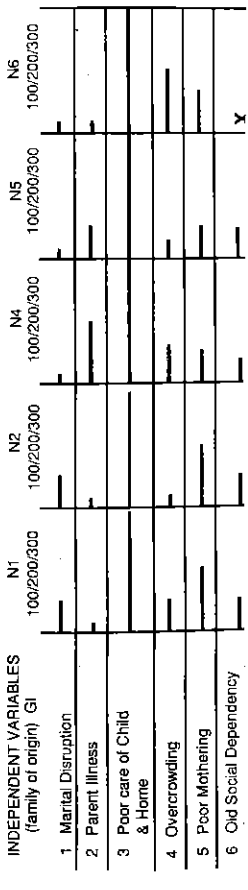
- 7 indices of deprivation
- Age of mothers of Red Spots when married
- Birthweight
- Ordinal position in family
- Occupational class
- Home ownership
- Unemployment
- Sex of child

B. 13 Performance Variables During School Years

• Mental ability and achievement	4
• School attendance	1
• Growth (height and weight)	2
• Behaviour	3
• Temperament	2
• Attitude to school	1

The analyses show that the explanatory variable with the greatest sum of the proportions of variance with regard to the 13 performance variables was poor care of the child followed by ordinal birth position. Others of importance are occupational status, home ownership and poor mothering. The proportion of the variance attributable to the set of variables was up to 25 per cent in relation to the mental ability variables, with smaller proportions in relation to growth and least in relation to behaviour variables.

It was also helpful to study the pattern of importance of the different explanatory variables in relation to the main measures of performance during the school years. For



INDEPENDENT VARIABLES (family of origin) GI	N1 100/200/300	N2 100/200/300	N4 100/200/300	N5 100/200/300	N6 100/200/300
1 Marital Disruption					
2 Parent Illness					
3 Poor care of Child & Home					
4 Overcrowding					
5 Poor Mothering					
6 Old Social Dependency Index					X
7 New Social Dependency Index	X	X	X	X	
8 Unemployment	X	X	X	X	
9 Mother's Age					X
10 Birth Weight					X
11 Occupational Class					
12 Home Ownership					
13 Ordinal Position					X
14 Sex of Child		X	X		
Note X= not included in the analysis	All Families	All Families With Girls	All Families With Boys	All Deprived Families	All Families Includes New Unemployment Index
'N' = Size of Population	568 to 780 A	279 to 336 B	277 to 395 C	250 to 330 D	592 to 691 E

Figure 13.1 Prediction of performance (Generation I to II in the school years) Multiple regression analysis by stepwise procedure. Sum of coefficients of prediction of all significant independent variables (see text)

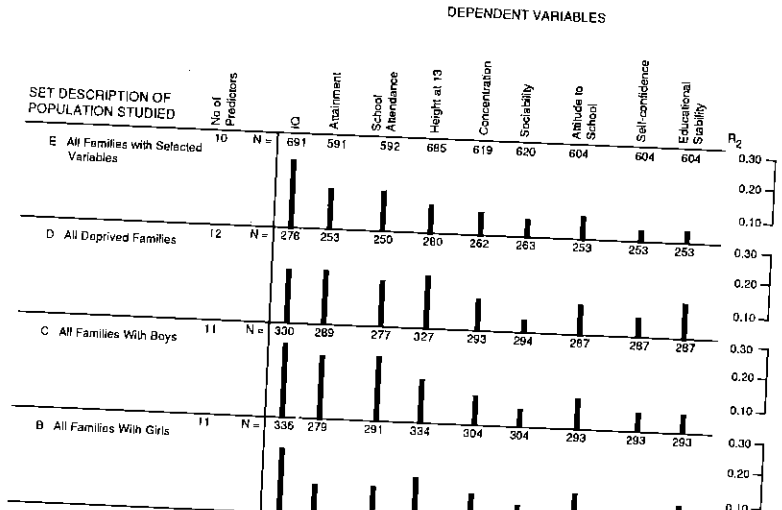


Figure 13.2 Prediction of performance – some dependent variables: Generations I–II

instance, poor care of the child and ordinal position were good predictors both of intellectual ability and child behaviour. Birthweight was a good predictor only of growth. Prediction of behaviour also varied according to the sex of the child, probably because deviant behaviour is more common in boys.

Analysis confined to boys during their school years (Figures 13.1C and 13.2C) In this analysis only eleven explanatory variables were used. The most important explanatory variable proved to be poor care of the child and home followed by ordinal position. Other variables of some importance were

occupational class and home ownership and parental illness. This predictive set accounted for more than 25 per cent of the variance for intellectual ability and school attendance, but accounted for little of the variance of behaviour.

Analyses confined to girls during school years (Figures 13.1B and 13.2B) The pattern proved similar to that found for boys with impressive contributions of poor care and ordinal position, but the total effects of the explanatory variables were smaller than with boys. Furthermore, while social factors appeared to make a relatively smaller contribution to overall prediction, poor mothering assumed greater importance.

Analyses confined to deprived families (Figures 13.1D and 13.2D) The best overall predictor was poor care of the child; second was ordinal position; third was birthweight but only in relation to later height and weight. Occupational status did not emerge as important and we think that this was a result of its truncation in the sample which contained few families in the upper social strata. The proportion of variance accounted for by the explanatory variables was not great, being at best 20 per cent in the case of intellectual ability and height.

The contribution of unemployment (Figures 13.1E and 13.2E) In order to study the independent contribution of unemployment as an explanatory variable in the 1950s, the social dependence index was divided into residual social dependence and unemployment. However, these proved of little importance and the contribution of unemployment was probably submerged by its correlation with other associated adverse social influences.

Predicting the performance of the children of the Red Spots

For these purposes we used the 179 families with first-born children of school age and a similar set of variables to that used before:

1 the six criteria of deprivation;
2 occupational status;

3 home ownership;
4 family size;
5 age of mother at first marriage or cohabitation;
6 birthweight;
7 sex of child.

We would have preferred to use performance measures identical to those in the previous analyses but the best we could achieve was broad comparability: mental ability and achievement were represented by vocabulary, non-verbal reasoning and reading abilities; growth by height and weight (in standard form); school behaviour by neurotic and antisocial subscores (Rutter B2) and school attendance; behaviour at home by neurotic and antisocial behaviour scores (Kolvin *et al.*, 1975); and temperament by withdrawal and irregularity scores (Garside *et al.*, 1975).

The different types of performance variables relating to children were thus:

	Generation I to II	Generation II to III
Mental ability	4	3
School attendance	1	1
Growth	2	2
Behaviour	3	4
Temperament	2	3
Attitude to school	1	1
Total	13	14

Analysis including all available families (total group)

The most important predictor overall was occupational status (Figure 13.3), followed in turn by mother's age at first marriage, inadequate physical care of the child and home, birthweight and poor mothering. The remaining variables made little contribution to the overall pattern.

This predictive set accounted for a considerable proportion of the variance of vocabulary ability (36 per cent), non-verbal ability (20 per cent) and reading (25 per cent) (Figure 13.4). The proportion of variance accounted for in relation to behavioural and temperamental performance proved small. We noted which explanatory variables best predicted specific measures of performance: occupational class predicted intellectual functioning and antisocial behaviour; poor mothering

INDEPENDENT VARIABLES	100/2
1 Marital Disruption	X
2 Parent Illness	X
3 Poor care of child & house	—
4 Overcrowding	X
5 Poor mothering	—
6 Educational Insufficiency	X
7 Old Social Dependency Index	—
8 New Social Dependency Index	X
9 Unemployment	X
10 Mother's Age at Marriage	—
11 Birth Weight	—
12 Occupational Class	—
13 Home Ownership	—
14 Family Size	—
15 Sex	—
16 Pregnancy Reaction	X
17 Deprivation Summed Index	X
18 Index of Management Techniques	X
19 Recent Life Events	X
20 Separation Index	X
21 Marital Problems	X
22 Family Worries	X
23 Maternal Disturbance	X
Note X = not included in the analysis	All Famil

Figure 13.3 *Predictio regressio Generati*

predicted behavioural weight predicted only

Varying the predictors

First, we divided social other indices of so educational disadvanta 13.3N2 and 13.4N2). N social dependency ind

INDEPENDENT VARIABLES	N1 100/200/300	N2 100/200/300	N4 100/200/300	N5 100/200/300	N6 100/200/300
1 Marital Disruption	X	–	X	X	X
2 Parent Illness	X	–	X	X	X
3 Poor care of child & house	—	—	X	X	X
4 Overcrowding	X	–	X	X	X
5 Poor mothering	—	—	X	X	X
6 Educational insufficiency	X	—	X	X	X
7 Old Social Dependency Index	–	X	X	X	X
8 New Social Dependency Index	X	–	X	X	X
9 Unemployment	X	–	X	X	X
10 Mother's Age at Marriage	—	—	—	—	—
11 Birth Weight	—	—	—	—	—
12 Occupational Class	—	—	—	X	X
13 Home Ownership	–	–	X	X	X
14 Family Size	–	–	X	X	X
15 Sex	–	–	–		–
16 Pregnancy Reaction	X	X	—		–
17 Deprivation Summed Index	X	X	—	—	—
18 Index of Management Techniques	X	X	—	—	—
19 Recent Life Events	X	X	—	—	—
20 Separation Index	X	X	–	–	–
21 Marital Problems	X	X	–	X	X
22 Family Worries	X	X	–	X	X
23 Maternal Disturbance	X	X	–	–	–
Note X = not included in the analysis	All Families	All Families	All Families	All Families	Deprived Families Only

Figure 13.3 *Prediction of performance (multiple regression analyses by stepwise procedures): Generations II to III*

predicted behavioural and temperamental factors: birthweight predicted only growth.

Varying the predictors

First, we divided social dependency into unemployment and other indices of social dependence and also included educational disadvantage in the predictor set (see Figures 13.3N2 and 13.4N2). Neither unemployment nor the residual social dependency index appeared to have any influence.

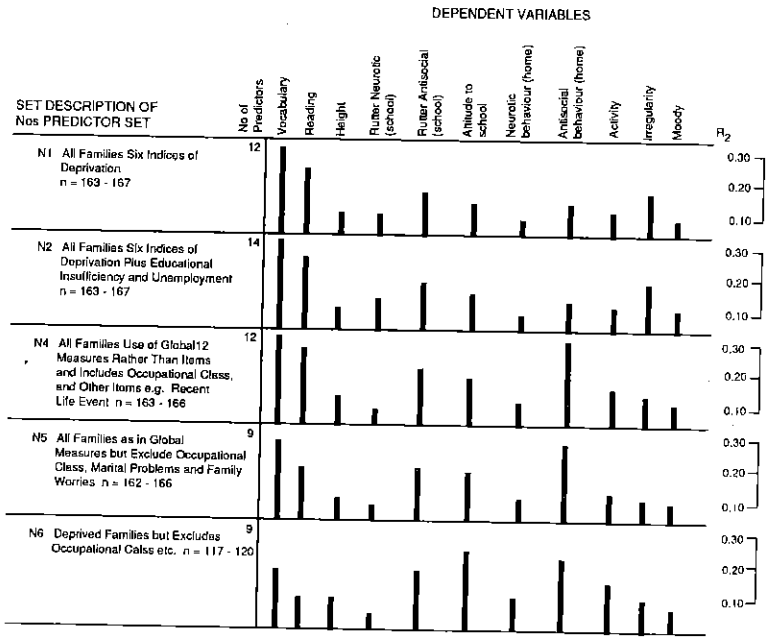


Figure 13.4 Prediction of performance – results of multiple regression analyses by stepwise procedures: Generations II to III

Educational disadvantage gave rise to the second greatest score when the proportions of variance in relation to the different measures of performance were summed, and it appeared to have an important influence on all the intellectual measures. Occupational status remained the most important explanatory variable overall.

All the indices of deprivation were next combined into a single score. Six different parental management techniques which, on theoretical grounds, were considered to be undesirable experiences for children were combined into a

single score. These were smacking, under-use of rewards, exclusion from family setting, not reasoning with the child, and maternal irritability or loss of control. An index reflecting the sum of recent life events and the following individual variables were then added: mother's reaction to pregnancy; separations of child from parents; marital problems falling short of disruption; family worries and psychiatric disturbance. Some of these made so little contribution that we decided to reduce the predictive set to the following 12 main variables (Figures 13.3N4 and 13.4N4): deprivation, summed score; mother's age at first marriage; mother's reaction to pregnancy; birthweight; occupational class; child management techniques, summed score; recent life events; parent-child separations; marital problems; family worries; maternal psychiatric disturbance; sex of child.

Using this second variation of the predictive set, the strongest predictors proved to be occupational class and child management techniques followed in order by the summed deprivation index, mother's age at first marriage and recent life events. The only other predictors of any consequence were reaction to pregnancy and birthweight. This set of predictors accounted for 39 per cent of the variance of vocabulary ability, 36 per cent of home reports of antisocial behaviour and 23 per cent of school antisocial behaviour, but for only 15 per cent of activity level.

The best predictors of individual performance measures were: occupational status predictive of intellectual measures and school reports of antisocial behaviour; poor child management techniques predictive of antisocial behaviour at home and school; the deprivation index predictive of intellectual measures and antisocial behaviour reported by parents; mother's age at marriage predictive of vocabulary level and school attendance; recent life events predictive of school attendance and antisocial behaviour; and pregnancy reaction predictive of performance at school.

The third variation excluded three explanatory variables which correlated highly with deprivation – namely, marital problems, family worries and occupational status (Figures 13.3N5 and 13.4N5). The summed deprivation index was then the most important predictor, followed by child management techniques, mother's age at marriage and recent life events. Birthweight and pregnancy reaction also appeared

influential but at a lower level. This set of predictors accounted for a moderate proportion of variance for vocabulary ability and antisocial behaviour in the home.

Analysis confined to the 'deprived' group (Figures 13.3N6 and 13.4N6)

In this instance the best predictor was child management techniques, followed by recent life events and mother's age at marriage. The deprivation index now had only marginal influence, probably because of the reduction of its variation within the deprived group. However, on this occasion the predictors used accounted for a more impressive proportion of the variance in behaviour than in intellectual performance.

The statistical data were too extensive for detailed reporting but general patterns were identified. The most important predictors of intellectual performance and attainments were the parental standard of education, family size and care of the child and home. The three main predictors of behaviour were care of the child and home, child-rearing techniques and recent life events. Occupational status and family size made some contribution. The only features which predicted temperament were poor mothering and poor child-rearing techniques. Thus it seemed that different predictors mostly predicted different elements of performance.

We judged it important to examine the relative significance of other potential predictors of performance. Unemployment as such did not emerge as a strong predictor; its impact was probably attenuated or submerged by other social and family factors. On the other hand, educational insufficiency of the parents proved a powerful predictor of children's performance. Two other important predictors were poor child management techniques and adverse recent life events, and it was surprising to discover that the mother's memory of distress in pregnancy adversely affected the child's later development while neither early separation nor maternal psychiatric disturbance appeared to contribute to later disturbance of the child. This was against expectations and we do not understand why; perhaps the influence of these variables was submerged in our analyses by more powerful predictors with which they were highly correlated.

From our findings seven key factors emerged and are listed

in historical sequence in relation to the way they might influence child development and behaviour.

Factors	Historical Sequence
1 Mother's age at first marriage or cohabitation	1 Prenatal and later
2 Pregnancy reaction	2 Prenatal
3 Deprivation experiences	3 Early formative years
4 Occupational status	4 Subsequent years and current
5 Educational insufficiency	5 Subsequent years and current
6 Child-rearing practices	6 Subsequent years and current
7 Recent life events	7 Recent times

Many mothers who marry early tend to find themselves in poor economic and social circumstances early in their marriage, yet the correlations with adverse factors identified are low. Our work highlighted the central role of inadequate care and poor mothering of children, and it is reasonable to suggest that poor mothering skills in the pre-school years subsequently result in inadequate child-rearing practices and thus continue to influence the child's behaviour over the middle years of childhood. Another set of important influences are recent life events which have been found to have powerful effects both in childhood and adulthood.

Also important is the impact of parental socioeconomic status at either end of the scale. Middle and higher occupational scores are likely to be associated with greater verbal and educational stimulation in childhood. We have already reported a significant association between occupational status and deprivation and suggest that, at the lower end of the occupational scale, the psychological mechanisms are similar to those operating in deprivation – that is, they may bring about their effects through poor child care and mothering. Educational disadvantage in parents is also likely to affect their children through poor stimulation over a wide range of functioning in play, in language and intellectual activities. This will be particularly true in the pre-school and early school years. Yet educational insufficiency is unlikely to act alone, but in combination with other adverse influences.

Prediction of behaviour from factors intrinsic to the child

We have seen how little of the variance of behaviour was accounted for when mainly background psychosocial and family variables were used. It is likely that environmental influences interact with factors intrinsic to the child which themselves must receive consideration in the prediction exercise. For this purpose we chose three factors – temperament, vocabulary and educational attainments – and, in so doing, some performance variables in the previous subsection were transferred to the status of explanatory variables.

Difficult–easy child index

Certain temperamental patterns in children may clash with those of parents, particularly the mother, and result in disturbed behaviour (Thomas and Chess, 1980). To explore this, we decided to combine certain dimensions of temperament – namely mood, overactivity, intensity and irregularity. This constituted our measure of difficult–easy temperament, with a high score reflecting difficulty.

Educational attainment

The literature suggests a relationship between sense of failure at school and the later emergence of behavioural problems.

Language and verbal ability

Poor language development often precedes disturbed behaviour (Fundudis *et al.*, 1979; Richman *et al.*, 1982). Since vocabulary level correlates well with verbal ability and even with general intelligence, we were happy to rely on the Mill Hill Vocabulary Test. For multiple regression analysis we used the following 10 explanatory variables in the predictor set:

1 summed deprivation index;
2 mother's age at first marriage;
3 summed child management index;
4 recent life events;
5 mother's reaction to pregnancy;
6 parent–child separation index;
7 an index of maternal psychiatric disorder;
8 summed child temperament index;

9 child's reading ability;
10 child's vocabulary ability.

We also employed three home-based and three school-based performance measures:

School-based	Home-based
Antisocial score (Rutter scale)	Antisocial score (reports by parents)
Neurotic score (Rutter scale)	Neurotic score (reports by parents)
School attendance problems	Psychosomatic score

Findings The most important predictor proved to be the child's temperament. It predicted behaviour described by the parents as neurotic, antisocial, psychosomatic and school-avoiding. Since temperament was assessed at the same time as behaviour, prediction could well be spuriously inflated by a measure which indirectly reflects behaviour. So while it is likely that temperament is an important predictor of behaviour (Graham *et al.*, 1973), our data are not suitable to test this.

When temperament was excluded, the picture became clearer. The measure of the mother's child management techniques was a good predictor, particularly of antisocial behaviour as reported by mother and teacher. Recent life events was a good predictor of antisocial behaviour as reported by mother, and also of problems with school attendance. Mother's age when first married was the next best predictor, but chiefly for psychosomatic disturbance. A few other explanatory variables proved significant as predictors of antisocial behaviour; they include the summed deprivation index, low vocabulary level and poor reading ability.

The proportion of variance accounted for by the above set of predictors in 132 children was 32 per cent for parent reports of antisocial behaviour, 14 per cent for problems of school attendance and 11 per cent for psychosomatic problems. There were no substantial effects of maternal psychiatric disturbance or reaction to pregnancy and only limited effects of early life parent–child separation. It has to be assumed that any correlation of these latter explanatory

variables with the outcome variables has been absorbed by other predictors.

We concluded that the most powerful influences were insensitive maternal management of children and recent undesirable life events.

Predicting adult family functioning from prior childhood factors

The next task was to examine the ability of factors operating during childhood to predict adult functioning. In this exercise some of the performance variables from earlier sections have been converted to the status of explanatory variables. We selected nine explanatory variables from the pre-school and school periods:

1 accidents before the fifth birthday;
2 classroom concentration/persistence;
3 sociability at school;
4 self-confidence;
5 attitude to schoolwork;
6 school attendance during the fifteenth year;
7 intelligence at age 11;
8 emotional stability;
9 juvenile delinquency.

Outcome variables, all relating to the same children as adults were:

1 the six criteria of deprivation in the family of formation;
2 occupational status in 1980;
3 unemployment;
4 home ownership;
5 wife's age at first marriage;
6 mother's reaction to her first pregnancy;
7 size of family in 1980;
8 mother's techniques of child management;
9 recent life events.

Analyses were undertaken separately for male and female Red Spots and significant predictions are shown in Table 13.8. Only two-thirds of the family 'performance' variables were significantly predicted by childhood 'explanatory'

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Educational insufficie
Occupational class
Unemployment
House ownership
Wife's age at first marri
Pregnancy reaction
Family size
Management technique

Note: Recent life ev
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Table 13.8 Outcome variables in families of the Red Spots as adults significantly predicted by prior childhood factors: percentage of variance

	Males %	Females %
Poor care and cleanliness of the child and home	21	–
Overcrowding	–	19
Educational insufficiency	26	40
Occupational class	31	–
Unemployment	23	–
House ownership	27	32
Wife's age at first marriage	23	–
Pregnancy reaction	34	–
Family size	29	–
Management techniques	25	30

Note: Recent life events, marital disruption, parental illness, poor mothering and social dependence were not significantly predicted.

variables. Significant prediction proved twice as common in males as in females. Only three factors were significantly predicted for both sexes: educational insufficiency, house ownership and the management of children. In males, occupational status, the wife's age at first marriage, wife's reaction to pregnancy, family size, unemployment and poor care of children were significantly predicted; and overcrowding in females. The only criteria of deprivation in Generation II which were predicted by childhood explanatory variables were poor care in men, overcrowding in women and educational insufficiency in both men and women. All the other significant predictions relate to social factors.

There were three important childhood predictors of adult outcome in men: IQ at the 11-plus examination, delinquent behaviour and poor school attendance. Explanatory variables reflecting personality and temperament were less important. In women, the most important predictors were IQ at the 11-plus examination and attitude to schoolwork, with school attendance emerging at a lower level; again, self-confidence and sociability made only a small contribution.

Finally we considered the role of the explanatory variables

in predicting individual measures of performance. The most important was IQ at the age of 11, being predictive of educational disadvantage, occupational status and home ownership in both men and women; in women it also predicted age at first marriage and in men family size. Attitude to schoolwork in girls was predictive of educational disadvantage, child management techniques, family size, overcrowding and age at first marriage. Male juvenile delinquency powerfully predicted the spouse's reaction to her pregnancy, poor school attendance, social dependency in women and unemployment in men. In girls, poor sociability in childhood predicted marital instability, and low self-confidence in adolescence predicted poor mothering abilities. There were two other suggestive predictions in males, first that poor concentration/persistence in adolescence predicted poor mothering of their children by their spouses and, second, that accidents in childhood predicted social dependency in adulthood.

The effects of two explanatory variables in predicting deprivation in the family of formation (Generation II)

We now turn to the use of two explanatory variables to predict the extent of deprivation in the family of formation.

Table 13.9A shows the joint effect of deprivation in the family of origin and the IQ of the Red Spot at the 11-plus examination upon the level of deprivation in the family of formation. The families of formation in our sample were divided into three groups according to the level of deprivation in their families of origin and then subdivided according to the IQ of the Red Spot (> 110, 91–110, < 91). Finally, each of the nine sub-groups was divided again according to the level of deprivation in Generation II.

Both childhood deprivation and IQ at age 11 had important effects on the level of adult deprivation. Taking the two extremes, only 13 per cent of those with good intelligence and no childhood deprivation became multiply deprived as adults; the corresponding figure for those of dull intelligence and multiple deprivation was 48 per cent. Further, few of those with good intelligence, despite some experience of deprivation in childhood, were multiply deprived in adult life, whereas a quarter of those with dull

Table 13.9 Prediction of deprivation in the family of formation from deprivation in the family of origin and IQ at the 11-plus examination

IQ at 11+	Deprivation in Generation II		Deprivation in Generation I: None		Some		Much		Total
			n	(%)	n	(%)	n	(%)	
A Actual Numbers									
> 111	None	0	8	(50)	9	(64)	1	(50)	18
	Some	1 + 2 crit.	6	(38	4	(29)	1	(50)	11
	Much	3 +	2	(13)	1	(7)	0	(0)	3
91–110	None	0	12	(41)	17	(32)	3	(20)	32
	Some	1 + 2 crit.	16	(55)	26	(49)	7	(47)	49
	Much	3 +	1	(3)	10	(19)	5	(33)	16
< 90	None	0	1	(14)	8	(20)	5	(10)	14
	Some	1 + 2 crit.	6	(86)	23	(58)	22	(42)	51
	Much	3 +	0	(0)	9	(22)	25	(48)	34
Total			52		107		69		228
B Predicted Numbers									
> 111	None	0	74		21		2		97
	Some	1 + 2 crit.	56		8		2		66
	Much	3 +	19		2		0		21
91–110	None	0	111		40		5		156
	Some	1 + 2 crit.	149		63		12		224
	Much	3 +	9		23		8		40
< 90	None	0	9		19		8		36
	Some	1 + 2 crit.	56		51		36		143
	Much	3 +	0		21		42		63
Total			483		248		115		846

Notes. 1. Here the categories of deprivation are mutually exclusive.
2. B reflects the reconstituted sample.

intelligence became so. Few without deprivation at five years of age, were in multiple deprivation in 1980, irrespective of their intelligence score at 11 years. Both good intelligence and absence of deprivation in childhood appeared to have good protective effects.

As explained in Chapter 2, the sample of families which we followed up in 1979–80 was biased towards deprivation and

included only about one in eight of the original non-deprived families but one in two of the deprived and two in three of the multiply deprived. It was therefore of interest to reconstitute the original population of 847 families using the appropriate multiplier for each of the three subsamples, and these figures are presented in Table 13.9B. It must be emphasized that these are merely estimates based, in some cases, on very small samples and there may be some distortion.

The figures in Table 13.9 were analysed formally using log-linear analysis which is used when the data consist of proportions rather than measurements and which gives an estimate of the independent effects of each of the explanatory factors and of any interaction between them. The measure of these effects is the Likelihood Ratio Chi Square which is denoted by G2. In this analysis the actual, rather than the estimated, figures were used. The results (Table 13.10) show significant effects for both intelligence ($p < .01$) and deprivation in Generation I ($p < .05$) and no significant interaction. In the same way, we analysed the effects of deprivation in Generation I in combination with other childhood variables.

In all the analyses the effect of deprivation in Generation I was clear to see and statistically significant. In no case was there a significant interaction between the two explanatory variables. The other factors are discussed below.

Intelligence and arithmetic at the 11-plus examination

The picture for arithmetic was similar to that for intelligence and showed the same significant effects.

School-based personality and attitude factors

These factors comprised response in class, initiative, self-confidence and concentration/persistence based on teachers' ratings at the age of 10 years. Concentration/persistence was a composite score obtained by summing two variables. Inspection of the full data (not shown) suggested that these factors were of little importance in the non-deprived but may have had some effect in the case of the multiply deprived group. For instance, fewer of the multiply deprived whose teachers perceived them as good responders (as compared to those who were poor responders) ended up in multiple deprivation in adult life. This was also true of concentration/

Table 13.10

Analysis	n
A	228
B	228
C	207
D	200
E	207
F	207
G	207
H	264
I	256
J	264
K	229
L	228

Notes: Separate
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Table 13.10 Two factor prediction of deprivation in family of formation

Analysis	n	Explanatory Variables	dF	G2	Significance
A	228	Deprivation in Generation I	4	11.10	$p < .05$
		IQ at 11-plus examination	4	11.77	$p < .01$
B	228	Deprivation in Generation I	4	11.68	$p < .05$
		Arithmetic at 11-plus examination	4	15.27	$p < .01$
C	207	Deprivation in Generation I	4	16.34	$p > .01$
		Attitude to school work	4	10.95	$p > .05$
D	200	Deprivation in Generation I	4	10.42	$p < .05$
		School attendance at 15	4	15.08	$p < .01$
E	207	Deprivation in Generation I	4	16.42	$p < .01$
		Response in class	4	4.85	NS
F	207	Deprivation in Generation I	4	12.58	$< .05$
		Initiative in class	4	3.85	NS
G	207	Deprivation in Generation I	4	11.58	$< .05$
		Concentration/persistence	4	8.92	NS
H	264	Deprivation in Generation I	4	37.92	$< .01$
		Occupational class	4	1.86	NS
I	256	Deprivation in Generation I	4	32.05	$< .01$
		Family size	4	NS	
J	264	Deprivation in Generation I	4	29.43	$< .01$
		Accidents to year 5	4	NS	
K	229	Deprivation in Generation I	4	22.42	$< .01$
		Height 1956	4	NS	
L	228	IQ at 11-plus examination	4	29.71	$< .01$
		Occupational class in 1952	4	NS	

Notes: Separate effects of two explanatory variables on deprivation in family of formation using log-linear analysis.
Interaction never significant.

persistence. Furthermore, when poor concentration/persistence in class and multiple deprivation at five years were combined they appeared to contribute to deprivation in the next generation. However, none of the effects was statistically significant.

Attitude to schoolwork was rated by teachers in the fifteenth year. The pattern was the same as in concentration/

persistence, but attitude to school also proved a significant predictor ($p < .05$) of the level of adult deprivation.

School attendance in the fifteenth year
Good attendance at school also seemed to enhance resilience in the face of severe early life deprivation. No one from a non-deprived home who was a good attender at school was subsequently multiply deprived in adulthood. Further, when poor school attendance was combined with multiple deprivation in the early years few escaped deprivation in the family of formation. When applying log-linear analysis, school attendance proved to be strongly predictive ($p < .01$) of the future level of deprivation.

Family factors
Those tested were family size at five years of age and the number of accidents in the first five years. Neither proved a significant predictor of adult deprivation, although inspection of the full data suggested some influence of larger family size among the multiply deprived. It is possible that their effect had been absorbed by family deprivation.

Growth
The child's weight at nine years showed no effect.

Path analysis

Introduction
Our next step was to use path analysis in an attempt to develop a model depicting the ways in which the biological, social and family background variables might influence child development and behaviour. The method consists in proposing a set of causal sequences in which explanatory variables are examined logically in sequence in relation to subsequent growth, intellectual functioning and behaviour. Such a path analysis cannot itself 'elucidate the direction of a causal sequence and therefore it has to be assumed a priori that the causal sequence proposed is correct' (Stevenson and Graham, 1983). Nevertheless it is possible on both theoretical and empirical grounds to propose a series of causal sequences which can be examined using path analysis. Regression and log-linear analyses are based on models describing how

explanatory variables affect performance. Path analysis merely unravels the patterns depicted by these two methods over time.

Some theoretical considerations

Previous intergeneration research seeking evidence concerning relationships or causation has tended to rely on simple bivariate correlations or changes in proportions. Usually these studies have not investigated anything more detailed than the presence or absence of relationships in terms of simple associations between factors. Thus it seemed that a more detailed examination was required, first of the causal processes by which inter- and intra-generation influences operate and, second, of the way in which social, family and environmental factors causally influence a child's development and functioning. In a review, Rutter and Madge (1976, p. 311) pointed out that much of the literature on intergeneration continuities report only the proportion of disadvantaged adults who had disadvantaged parents or children. They consider that these data on their own mean very little and that simple estimates of the extent of intergenerational continuities provide no guide to social policy or political action. Furthermore, Kenny (1979) has demonstrated the pitfalls that can result when simple bivariate correlations alone are used to justify causal links.

This section concerns itself with causal processes which refer to an interconnecting network of causal influences rather than the identification of any supposed single basic cause.

Background to causal path analysis

In most cases, causation involves an interaction between several different types of influences. Thus the causal processes for a specific set of factors, both within and across generations, should be considered as a whole. There are two other considerations. First, the causes are likely to vary according to the type of functioning (such as performance) which is being studied; and second, the process of causation will usually involve a chain of circumstances no one of which can be identified reasonably as direct and basic.

Fuller accounts of the statistical theory of causal modelling or path analysis are available elsewhere (Asher, 1983;

Kenny, 1979; Macdonald, 1977). Path analysis is a technique which structures multiple regression analysis around considered theories. It investigates the causal links *a priori* between measured variables. These proposed, or hypothesized, networks of causal associations are generally referred to as path models. The choice of variables for any model is based both on theoretical knowledge of the area under study, and on substantive reasoning. In the context of this study, such a structure of causal links is termed a psychosocial model. Having generated a psychosocial model a path diagram can then be constructed as a pictorial representation of that model.

Figure 13.5 represents a proposed model and Figures 13.6–13.10 revised models. The unbroken arrowed lines represent causal links where the association between the two factors in question is significantly different from zero. The relevant coefficient is termed a path coefficient. The broken arrow lines represent proposed paths which have been omitted and which

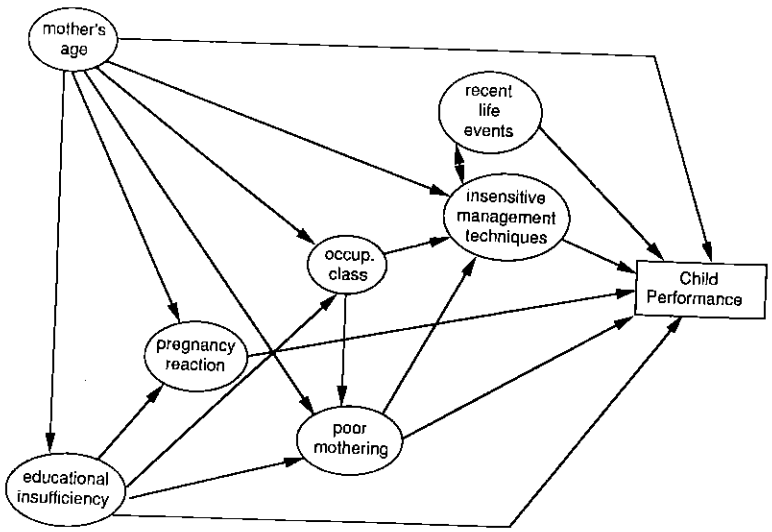

Figure 13.5 *Path analysis: proposed model: child performance*

are, therefore, implicitly set equal to zero. Proposed linkages are omitted if no significant causal association for a proposed linkage emerged from the multiple regression analysis. When two or more predictors are highly correlated (multicollinearity), the result is a very imprecise estimate of the magnitude of their causal influences on performance, and can sometimes result in some of the predictors apparently having no significant causal influence, when in fact they do (Kenny, 1979). The choice of factors to include or to omit, should, as far as possible, be made on logical grounds. The curved double-headed arrow lines represent simple non-causal associations. Their relevant coefficients are termed correlation coefficients. The arrows marked with an E represent all those unspecified factors which may influence the performance variable in question, but which have not been identified or measured and included in the proposed psychosocial model. Their coefficients are termed residual coefficients which, when squared, give the proportion of variance of the performance variable which has not been explained by the proposed predictor or explanatory variables.

A path analysis covering two generations

The independent and dependent variables

This set of analyses concerns itself with studying the way social and family background variables influence child performance and behaviour. For these purposes, the eldest children of school age of the third generation were included in the analyses (Gatzanis, 1985). School age children were selected because two of the areas of child functioning being investigated were specifically concerned with educational attainment (reading) and psychological adjustment (neurotic and antisocial behaviour) as reported by the children's teachers in the school setting. Data were required for all the explanatory and dependent variables under consideration, so that only the 162 Generation II families with complete data could be included in the analysis.

A small number of social and family factors (explanatory variables) were selected on both theoretical grounds and the results of the previous analysis. They were:

1 mother's age at first marriage or cohabitation;

2 mother's reaction to her pregnancy;
3 the quality of mothering (for these purposes the two measures of poor care of the child and poor mothering were summed to give an index of quality of mothering);
4 mother's child management techniques;
5 an index of educational sufficiency of parents;
6 occupational status of the breadwinner;
7 recent life events index – the sum of the negative recent life events.

The third-generation children were assessed in four broad areas of performance:

(a) reading competence;
(b) vocabulary ability;
(c) non-verbal reasoning ability;
(d) psychological adjustment with regard to neurotic and antisocial behaviour in two settings (home and school).

The psychosocial model

A single psychosocial model was proposed and was investigated with respect to six third-generation factors. In the following section, path diagrams are presented only when there were significant causal links to the Generation III factors under study, since the emphasis of this sub-study is to investigate social, family and environmental influences on children's performance. In this model (Figure 13.5), the proposed set of explanatory variables was ordered in a chronological sequence which seemed sensible on theoretical grounds. First came mother's age when first married; next, educational insufficiency, as we have defined it, which may in part be contemporaneous but might also reflect an irresponsible attitude in youth or an unwillingness to seek vocational training; third came lack of occupational success and an adverse reaction to pregnancy; the latter is followed by poor mothering in the infant years and insensitive child management techniques; and, finally, there was the total of adverse recent life events.

It was necessary to establish whether any of the factors in this psychosocial model were so correlated with each other as to distort the patterns that emerge, but in fact the correlations proved only moderate – the highest being

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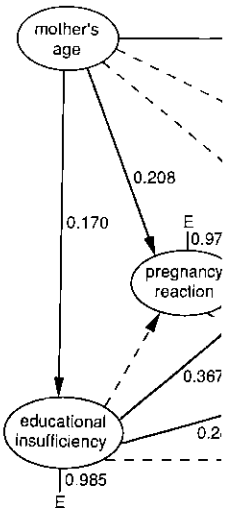


Figure 13.6 Pati
with

between educational insufficiency and occupational class (0.37).

This path model (Figures 13.6–13.10) suggested that factors associated with mother's age at first marriage had an influence on educational and vocational attainments and also on reactions to pregnancy but did not significantly influence the occupational status of the family or the quality of mothering. While educational insufficiency did not significantly influence the reaction to pregnancies, it did influence the quality of mothering and also the occupational status of the breadwinner. Although these patterns were according to expectation, there were some surprises. For instance, mother's age at marriage, occupational class, and poor mothering skills did not appear to be significant prior causal influences of insensitive child management techniques.

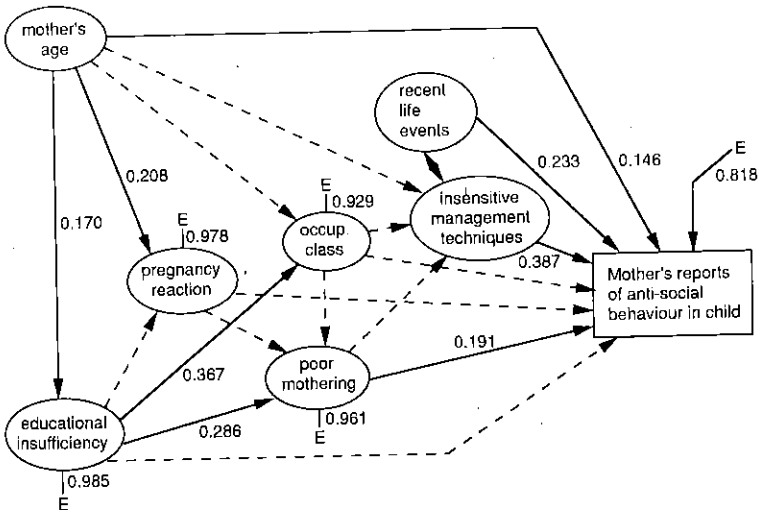


Figure 13.6 *Path analysis: revised model: path diagram with coefficients: antisocial behaviour*

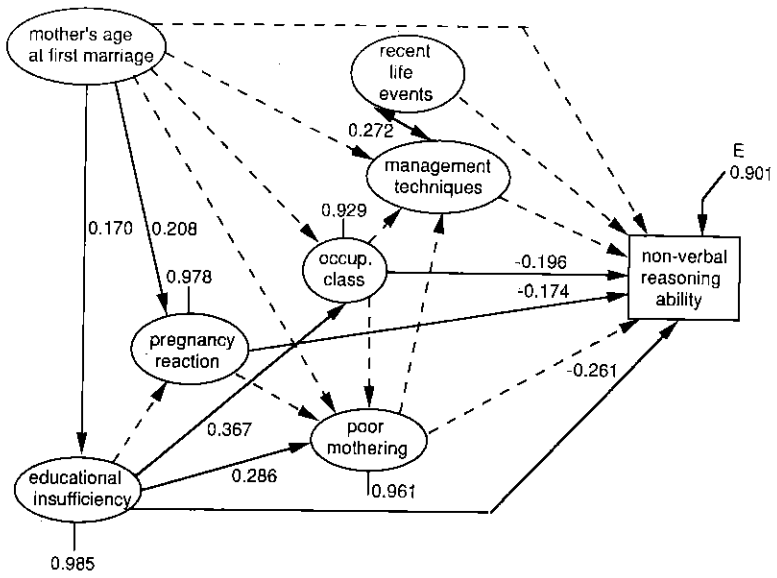


Figure 13.7 Path analysis: revised model: non-verbal reasoning ability

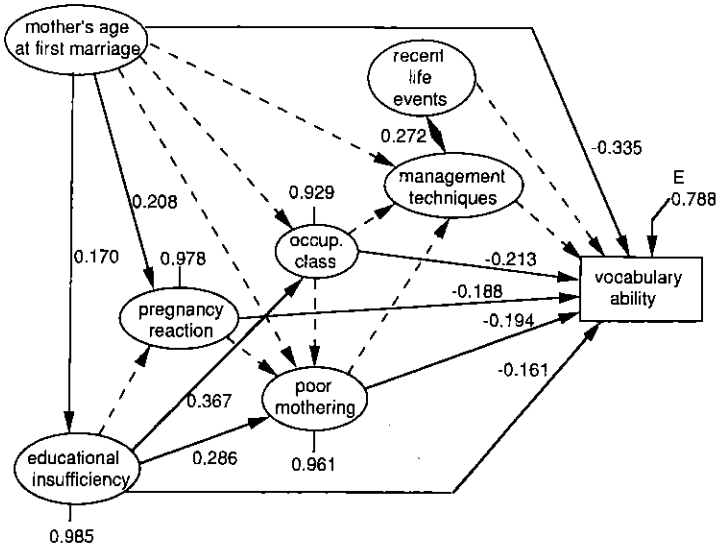


Figure 13.8 Path analysis: revised model: vocabulary ability

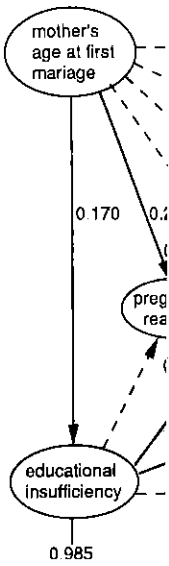


Figure 13.9

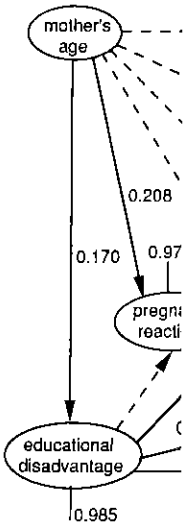


Figure 13.10

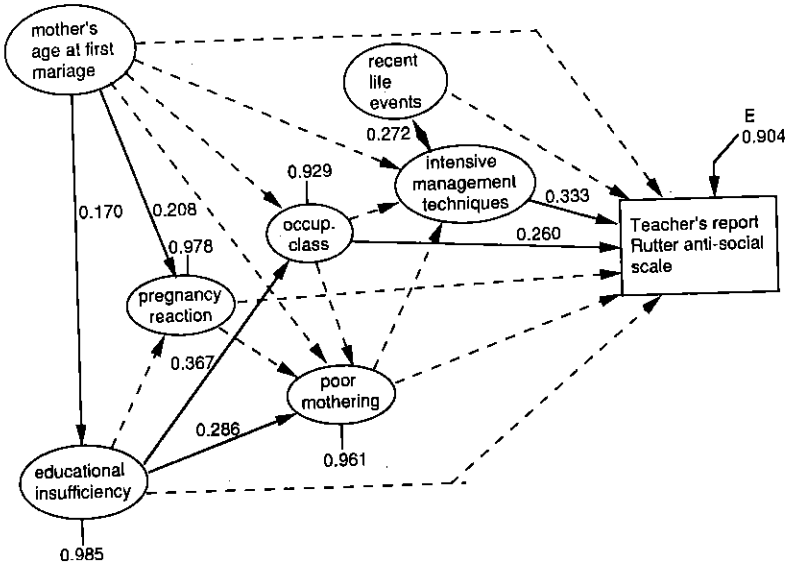


Figure 13.9 Path analysis: revised model: antisocial behaviour (Rutter)

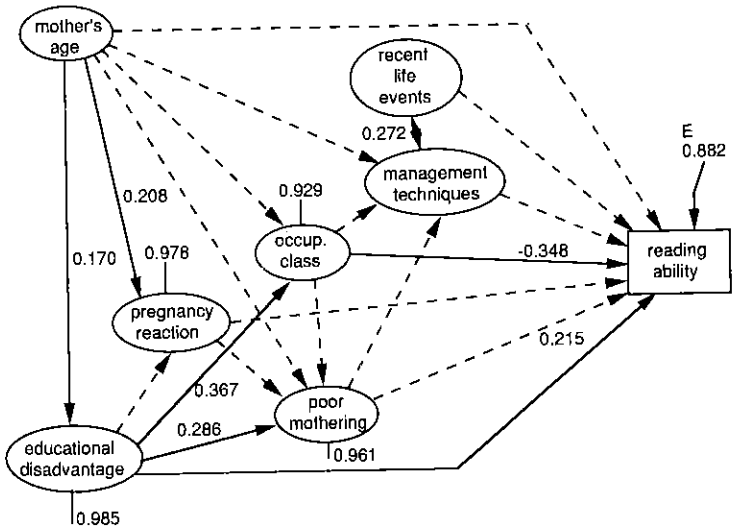


Figure 13.10 Path analysis: revised model: reading ability

The following were the specific findings.

1 Mother's accounts of antisocial behaviour (Figure 13.6) The only significant causal influence which stretched across the chronological sequence of factors was that which extended from mother's age to educational insufficiency, to poor mothering and finally to antisocial behaviour. However, mother's age also had a more direct causal influence, as did insensitive child management techniques. Recent life events also made an important contribution.

2 Non-verbal reasoning ability (Figure 13.7) There were three sets of causal influences which extended across the chronological sequence as follows:

(i) Mother's age at first marriage to pregnancy reaction to non-verbal reasoning ability.
(ii) Mother's age to educational disadvantage to non-verbal reasoning.
(iii) Mother's age to educational insufficiency to occupational class to non-verbal reasoning.

3 Vocabulary ability (Figure 13.8) There were four sets of causal influences, three of which were identical to those described in relation to non-verbal reasoning ability. The fourth passes from mother's age to educational disadvantage to poor mothering and finally to vocabulary.

4 Teacher's reports of antisocial behaviour (Figure 13.9) The causal influence extending across the chronological sequence followed the path from mother's age at first marriage to educational disadvantage, to occupational class and then to antisocial behaviour. Occupational class appeared to be the key mediating explanatory variable. The only other explanatory variable with a causal influence was insensitive child management techniques.

5 Educational attainment (reading ability) (Figure 13.10) The same path as in (4) above emerged as significant. Educational disadvantage also made an important direct contribution and was another path directly extending across the historical sequence.

Path analysis across two generations

The same technique was used to study the influence that social and environmental factors in grandparents and parents (Generations I and II) had on the grandchildren's performance (Generation III). The study was confined to families resident in Newcastle in 1980. Data relating to the Red Spots as children were taken from the 1957 analysis for, at this point, both generations seemed most alike in terms of child-rearing.

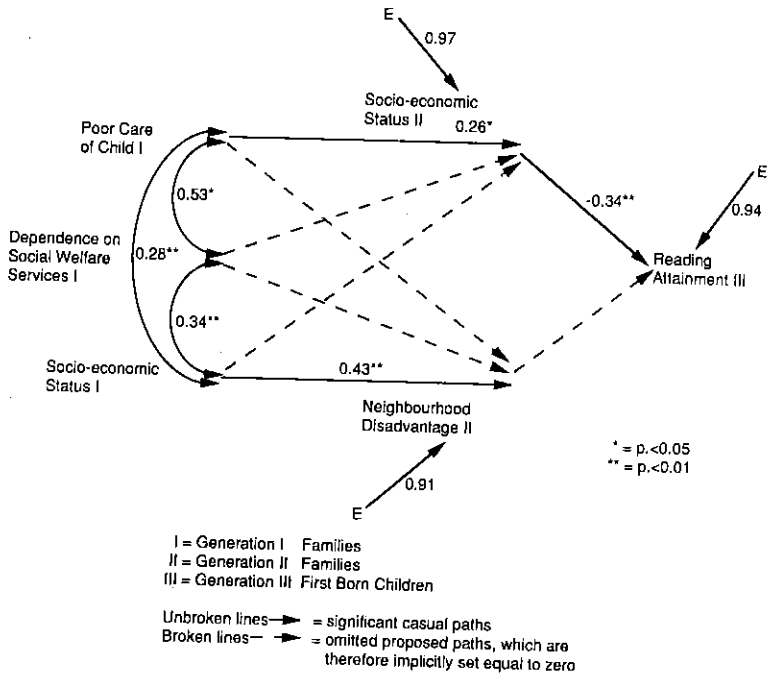
The families selected fulfilled the following requirements: they had lived in Newcastle throughout 1947–80; 95 of the 264 families interviewed fulfilled those conditions and 87 were included in the analysis. Most of the other eight were excluded because the data were incomplete.

The explanatory variables

The explanatory variables selected were socioeconomic status, degree of dependence on social welfare services, level of marital disturbance and the extent to which the child was cared for in his or her home. We also wished to investigate the influence of the neighbourhood environment upon the performance of the children under consideration. To do so it was necessary to have a measure of neighbourhood environment for each of Newcastle City's 26 wards and this is described in Chapter 7. A number of these ward characteristics were selected for investigation. A principal component analysis clearly showed that all the social characteristics of each ward could be reduced to a single composite factor. Thus, each Generation II family was allocated the appropriate composite score for the ward in which they lived, and this acted as a neighbourhood explanatory variable representing social disadvantage for Generation II families.

The proposed models

Two psychosocial models A and B were proposed (Figures 13.11 and 13.16). Each was investigated with respect to each of the nine third-generation performance measures under study. In Model A we examined psychosocial influences in the following chronological sequence: Generation I – poor care of child and home, dependence on social welfare services and occupational class of the breadwinner; Generation II –



(See Gatzanis, 1985)

Figure 13.11 Path analysis: psychosocial model A: reading attainment

occupational class of the breadwinner and an index of neighbourhood disadvantage.

Model B proposed that factors representing poor social and marital functioning were likely to be important mediators of poor care of the child and home. We examined psychosocial influences in the following chronological sequence: Generation I – Stage One – dependence on social welfare services and marital disturbance – Stage Two – poor care; Generation II – Stage One – dependence on social welfare services and marital disturbance – Stage Two – poor care.

Findings concerning psychosocial model A

Model A (Figures 13.11 to 13.15) shows that for five of the

Path Analysis: Psychosocial Model A Child Performance

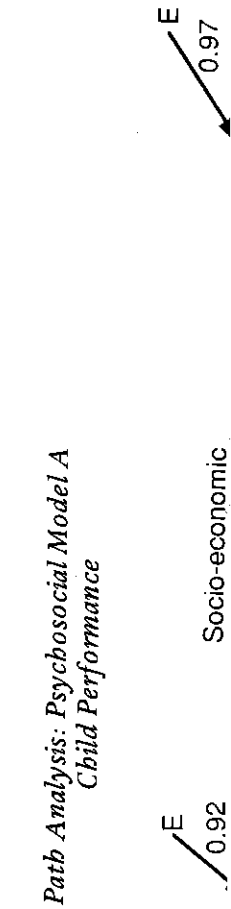


Figure 13.12 Vocabulary ability

Figure 13.13 Non-verbal reading ability

Figure 13.14 Antisocial behaviour at school

Figure 13.15 Neurotic behaviour at home

nine performance measures there appeared to be evidence in favour of intergeneration influences. In these models the occupational status of the child's family seemed to be the immediate prior causal influence on all five performance measures, namely reading ability, vocabulary and non-verbal reasoning ability, antisocial behaviour in school and neurotic behaviour in the home. Thus, for these path models, the occupational status of the child's own family constituted a key mediating variable. Further, the derived measure of neighbourhood disadvantage had no direct or indirect causal influence on any of the measures of child performance under consideration.

We must emphasize that the three first-generation explanatory variables were multicollinear with respect to causally influencing occupational status in the second generation. Therefore, any of the first-generation explanatory variables could have been chosen as the causal influence on occupational status in second-generation families. Although poor care of the child was chosen, we consider that very similar conclusions would have been reached if another first-generation variable had been selected.

Occupational status and neighbourhood influence were analysed simultaneously in every instance of model A, so that the relative influences of the home and the community in determining third-generation performance could be assessed. From the results we concluded that, while the former appeared to exert a powerful causal influence, the latter did not. We do not believe that this means that the neighbourhood has little influence, but rather that any such influence is likely to be overwhelmed by intrafamilial experiences.

Findings concerning psychosocial model B (Figures 13.16 to 13.19)

In contrast to model A, each of the second-generation explanatory variables examined had a specific final pathway to a different area of child performance. The model suggests that, for the four measures of reading attainment, vocabulary ability, antisocial behaviour in school and home, there was evidence of intergeneration influences. Like model A, model B also demonstrated the influence, across two generations, of certain social variables on the reading attainment and vocabulary ability of the first-born children of a third

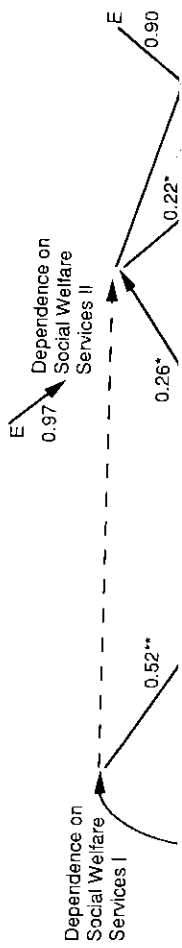


Figure 13.16 Path analysis: psychosocial model B: reading attainment

Path Analysis: Psychosocial Model B: Child Performance

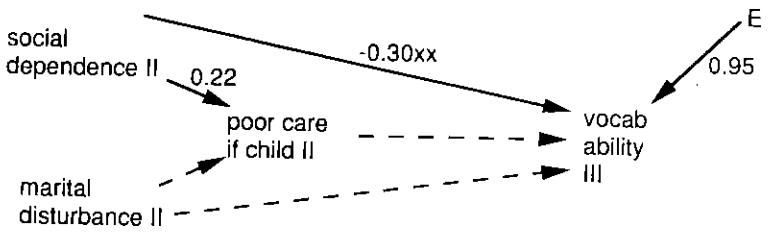


Figure 13.17 Vocabulary ability

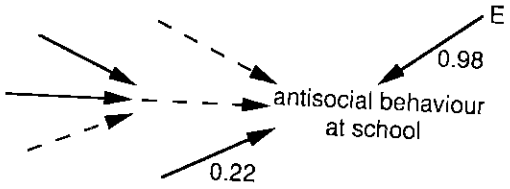


Figure 13.18 Antisocial behaviour at school

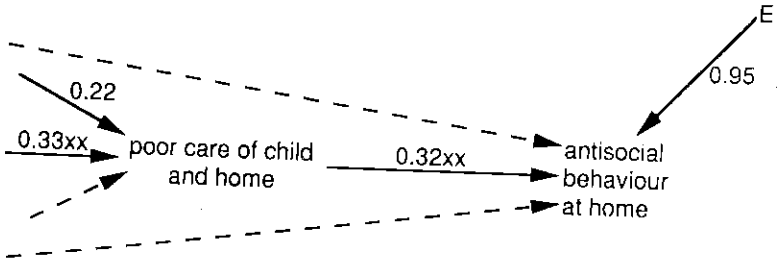


Figure 13.19 Antisocial behaviour at home

generation. Generation I variables of family dependence on social welfare services and marital disturbance had a causal influence on the quality of care experienced by the second-generation children. There also appeared to be a causal association between the experience of poor care as a child on the one hand, and dependence on social welfare services in adult life and poor care of one's own children on the other. The social deprivations of the two previous generations also appeared to be associated causally with lower reading scores and lower vocabulary quotients in third-generation children.

Antisocial behaviour (but not neurotic behaviour), in both the home and the school setting was adequately modelled by psychosocial model B. The prior causal influence on antisocial behaviour in the home was the poor care experienced by the child in that home; but for antisocial behaviour in the school, parental marital disturbance appeared to be a crucial prior causal influence. These results suggested that different aspects of a child's home environment were likely to have different influences on behaviour.

Also evident was intergeneration continuity extending from dependence on social welfare services and marital disturbance in Generation I to the intervening or mediating explanatory variable of poor child care. This in turn extended to dependence on social welfare services and poor care of the child in Generation II.

Some measures of child development and functioning, such as physical growth (height and weight) and neurotic behaviour reported by the child's schoolteacher had no identifiable significant pathways. Three possible conclusions might be drawn:

1 The explanatory measures were not sufficiently sensitive to discriminate between the difference in development.
2 The most appropriate variables were not considered in the models.
3 There were no such influences.

Comment

In this chapter we have examined the effects of explanatory variables using analysis of variance. Our conclusions are as follows:

Concerning the effects of family deprivation and occupational status in the family of origin

Ability and achievements Deprivation in the pre-school years had a powerful and lasting effect on measured intelligence and achievement in both boys and girls. Occupational status of the breadwinner had an important effect in boys but less so in girls, but the effect of family occupational class had mostly disappeared by mid-adolescence.

School attendance Family deprivation in the pre-school period had an important effect on adolescent school attendance both for boys and girls, but occupational status was less important.

Behaviour and temperament Deprivation strongly explained concentration, persistence and criminal behaviour in males, but occupational class had little effect.

Concerning family deprivation at five and 10 years and performance in adolescence and adulthood

Deprivation in the pre-school years proved the more important factor. This finding was considered in terms of adult performance and gave rise to the suggestion that, for boys, deprivation in the pre-school or school years had no substantial implications for adult performance. However, there were wider implications for the girls irrespective of whether the deprivation occurred in their own families or that of their spouses.

Concerning the joint effect of deprivation in the families of origin and formation

Our conclusion was that deprivation in the families of origin had less effect on psychological functioning of the adults of the next generation than current deprivation, and that only the latter had significant effect and then only in relation to women. On the other hand, deprivation in the families of origin had continuing effect on intellectual performance.

The next analysis related to performance in the third generation where all the significant effects were in relation to recent deprivation (such as in the family of formation).

Occupational class of parents explained antisocial behaviour and educational achievements; parental vocabulary ability explained educational achievements and non-verbal intelligence. However, when all children rather than only the first-born were studied, deprivation both in the families of origin and families of formation had significant effects in relation to antisocial behaviour in school.

We then moved to multiple regression analysis to predict the performance of the Red Spots in childhood. The most important explanatory variables were ordinal position and care of the child. In girls, poor mothering assumed great importance in prediction. In deprived families, the best overall predictor was again poor care of the child. Again, occupational status did not distinguish itself as a predictor, nor did unemployment.

We employed the same technique with those families having complete data in order to predict the performance of the children of the Red Spots. The most important predictors in order of importance were occupational status, age of mother at first marriage, birthweight and care of the child. When we varied the prediction set, the strongest predictors were occupational class, child management techniques, summed deprivation index, mother's age at marriage and recent life events.

Discussion: prediction analysis

Do our findings make sense?

We need to ensure that our major findings accord with what is considered sensible both on clinical grounds and from theoretical knowledge. To do so we look particularly at the findings relating to prediction of performance of the Red Spots as schoolchildren since this is based on relatively large numbers in a representative population.

It is well known that the *age of mother at marriage* is related to achievement on intellectual tests (Illsley, 1967; Neligan *et al.*, 1976). In the current study, this relationship is variably confirmed in terms of aspects of intelligence and behaviour. The predictive force of *gender* proved small but widespread in the case of intelligence, growth and antisocial behaviour of the Red Spots as children, which is consistent with previously published reports (Neligan *et al.*, 1976).

However, the influence of gender proved less widespread in relation to performance of children of the Red Spots, with the exception of antisocial behaviour.

In most previous research, *parental occupational status* has assumed a position of central importance in the prediction of all types of performance. The exception is where its influences have been weakened by the presence, in a prediction set, of other factors with which it is strongly associated (Neligan *et al.*, 1976). In the current analysis, home ownership is such a factor. In the Newcastle Child Development Study (Neligan *et al.*, 1976), the background factor of overriding importance was *mother's care of her child* at the age of three as assessed by the city's health visitors. It was therefore reinforcing in the present study to find that assessment of care of the child in the pre-school period proved a most powerful predictor of the performance of the Red Spots as schoolchildren. The well known widespread effects of ordinal position in the family (Illsley, 1967; Davie *et al.*, 1972; Neligan *et al.*, 1976) are confirmed in the current study, and the relatively small importance of birthweight as a predictor in comparison to social and family factors is also confirmed (Neligan *et al.*, 1976). Thus, we think that, in our study, the results of multiple regression analysis make sense both in terms of clinical expectation and previously published findings.

Patterns of prediction: the Red Spots as children

Previous work has emphasized the overriding importance of *poor care of the child and home*. This has also proved true in the current research, irrespective of the way in which the explanatory variables in the predictive sets were varied. Poor mothering in the early years of life also made an important contribution to subsequent performance. Another important conclusion was that *parental unemployment* in the pre-school years made little contribution to prediction of performance of the Red Spots as children.

A third finding was that, when the spread of families across occcupational strata was narrow (as occurred with deprived families), the contribution of occupational class to prediction became minimal. Fourth, our set of explanatory variables appeared to have a more important effect on the subsequent performance of boys than girls.

This may not be surprising, since it is already well known that, in early life, boys are the more vulnerable sex. Finally, the proportion of variance due to the sets of predictive factors was never very high, being more than 20 per cent only in the case of intellectual ability irrespective of how the samples were selected or how the set of explanatory variables varied.

Patterns of prediction: the children of the Red Spots

The sample used in this prediction analysis consisted of a new set of families derived from the combination of the stratified samples of first-generation families whose children were grown up with families of their own.

Poor care of the child and *poor mothering* continued to be important but *occupational status* eventually became of overriding importance. As we had confined the analysis in the third generation to first-born children, we could not study the effects of ordinal position and substituted the variable of family size in 1980, but this did not prove to be a sensitive predictor. On this occasion, mother's age at first marriage proved to be a major predictor. Birthweight again made only a moderate contribution to prediction. In this generation the set of predictors used accounted for a greater proportion of the variance of all types of performance than in the previous generation. It is not clear why this occurred; it may have been due to the nature of our reconstituted study group or the fact that our predictive and outcome variables were all measured at about the same time.

In summary, the patterns of prediction identified proved similar to those found in the previous generation, which strengthens our confidence in the validity of these patterns. It is not difficult to note and understand the causal connections between the predictors and the measures of performance, as already discussed. These analyses provide overwhelming evidence that poor child care and mothering in the early formative years have a powerful negative impact on the behaviour and intellectual development of children.

The prediction of adult family functioning from prior childhood factors

The most powerful childhood predictor of adult performance was poor intellectual ability measured at the age of 11 years.

While it is to be expected that intellectually dull children will do less well at school examinations, and are less likely to obtain vocational qualifications and well paid employment, it is to be noted that dull girls were likely to marry or cohabit earlier. Elsewhere we indicated that young mothers tend to be ineffectual parents. These findings underpin the clinical impression that dullness and immaturity are likely to constitute an unhelpful mix for mothering. A poor attitude to school in girls appeared to have both short- and long-term implications, as did a lack of success in subsequent education, early marriage or cohabitation, having a relatively large family, living in overcrowded circumstances and showing inadequate child management skills. It is also noted that male juvenile delinquency predicted the females' reaction to pregnancy; this suggests that a delinquent propensity may constitute a source of stress in the family, with the wife becoming apprehensive because she may have to care for the child without adequate support. Whatever factors determine poor attitudes to school or schoolwork and bad school attendance, these do not simply cease when the youth leaves school. The data suggest that an explanatory variable such as poor attitude to school may presage poor attitudes to work and thus the possibility of eventual dependency on state social and welfare benefits. In girls, poor social skills in pre-adolescence extends into poor skills in adult relationships; furthermore, the pre-adolescent girls who lack confidence also seem to lack skills (and possibly confidence) in relation to mothering.

Another important predictor in boys is accidents in childhood predicting social disadvantage in adulthood, which suggests that accidents may be a manifestation of social inadequacy in the family which has a tendency to repeat itself in the next generation. Further, poor concentration or impersistence in males (one of the characteristics of the so-called attention-deficit disorder syndrome of childhood) also predicts poor mothering by the spouse in the next generation. One possible explanation is that an attention-deficit disorder in childhood in one generation recurs in childhood in the next, and difficulties in coping with such children may be the basis of mothering problems. Finally, only one of the specified criteria of deprivation (educational disadvantage) was reasonably well predicted. Thus, the

attempt to predict family deprivation from childhood explanatory variables gave moderate success.

The relative effects of two explanatory variables in predicting deprivation

First, few of the Red Spots with good ability or attainment at school, irrespective of exposure to deprivation in childhood, were multiply deprived in adulthood. Second, few of those who had been free from deprivaton in childhood, irrespective of dullness of intelligence or relatively poor attainments at school, were multiply deprived in adulthood. Finally, poor ability combined powerfully with multiple deprivation so that few of those with the double handicap escaped deprivation in their family of formation; more than half were in multiple deprivation in 1980. We concluded that 'non-deprivation' in childhood gave protection irrespective of ability and appeared to enhance resilience.

In addition, we found that responsiveness, initiative, self-confidence and concentration in the classroom all improved the resilience of those youths who had previously experienced deprivation, although none of the effects was statistically significant. However, good attitude to school-work and good attendance at school seemed to increase the resilience of those previously exposed to multiple deprivation and, furthermore, both of these attitudinal factors proved to be significant predictors of later deprivation.

Pathways from Generation I as adults to Generation II

Antisocial behaviour in childhood The mother's young age at marriage, recent life events and insensitive management techniques appeared to have had a significant direct causal influence on antisocial behaviour. Another pathway was identified beginning with mother's age at marriage, passing to educational handicap and then to poor mothering and ending at antisocial behaviour.

Antisocial behaviour in school Here the only direct influence was insensitive child management techniques but, in addition, one significant causal pathway was identified. It began at mother's age at marriage, passed to educational disadvantage, then to occupational class and finally to antisocial behaviour.

Reading One significant causal pathway was identified identical to that described above and another began at mother's age at marriage, passed to educational disadvantage and finally to antisocial behaviour.

Non-verbal reasoning ability (Raven's Matrices) Three significant causal pathways were identified, all starting at mother's age at marriage; the first passed to undesirable reaction to pregnancy then to non-verbal reasoning ability; the second, after educational disadvantage, went to occupational class and non-verbal ability; the third passed directly from educational disadvantage to non-verbal ability.

Vocabulary ability (Mill Hill) The pattern is similar to that for non-verbal reasoning ability. A further pathway extends from educational disadvantage to poor mothering and then vocabulary ability.

Pathways from Generation I to Generation II to Generation III

These have already been fully discussed.

In model A, for reading attainments, the path extended from poor care (GI) to socioeconomic status (GII) to reading (GIII). Similar significant pathways occurred for vocabulary, perceptual ability, antisocial behaviour at school and neurotic behaviour at home.

In model B, for reading attainments, the path extended from social dependence (GI) to poor care (GI) to social dependence (GII) to reading (GIII). A similar path extended from marital disturbance (GI) and thereafter the links were the same.

The pathway was identical for vocabulary ability. For antisocial behaviour at school, the pathway extended from marital disturbance (GI) to marital disturbance (GII) to antisocial behaviour at school. For antisocial behaviour at home, the path extended from either dependence (GI) or marital disturbance (GI) to poor care (GI) to poor care (GII) to antisocial behaviour; a variation of this is from poor care (GI) to social dependence (GII) to poor care (GII) to antisocial behaviour.

The specific mediators of dysfunction have proved to be poor social and family circumstances (socioeconomic status,

social dependence and marital disturbance) and poor care. While we must conclude that an adverse social ambience has an undesirable general effect, it is likely that the nature and quality of parental care is a crucial mediating process.

Limitations of path analysis

One of the major limitations of path analysis is that the causal path often accounts for only a small proportion of the variance. Stephenson and Graham (1983) reported that there were only slender and inconsistent links between indices of adverse family circumstances and subsequent child performance, and the variables which they studied explained only a small proportion of the variance of child dysfunction. Our findings matched this. Nevertheless, it may be partly a reflection of the insensitivity of the explanatory variables included as causal influences. For instance, in the path analyses from Generation II to III the network of clinically relevant variables selected for inclusion accounted for a relatively high proportion of the variance, ranging from 18–33 per cent in respect of behaviour and 19–38 per cent for cognitive measures (Table 13.11). However, when studying causal influences across three generations, we were constrained by our decision to focus on the same explanatory variables or influences operating at similar points in the generation cycle. The explained variance was then substantially less than in the previous set of analyses. For example, vocabulary ability is well explained in the first set of analyses but not in the second.

Table 13.11 Path analysis: proportion of explained variance

	Generations II to III	Generations I to II to III	
	%	Model A %	Model B %
Antisocial behaviour (home reports)	33.1	–	9.8
Antisocial behaviour (school reports)	18.3	7.8	4.0
Reading	22.2	11.6	5.9
Vocabulary ability	37.9	15.4	9.8
Non-verbal ability	18.8	5.9	–

Further, in the model covering three generations, only the measures of occupational status and mothering were included whereas the model covering two generations included at least four other major influences:

1 educational disadvantage (probably a reflection of genetic inheritance as well as social);
2 undesirable child management techniques;
3 undesirable recent life events;
4 a measure of poor maternal competence which itself probably reflects a combination of lower intelligence, inadequate motivation and inadequate strength of personality.

In the circumstances, these findings are not surprising. They mean that the unknown variables responsible for the major part of differences in performance must be different in kind from those that have been measured. This was explained by Heath (1981) who wrote that many variables such as family size, overcrowding, health and employment records may add very little to prediction if they are strongly correlated with the variables already included. To discover more about the unknown sources of variation we must add variables not correlated with those already included.

Like Stephenson and Graham (1983) we concluded that, despite a presumed measurement error and the known relative inefficiency of path analysis for explaining social phenomena (Miller and Stokes, 1975), the results of path analysis are indeed of both theoretical and clinical interest. The techniques contain a potential to clarify the bases of complex networks of causal influences.

Notes

1 Regression does not merely consider the correlations between various predictive measures and subsequent performance but also takes into account the intercorrelations between predictive measures. Any predictive variable may be highly correlated with a measure of subsequent performance and yet have a low predictive weight in regression analysis because it is highly correlated with other predictive measures. The conclusions from these two different methods will not necessarily be identical or even similar. The correlative method considers each explanatory factor individually but tells nothing of the nature of its other associations;

whereas the more complex multiple regression method emphasizes the most predictive variables from a group.

2 For each explanatory variable we obtained a value for the coefficient of determination (R2) which represents the proportion of the total variance accounted for by that variable. The proportion of variance of each predictive measure is obtained by calculating the product of the appropriate correlation coefficient and the standardized partial regression coefficient (Guildford, 1956: p. 398).