



# **GROWING UP IN SCOTLAND:** Children's social, emotional and behavioural characteristics at entry to primary school

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# **GROWING UP IN SCOTLAND:** Children's social, emotional and behavioural characteristics at entry to primary school

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Prepared for the Scottish Government: Children, Young People and Social Care  
Directorate by the Scottish Centre for Social Research

# GROWING UP IN SCOTLAND:

Children's social, emotional and behavioural characteristics at entry to primary school

## ACKNOWLEDGEMENTS

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Responsibility for the opinions expressed in this report, and for all interpretation of the data, lies solely with the authors.

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This report uses data from the Growing Up in Scotland study (GUS) to present a detailed exploration of children's social, emotional and behavioural development during the early years of their lives up to their entry to primary school. The aim of this report is to explore patterns of social, emotional and behavioural difficulties amongst children in primary one and examine how these are related to early familial experiences and earlier assessments of development in the same domains. This report aims to answer a number of distinct research questions:

- What is the extent and nature of social, emotional and behavioural difficulties among Scottish schoolchildren around the age they enter primary one?
- Which children are most likely to have social, emotional and/or behavioural difficulties at entry to primary school?
- To what extent are earlier behavioural difficulties predictive of later difficulties?

#### **The extent and nature of social, emotional and behavioural difficulties**

- At the point of entry to primary school the vast majority of children do not present with any social, emotional or behavioural difficulties as measured via Goodman's Strength and Difficulties Questionnaire (SDQ). Amongst the difficulty scales, on all but conduct problems, over 80% of children return scores within the accepted normal range, that is the range in which most children would be expected to score. 73% do so in relation to conduct problems.
- Between 10% and 27% of children are reported by their parents to have behaviour which places them outside the normal range on any subscale indicating moderate or severe difficulties. These proportions broadly match that which is expected of SDQ scores taken from any community population.
- Conduct problems were the difficulties most prevalent, whereas emotional problems were those least so.

Using cluster analysis, it was possible to divide children into five groups based on their characteristics across the five SDQ sub-scales. The largest groups were those in which the children had no, or only singular difficulties. Two groups of children with more problematic behaviour emerged. One had considerably higher than average hyperactivity/inattention scores along with conduct, peer and pro-social difficulties. The other had higher than average emotional difficulties along with issues around conduct, peers and hyperactivity.

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## Characteristics of children with social, emotional and behavioural difficulties at age of school entry

- The socio-economic characteristics which were related to difficulties at school entry varied according to the subscale being examined. Overall, these socio-economic characteristics had limited bearing on behavioural outcomes at school entry. Level of household income was the measure most consistently related to behavioural development with children in lower income households at higher risk of difficulties with conduct, emotional development and hyperactivity than those in higher income households.
- Health and development factors also affected different behavioural domains in different ways. The condition of the child's general health over the period from age 2 to age 5 was consistently and strongly associated with behavioural difficulties at age of school entry. Children with poorer general health tended to have greater behavioural difficulties than those with better health.
- Delays in motor development at age 2 were associated with having more emotional difficulties at school entry. Delays in language development at age 2 were associated with greater difficulties in hyperactivity and peer problems as well as a high score on the total difficulties scale.
- Parenting factors, such as use of particular discipline styles or taking children on social visits, tended to be more related to issues of conduct and hyperactivity. Those children who experienced no shouting or smacking, higher levels of parent-child social interaction, and a higher frequency of social visits were less likely to score in the problem ranges of conduct and hyperactivity scales.
- No statistically significant differences in difficulty scores were found according to differences in children's age at school entry.

## The continuity of social, emotional and behavioural characteristics

- Children's difficult behaviour tends to decrease, and pro-social behaviour increase as they move from the pre- to primary school stage although the changes are small. Emotional problems show an increase between pre-school and entry to primary.
- There is a strong correlation between a child's total difficulties scores at pre-school and primary school suggesting that the particular social, emotional and behavioural characteristics which children exhibit at pre-school remain, for the most part, at the point they start primary school.
- The strongest correlation in sub-scales occurs on the hyperactivity score suggesting that this is the behaviour least likely to change during that period.

- There were no significant differences in mean SDQ scores between entry to primary one and entry to primary two indicating that children's social and behavioural characteristics remain more similar over the first two years of primary school than they do in the period from pre-school into primary school and that those children who have difficulties in relation to social, emotional and behavioural development at entry to primary school tend to still have them at entry to primary two.

### Conclusion

Most children entering primary school in Scotland do not display any particular difficulties in their social, emotional and behavioural development. However, it is clear that a small proportion of children do have quite severe difficulties at this point and a significant minority (around 21%) display difficulties simultaneously across a range of behavioural domains.

For many children, the difficulties observed at school entry were also present at pre-school whereas for others difficulties developed during the pre-school period. Issues associated with hyperactivity/inattention were considerably more likely to have been present at age 3 and persist through to school entry. Emotional difficulties, in contrast, had a greater likelihood of developing between pre-school and entry to primary school.

These children are likely to respond to the transition to school, and the early and continuing school experience in different ways. Children with hyperactivity and conduct difficulties in particular, may find it difficult to adapt to the educational and social constraints of the classroom impacting on their adjustment, further behaviour and later attainment. Given the often long-term nature of these difficulties, it appears there would be benefit to early screening, in the preliminary pre-school period for example, of these behaviours and their patterns of co-occurrence. Those children displaying difficulties matching the most problematic groupings could, along with their parents, be provided with the necessary support to manage and improve such difficulties. Furthermore, a more tailored transition process to ensure that moving into the school environment does not encourage deterioration of behaviour may be advisable.



chapter  
INTRODUCTION

1

Adequate social, emotional and behavioural development is recognised as being central to a child's success at school. Difficulties with inattention, social interaction and emotion regulation can all provoke a poor reaction to the school environment and experience and ultimately lead to more negative school outcomes. Children who present difficult behaviour on entry to primary school have been shown to have higher truancy rates, poorer peer-to-peer and student-teacher relationships and achieve lower or no educational qualifications than those without such difficulties. Furthermore, a range of research has demonstrated that often, difficulties present early in life are predictive of behavioral issues and other negative outcomes at later stages of childhood, adolescence and beyond (Richman *et al*, 1982; Caspi *et al*, 1996; Moffit *et al*, 1996; Campbell 1994; Shaw, 1996).

The significance of early identification of social and behavioural difficulties is acknowledged by the Scottish Government's Early Years Framework which looks to shift focus from 'crisis interventions' to early years preventative and early intervention work (Scottish Government, 2008). The importance of a successful educational experience and positive development through education is acknowledged in the purpose of the Curriculum for Excellence (The Curriculum Review Group, 2004) which has, at its centre, four capacities seeking to enable children and young people to be successful learners, confident individuals, responsible citizens and effective contributors. Difficulties with social, emotional and behavioural development at entry to primary school will inhibit a child's ability to achieve such capacities.

Longitudinal surveys afford a unique opportunity to study change over time for the same individuals, and to explore the impact of circumstances at one time on long-term outcomes. Whilst there is an abundant research literature around children's social development and the factors which influence it, including exploration of the early years period, little is known about the extent and nature of social, emotional and behavioural development of children *in Scotland* around the time they start primary school. Neither is there much of an understanding of the extent to which the issues and factors which have been shown to influence early social and behavioural development in children elsewhere affect Scottish children in the same way. This is important because legislative powers and policy development in the areas of early years services, child health and education – areas key to supporting children with social, emotional and behavioural difficulties – are devolved. As a result, some services in these areas are structured and delivered differently in Scotland than in the rest of the UK. Developing an understanding of what factors affect early social and behavioural development amongst Scottish children is a focus of this report.

# GROWING UP IN SCOTLAND:

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The Growing Up in Scotland (GUS) study provides a unique opportunity to present a detailed exploration of children's social, emotional and behavioural development during the early years of their lives up to their entry to primary school. Analysis of this data can provide a better understanding of the factors which lead to positive and negative behavioural outcomes upon entry to school. The aim of this report is to explore patterns of social, emotional and behavioural difficulties amongst children in primary one and examine how these are related to early familial experiences and earlier assessments of development in the same domains. This report aims to answer a number of distinct research questions:

- What is the extent and nature of social, emotional and behavioural difficulty among Scottish schoolchildren around the age they enter primary one?
- Which children are most likely to have social, emotional and/or behavioural difficulties at entry to primary school?
- To what extent are earlier measures of behaviour predictive of later measures?

## 1.1 Methods

### 1.1.1 *The Growing Up in Scotland study*

This report is based on analysis of the first four sweeps (2005/06 to 2008/09) of GUS. Commissioned by the then Scottish Executive Education Department (SEED), and managed by the Scottish Centre for Social Research (ScotCen), GUS is a large-scale longitudinal research project aimed at tracking the lives of two cohorts of Scottish children from the early years, through childhood and beyond. Its principal aim is to provide information to support policy-making, but it is also intended to be a broader resource that can be drawn on by academics, voluntary sector organisations and other interested parties. Focusing initially on a cohort of 5,217 children aged 0-1 years old (the birth cohort) and a cohort of 2,859 children aged 2-3 years old (the child cohort), the first wave of fieldwork began in April 2005 and annual data collection from both cohorts has been undertaken since that time.<sup>1</sup>

The analysis in this report uses information from families in the **child cohort** that took part in all of the first four sweeps of GUS. Some families who initially took part in GUS did not do so for all of the subsequent sweeps. All of the statistics have been weighted by a specially constructed weight to adjust for non-response and sample selection. Both weighted and unweighted sample sizes are given in each table. Standard errors have been adjusted to take account of the cluster sampling.

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1 Further information on the design, development and future of the project is available from the study website: [www.growingupinScotland.org.uk](http://www.growingupinScotland.org.uk)

### **1.1.2 Measuring social, emotional and behavioural development**

Social, emotional and behavioural development is measured by administration of the Strengths and Difficulties Questionnaire (Goodman, 1997). The Strengths and Difficulties Questionnaire (SDQ) is a brief behavioural screening questionnaire designed for use with 3-16 year olds. The scale includes 25 questions which are used to measure five aspects of the child's development: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and pro-social behaviour. A score is calculated for each of these domains<sup>2</sup>, as well as an overall 'difficulties' score which is generated by summing the scores from all the scales except pro-social. For all scales, except pro-social where the reverse is true, a higher score indicates greater evidence of difficulties. The data was obtained via parental report, normally the mother, in the computer assisted self-completion module of the interview. Data has been obtained annually since the children were three years old. To date, three sets of data are available measured at age 3 (46 months), age 4 (58 months) and age 5 (70 months).

#### *Constructing a measure of development at age of school entry*

There are two notable issues affecting the SDQ data which is used in this report. First is that the eligibility range for dates of birth in the child cohort and the fieldwork pattern is such that children in the cohort span two school year groups and are interviewed at different points in the school year. This means that children in the cohort entered primary school across two school intakes in different years – around three-quarters in August 2007 and one quarter in August 2008. For some children, primary one data was captured at sweep 3, and for others it was captured at sweep 4. To obtain a measure of development at school entry therefore, has required data to be merged from two sweeps of data collection each corresponding with the child's first year at primary school. Those children whose data is taken from sweep 3 were, on average, younger at school entry than were those whose primary one data was captured at sweep 4. As the spread of age at entry when the two groups are combined is similar to that of any single school year group this is not considered to be problematic. For example, at primary one intake, children in a typical school year group in Scotland will range in age from 4.5 to 6 years old. As can be seen from the discussion in section 3.4 below, and from Figure 3-A, this range is reflected in the GUS data.

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<sup>2</sup> Throughout this report, to avoid over-repetition, the four difficulty sub-scales of the SDQ – conduct problems, emotional symptoms, hyperactivity/inattention and peer problems – will be referred to variously as sub-scales or behavioural domains.

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Secondly, GUS data is obtained from the child's main carer, usually the child's natural mother. Therefore, the data does not present a picture of the child's behaviour at school, as observed by the teacher for example, but instead is a measure of the parent's perception of the child's behaviour and interactions. Validation of the SDQ (Goodman *et al*, 2000) indicates that combinations of parent and teacher information provide the most robust data with the greatest sensitivity. When compared, data from teachers is better at predicting externalising disorders such as difficulties with conduct and hyperactivity, whereas parent reports are better for the detection of internalising disorders related to emotional symptoms. As our data is from parent-report only we may therefore anticipate some under-reporting of difficulties with conduct and hyperactivity.

## 1.2 Structure of the report

Chapter two examines the extent and nature of social, emotional and behavioural difficulties displayed by children in their first year at primary school. This chapter begins by setting out the proportion of children who are reported to have no moderate or severe difficulties in each of the behavioural domains covered by the SDQ. The discussion then moves on to explore, using cluster analysis, the extent to which children exhibit difficulties simultaneously across multiple domains. Chapter three describes the socio-economic, socio-demographic, early development and parenting characteristics of children most likely to display moderate and severe difficulties in each domain at school entry. Finally, chapter four examines the relationship between children's behavioural characteristics at ages 3 and 5 exploring, in particular, how behaviour changes in the period equivalent to the child's attendance at pre-school, and the persistence or development of difficult behaviour during that time.



chapter  
THE EXTENT AND NATURE OF SOCIAL,  
EMOTIONAL AND BEHAVIOURAL DIFFICULTIES

# 2

## 2.1 Key findings

- At the point of entry to primary school the vast majority of children do not present with any social, emotional or behavioural difficulties as measured via the SDQ. Amongst the difficulty scales, on all but conduct problems, over 80% of children return scores within the accepted normal range, that is the range in which most children would be expected to score. 73% do so in relation to conduct problems.
- Between 10% and 27% of children are reported by their parents to have behaviour which places them above the normal range on any subscale indicating moderate or severe difficulties. These proportions broadly match that which is expected of SDQ scores taken from any community population.
- Conduct problems were the difficulties most prevalent, whereas emotional problems were those least so.
- Using cluster analysis, it was possible to group children into five groups based on their characteristics across the 5 SDQ sub-scales. The largest groups were those in which the children had no, or only singular difficulties. Two groups of children with more problematic behaviour emerged. One had considerably higher than average hyperactivity/inattention scores along with conduct, peer and pro-social difficulties. The other had higher than average emotional difficulties along with issues around conduct, peers and hyperactivity.

## 2.2 Prevalence of individual difficulties

Scoring information for the SDQ provides a useful, although acknowledgedly rough and ready, method through which individual scores on each of the scales can be classified as normal, borderline or abnormal.<sup>3</sup> The parameters for each classification are slightly different on each of the scales and are detailed in Appendix 2.

As shown in Table 2.1, at the point of entry to primary school the vast majority of children do not present with any social, emotional or behavioural difficulties as measured via the SDQ. Amongst the difficulty scales, on all but conduct problems, over 80% of children return scores within the 'normal' classification. The remainder on each scale are split fairly evenly between borderline and abnormal classifications. Between 5% and 15% of children have scores which fall within the borderline range in any one scale, and

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<sup>3</sup> Note that within the report, scores in the 'borderline' range are also referred to as 'moderate' and scores in the 'abnormal' range are also referred to as 'severe'.

between 5% and 12% of children are reported by their parents to have behaviour which places them in the abnormal classification. These proportions broadly match that which is expected of SDQ scores taken from any community population<sup>4</sup> and are comparable to those found in earlier Scottish research with a similarly aged, though smaller, sample drawn from Edinburgh and North Lanarkshire (Dunlop *et al.*, 2008). Children were most likely reported to have difficulties in relation to conduct, where a little over one quarter had scores classified as borderline or abnormal. The least prevalent difficulties were related to emotional symptoms, where just 1 in 10 children had a score outwith the normal range. The data also indicates that most children have good pro-social behaviour with just 7% scoring in the borderline or abnormal range for that scale.

**Table 2.1 Classifications and mean scores on all SDQ scales at entry to primary school**

	SDQ scale					
	Emotional symptoms %	Conduct problems %	Hyperactivity %	Peer problems %	Total Difficulties %	Pro-social %
<i>Score</i>						
Normal	90	73	83	85	<b>89</b>	93
Borderline	5	15	7	8	<b>6</b>	5
Abnormal	5	12	10	7	<b>5</b>	2
Mean score	1.4	1.8	3.5	1.1	<b>7.8</b>	8.3
<i>Standard deviation</i>	1.7	1.5	2.3	1.5	4.8	1.6
<i>Standard error</i>	0.04	0.03	0.05	0.03	0.12	0.03
<i>Bases</i>						
<i>Weighted</i>	2069	2067	2062	2063	2056	2067
<i>Unweighted</i>	2074	2072	2069	2068	2063	2072

Taken together, it is unsurprising therefore, that scores on the overall difficulties scale are also concentrated towards the lower end. Whilst the full scale ranges from 0 to 40, the mean score amongst Primary 1 children is just 7.8, well within the 'normal' range of 0 to 13. Indeed, almost 9 in 10 children have total scores within the normal range, 6% have

4 Normative data from British samples is available at [www.sdq-info.com](http://www.sdq-info.com)

scores classed as borderline (a score between 14 and 16), and 5% have scores classed as abnormal (a score of 17 or above). Again, these results broadly match the normative SDQ data in which 8% of 5-10 year olds score within the abnormal range for the total difficulties scale, and where the mean difficulties score is 8.6.

## 2.3 Patterns of shared difficulties

Consideration of the various sub-scales and overall difficulties scores provides a useful indication of the spread of various developmental difficulties amongst children at school-entry age. However, whilst the total difficulties score is indicative of the existence of multiple difficulties, it does not illustrate in what combination and to what extent children exhibit difficulties concurrently in each of the individual domains.

The co-occurrence of problems associated with attention-deficit hyperactivity disorder (ADHD) and conduct disorder (CD) or oppositional defiant disorder (ODD) in childhood have been demonstrated in a range of research studies (see Campbell *et al.*, 2000 for a discussion). A number of these studies indicate further that children with co-occurring conduct problems have more severe and persistent difficulties later in life (Barkley *et al.*, 1990; Weiss and Hechtmann, 1993). Research by Sonuga-Barke and colleagues (1997), for example, showed that pre-school children could be categorised into six groupings based on their scores on the Behavioural Checklist, an instrument similar to the SDQ. The first and largest grouping contained children with no problems and a further three had children with specific but low-level issues. The remaining two groups of children displayed greater conduct problems; for one group this was combined with significant emotional difficulties, and for the other with extreme hyperactivity. Following up the children at age 8, the research found that children in the hyperactive/conduct group were likely to have prolonged problems.

It is pertinent, therefore, to examine patterns of shared difficulties in the GUS data. To do so, cluster analysis was undertaken in an attempt to create identifiable groups of children with similar characteristics across each of the SDQ sub-scales. A description of the cluster analysis is provided in Appendix 3.

### 2.3.1 The five clusters

The cluster analysis produced five 'clusters' of children on the basis in which they shared difficulties, or not, on each of the SDQ sub-scales. Table 2.2 shows the mean individual scores for each cluster on each of the SDQ scales, plus scores for the overall sample. A summary of the behavioural characteristics of the children in each cluster is provided in Figure 2-A.

**Figure 2-A Behavioural characteristics of children in each of the five clusters at entry to primary school**

#### **Cluster 1**

- Children have low pro-social scores but fairly average scores for emotional symptoms, conduct problems, hyperactivity/inattention and peer relationship problems.
- This suggests these children are generally well behaved but perhaps withdrawn and do not make friends easily.
- 17% of children fell into this cluster.

#### **Cluster 2**

- Children have very low scores on emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and high scores for pro-social behaviour.
- This suggests that children in this group are both well adjusted and emotionally secure.
- This is the largest group with 37% of children falling into this cluster.

#### **Cluster 3**

- Children have low pro-social scores and higher than average scores for emotional symptoms, conduct problems and peer relationship problems. In particular their scores for hyperactivity/inattention are very high.
- This is possibly the group of children whose behaviour is most problematic.
- 11% of children fell into this cluster.

#### **Cluster 4**

- Children have average pro-social scores and higher than average scores for conduct problems, hyperactivity/inattention and peer relationship problems. In particular their scores for emotional symptoms are very high; the mean emotional symptoms score is three times as high as the overall average.
- This indicates significant issues in emotional development for children in this group along with a range of other problematic issues.
- 10% of children fell into this cluster.

#### **Cluster 5**

- Similar profile to Cluster 2; high scores for pro-social behaviour and generally low scores for emotional symptoms, conduct problems, and peer relationship problems. Children in this cluster have higher than average scores for hyperactivity/inattention.
- This pattern suggests perhaps that these children are boisterous but do not exhibit particularly challenging behaviour.
- This is the second largest grouping with 25% of children falling into this cluster.

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The majority of children fell into clusters where behaviour was generally non-problematic; 62% are in either cluster 2 or 5 where scores on the problem scales were all or mostly low and pro-social scores high. Only two clusters contain children who exhibit a particularly concerning pattern of shared difficulties. Children in cluster 3 have high scores on all of the problem scales with particularly high hyperactivity scores. Children in cluster 4 also have higher scores on the problem scales, but with particularly high emotional symptoms scores. Around one-fifth of children fell into one of these groups.

**Table 2.2 Mean scores on SDQ scales at entry to primary school by cluster**

SDQ scale	Cluster					
	1	2	3	4	5	All
Conduct problems	2.0	0.7	3.5	2.7	1.8	1.7
Emotional symptoms	0.8	0.8	1.8	4.7	0.9	1.3
Hyperactivity	3.0	1.3	7.3	4.2	4.6	3.4
Peer problems	1.2	0.5	2.2	2.7	0.6	1.1
Pro-social score	6.3	9.3	6.5	8.3	9.0	8.3
<i>% of all children in cluster</i>	<i>17%</i>	<i>37%</i>	<i>11%</i>	<i>10%</i>	<i>25%</i>	<i>100%</i>
<i>Base (unweighted)</i>	<i>377</i>	<i>820</i>	<i>251</i>	<i>220</i>	<i>565</i>	<i>2233</i>

## 2.4 Summary

The vast majority of children do not present with any social, emotional or behavioural difficulties when they start primary school. Between 70% and 80% of children return scores within the accepted normal range on all of the difficulty scales, that is the range in which most children would be expected to score. Only between 5% and 12% of children are reported by their parents to have behaviour which places them within the abnormal range on any subscale indicating severe difficulties. These proportions broadly match that which is expected of SDQ scores taken from any community population. The most prevalent difficulties were related to conduct problems, whereas emotional problems were least evident.

The cluster analysis produced five groups of children based on their characteristics across the five SDQ sub-scales. The largest groups were those in which the children had no, or only singular difficulties. Two groups of children with more problematic behaviour emerged. In cluster 3, children had considerably higher than average hyperactivity/inattention scores along with conduct, peer and pro-social difficulties. In cluster 4, children had higher than average emotional difficulties along with issues around conduct, peers and hyperactivity.



CHARACTERISTICS OF CHILDREN WITH  
SOCIAL, EMOTIONAL AND BEHAVIOURAL  
DIFFICULTIES AT AGE OF SCHOOL ENTRY

chapter

3

# GROWING UP IN SCOTLAND:

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The aim of this chapter is to identify the children most likely to score in the borderline or abnormal ranges of each of the SDQ scales at entry to primary school. Various background characteristics of children are explored spanning socio-demographic, socio-economic, parenting and early child development factors. Whilst a descriptive overview of the types of children scoring in the borderline or abnormal ranges on each scale is provided, multivariate regression analysis was used to determine which characteristics are related to an increased risk of having difficulties in each of the domains when holding other, potentially confounding, characteristics constant.<sup>5</sup>

A range of factors were identified that are likely to be associated with social, emotional and behavioural development in young children (Campbell *et al.*, 2000; Shaw *et al.*, 1996). These factors cover the domains of socio-demographic background, socio-economic characteristics as well as specific issues related to early child development and approaches to parenting. For the most part, these characteristics are only measured once during the period of interest, such as ethnicity or mother's age at the child's birth. However, the availability of longitudinal data from GUS allows consideration of changes in key background characteristics which may affect social development such as change in family type or child health. As such, some measures of these changes have been constructed for consideration in the analysis. Appendix 2 presents a detailed description of all factors and explains how they were measured using the GUS data.

Regression analysis allows the association between an explanatory variable (such as income) and an outcome variable (such as severe behavioural difficulties) to be explored whilst controlling for other variables which may affect behavioural difficulties (such as gender). *All* factors were analysed together using a *single* binary logistic regression model. The same model was run separately for each SDQ sub-scale and for the overall difficulties scale. The outcome variable in each model indicated whether or not the child's score for the respective scale, when measured at school entry, was above the normal range.<sup>6</sup> Thus the analysis identifies which characteristics are statistically significantly related to (or 'associated with') a child having a score in the borderline or abnormal range at school entry. Whilst all variables were included in one model, for clarity the results are presented separately for the different sets of explanatory factors.

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5 The statistical analysis and approach used in this report represents one of many available techniques capable of exploring this data. Other analytical approaches may produce different results from those reported here.

6 The odds ratios from the regression models are included in Table A1.1 in Appendix 1. The interpretation of odds ratios is explained in Appendix 1.

### 3.1 Key findings

- The socio-economic characteristics which were related to difficulties at school entry varied according to the subscale being examined. Overall, these characteristics had limited bearing on behavioural outcomes at school entry. Level of household income was the measure most consistently related to behavioural development with children in lower income households at higher risk of difficulties with conduct, emotional development and hyperactivity than those in higher income households.
- Health and development factors also affected different behavioural domains in different ways. The condition of the child's general health over the period from age 2 to age 5 was consistently and strongly associated with behavioural difficulties at age of school entry. Children with poorer general health tended to have greater behavioural difficulties than those with better health.
- Delays in motor development at age 2 were associated with having more emotional difficulties at school entry. Delays in language development at age 2 were also statistically significant, being associated with greater difficulties in hyperactivity and peer problems as well as a high score on the total difficulties scale.
- Parenting factors, such as use of particular discipline styles or taking children on social visits, tended to be more related to issues of conduct and hyperactivity. Those children who experienced no shouting or smacking, higher levels of parent-child social interaction, and a higher frequency of social visits were less likely to score in the problem ranges of conduct and hyperactivity scales.
- No statistically significant differences in difficulty scores were found according to differences to children's age at school entry.

### 3.2 Socio-demographic and socio-economic characteristics

Table 3.1 illustrates the proportion of children with particular socio-demographic and socio-economic characteristics who scored in the borderline or abnormal ranges of each of the SDQ difficulties scales and the overall scale at school entry. Those figures which are printed in italics were those which did not remain statistically significant when entered into the regression model. Those which are printed in bold did remain significant.

The socio-economic characteristics which were associated with difficulties at school entry – after controlling for other possible confounding factors – varied according to the domain being examined. On the whole however, very few of these characteristics were associated with scores on the scales when other characteristics were taken into account. Level of annual equivalised income was the factor which was most consistently associated with difficulties at school entry. Although the size of the effect varied dependent on the subscale in question, in general those children living in higher income households had a lower risk of difficult behaviours than did those in lower income

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households (Table 3.1). For example, one-fifth of children (19%) in the highest income group had scores in the borderline or abnormal ranges for conduct problems at school entry compared with a little over two-fifths of children in the lowest income group (43%).

Living in a house with siblings appeared to reduce the risk of emotional difficulties at school entry. Children with two or more siblings in the household at age 2 were half as likely as children who were the only child in the household to have an emotional symptoms score in the borderline or abnormal range (8% compared with 15%).

Family type and transitions were associated with conduct problems with lone parenting related to greater conduct difficulties. Forty-four per cent of children in stable and repartnered lone parent families had a conduct score in the borderline or abnormal range compared with 31% of children who experienced parental separation and 23% in stable couple families.

Hyperactivity was the only behaviour affected by the child's gender with boys more likely to have difficulties in this domain than girls; 22% of boys returned a score in the borderline or abnormal range compared with 15% of girls. Ethnicity, on the other hand, was the only socio-economic or demographic factor which was associated with peer problems. Non-white children were significantly more likely to have peer difficulties at school entry than were white children (50% compared with 16%). However, the small size of the non-white sample (unweighted base = 56) means that this result should be treated with caution.

**Table 3.1** Socio-demographic and socio-economic characteristics of children who score in the borderline or abnormal ranges for each SDQ sub-scale and the total difficulties scale at school entry

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties	Weighted	Un-weighted
<b>Sex of child</b>							
Male (%)	31	11	<b>22</b>	18	14	1046	1047
Female (%)	26	12	<b>15</b>	15	10	1047	1016
<b>Mother's ethnicity</b>							
White (%)	29	11	18	<b>16</b>	12	1985	2005
Non-white (%)	24	17	17	<b>50</b>	16	69	56
<b>Age of mother at birth of cohort child</b>							
Under 25 (%)	37	15	26	21	19	503	384
25 - 29 (%)	30	14	21	19	11	468	456
30 - 34 (%)	25	9	13	13	9	654	721
35 or older (%)	22	8	13	13	10	403	476
<b>Number of children in household at age 2</b>							
One (%)	26	<b>15</b>	21	19	14	688	663
Two (%)	30	<b>10</b>	17	14	11	926	955
Three or more (%)	30	<b>8</b>	17	19	11	441	445
<b>Family type transitions from age 2 to 5</b>							
Stable couple (%)	<b>23</b>	9	15	14	9	1450	1577
Couple who separate (%)	<b>31</b>	22	19	18	14	118	112
Stable lone parent (%)	<b>44</b>	17	28	27	21	316	239
Lone parent who repartnered (%)	<b>44</b>	12	30	21	21	172	135
<b>Equivalised annual household income</b>							
1st Quintile (< £11,875) (%)	<b>43</b>	<b>16</b>	<b>30</b>	24	<b>20</b>	474	388
2nd Quintile (≥£11,875<£19,444) (%)	<b>28</b>	<b>14</b>	<b>17</b>	18	<b>14</b>	404	382
3rd Quintile (≥£19,444< £25,625) (%)	<b>25</b>	<b>9</b>	<b>15</b>	13	<b>7</b>	341	360
4th Quintile (≥£25,625< £37,500) (%)	<b>22</b>	<b>9</b>	<b>12</b>	12	<b>8</b>	380	382
Top Quintile (≥£37,500) (%)	<b>19</b>	<b>6</b>	<b>12</b>	12	<b>5</b>	328	382

Note: Figures printed in italics are those which did not remain statistically significant when entered into the regression model. Those which are printed in bold did remain significant.

### 3.3 Parenting approaches and health and development indicators

Factors associated with parenting experience and child health and development were generally more closely associated with behavioural outcomes at school entry (Table 3.2) than were socio-economic and demographic factors.

The condition of the child's general health over the period from age 2 to age 5 was consistently and strongly associated with behavioural difficulties at age of school entry. Those children whose health was reported as fair, bad or very bad *at any point* during that time – that is either temporarily (at any single sweep), or always (at all sweeps) – were more likely to have scores in the borderline and abnormal ranges at school entry. For example, 22% of children who temporarily or always had poorer health had scores in the borderline or abnormal range of the emotional symptoms score at school entry compared with 10% of those who reported no poorer health. Indeed, poor health was a very strong predictor of several social, emotional and behavioural issues.

Delays in motor development at age 2 were associated with emotional difficulties at school entry. Seventeen percent of those who had not achieved three or more developmental milestones at age 2 were reported to have emotional difficulties at school entry compared with 5% of those who had achieved all the milestones. Delays in language development at age 2 were associated with difficulties in hyperactivity and peer problems as well as a high score on the total difficulties scale. Notably, early problems with language development was one of the few factors significantly associated with peer problems; 23% of children who were reported to have language difficulties at age 2 had peer problem scores in the borderline or abnormal range at school entry compared with 14% of those with no language difficulties.

**Table 3.2 Parenting experiences and health and development characteristics of children who score in the borderline or abnormal ranges for each SDQ sub-scale and the total difficulties scale at primary school entry**

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties	Weighted	Un-weighted
<b>Child's general health transitions</b>							
Always good or very good	26	10	16	16	10	1786	1821
Temporarily or always fair, bad or very bad	48	22	35	24	27	269	241
<b>Delay in motor developmental at age 2</b>							
None	25	5	13	15	8	226	223
1 milestone	23	9	17	13	8	371	378
2 milestone	31	11	17	15	9	347	341
3 or more milestones	34	17	23	20	18	479	482
<b>Child's speech difficult for others to understand at age 2</b>							
Yes	35	13	25	23	19	1401	1443
No	25	11	15	14	8	655	620
<b>Use of harsh discipline: birth to age 3</b>							
None	19	11	14	15	9	461	444
Shouting only	34	13	22	13	13	63	62
Smacking only	26	10	18	16	11	911	924
Shouting and smacking	40	14	21	19	15	621	632
<b>Frequency child taken to visit other people with children at age 2</b>							
Fortnightly or more often	27	11	17	15	10	1610	1617
Less often	35	13	24	23	17	442	443
<b>Mean scores on parent-child social interaction scale</b>							
Children with scores in normal range	1.41	1.41	1.42	1.42	1.42	1183	1220
Children with scores above normal range	1.35	1.33	1.28	1.29	1.25	136	125

Note: Figures printed in italics are those which did not remain statistically significant when entered into the regression model. Those which are printed in bold did remain significant.

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Early parenting approaches and experiences were also related to behavioural outcomes at school entry. Use of harsh discipline – that is smacking and shouting – at age 3 was associated with difficulties in conduct and hyperactivity. Children whose parents reported both smacking and shouting were more likely to have difficulties in these domains than children whose parents did neither. For example, 40% of children whose parents used both smacking and shouting had scores in the borderline or abnormal range of the conduct problems scale compared with 19% of children whose parents used neither. Frequency of visits to other households with children was the factor most consistently associated with behavioural outcomes. Those children who had this type of interaction less often than fortnightly, or never, were more likely to score in the borderline or abnormal range for conduct, hyperactivity and peer problems as well as for the total difficulties score. In relation to the peer problems scale for example, 15% of children who experienced this social interaction fortnightly or more often scored in the borderline or abnormal range compared with 23% of children who experienced it less often or never. Low parent-child social interaction was less important, being significantly, but only very weakly, associated with conduct problems and hyperactivity. The direction of the relationship is not clear here. Increased use of harsh discipline, lower levels of parent-child social interaction and reduced visits to other households with children may be responses to already difficult behaviour rather than pre-cursors of it.

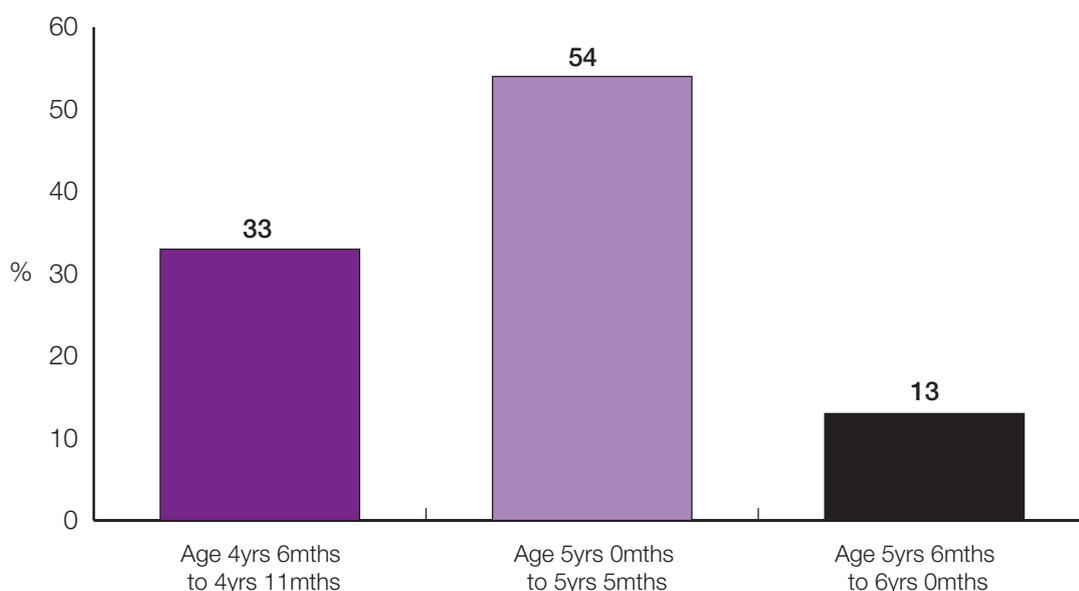
## 3.4 Differences by age at school entry

As acknowledged above, because of the eligible dates of birth in the original sample design, children in the GUS cohort are spread across two school year groups. Thus to explore characteristics of children in Primary 1 meant combining some data from sweep 3, when around one third of the child cohort had started school, with data from sweep 4, when the remainder had started school. Two key differences exist between these groups which may lead to differences in their scores: first, data collection with those children who started school at sweep 3 occurred, for the most part, in the first school term between August and December whereas that for the sweep 4 group occurred in the spring and summer terms. Second, children who had started school at the sweep 3 interview were younger on average at school entry than were those who had started by their sweep 4 interview, and younger at the time of data collection. Seventy-one percent of children who had started school by the sweep 3 interview were under 5 years old when they started, compared with just 12% of those who had started by sweep 4. However, combining data from both sweeps captures the full spread of ages typical of any single school year group at school entry as well as including data from all school terms.

The appropriate age at which children should start school is a subject which has received much research attention including in relation to its effects on later attainment and social development (Sharp, 2002). To look for any such variations in social, emotional and behavioural development, scores on the SDQ were compared according to the age of the child at entry to primary school.

All local authority schools in Scotland begin the new school year in mid-August whilst some independent schools begin in early September. In order to allow age at entry to be calculated, all children who started school at sweep 3 were allocated a standard start date of 15<sup>th</sup> August 2007, with those who started at sweep 4 allocated the date 15<sup>th</sup> August 2008. Figure 3-A displays the distribution of ages at entry to primary one.

**Figure 3-A Child's age at school entry**



As the graph shows, children are more likely to be aged between 5 and 5 and a half when they start primary one than to be 4 or to be older than 5 and a half. However, there is a reasonable spread of ages with around one-third (33%) starting school when aged between 4 and a half and 5, and a little over one in ten (13%) when aged between 5 and a half and 6.

There were no statistically significant differences in the proportion of children whose scores were classified into each of the normal, borderline and abnormal ranges nor in average scores by age of entry to primary school. Thus the difference in age within a typical school year group does not appear to significantly explain variations in social, emotional and behavioural development at school entry.

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## 3.5 Summary

Factors significantly associated with a score in the borderline or abnormal range for each of the sub-scales and the total difficulties scale at school entry are summarised in Figure 3-B. (see also Table A1.1 in Appendix 1).

The analysis has shown that a range of socio-economic and socio-demographic characteristics, early development issues and parenting experiences act as risk factors for, or protective factors against, the development of social, emotional and behavioural difficulties at primary school entry. Household income and child general health are found, in particular, to be consistently associated with behavioural characteristics at school entry. Across most of the difficulty scales, children living in lower income households and those who experience either temporary or persistently poor health between the ages of 2 and 5 are at increased risk of showing difficulties at school entry.

**Figure 3-B Factors significantly associated with a score in the borderline or abnormal range at school**

#### **Conduct problems**

- Family type transitions: living in a stable lone parent or repartnered lone parent family.
- Equivalised household income: living in a lower income household.
- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Discipline: children who experienced shouting and/or smacking at age 3.
- Parent-child social interaction: children who experienced lower levels of social interaction.
- Visits to other households with children: children taken on visits less often than fortnightly.

#### **Emotional symptoms**

- Number of children in the household: being a lone child.
- Equivalised household income: living in a lower income household.
- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Delays in early motor development: delayed on 2 or more developmental milestones at age 2.

#### **Hyperactivity/inattention**

- Child's gender: being a boy.
- Maternal age at child's birth: having a younger mother.
- Equivalised household income: living in a lower income household.
- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Language difficulties at age 2.
- Discipline: children who experienced shouting and/or smacking between birth and age 3.
- Parent-child social interaction: children who experienced lower levels of social interaction.
- Visits to other households with children: children taken on visits less often than fortnightly.

#### **Peer problems**

- Mother's ethnicity: children whose mother is non-white.
- Language difficulties at age 2.



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# 4

Thus far social, emotional and behavioural development has only been explored in detail at a single point in time – entry to primary school. However, the analysis undertaken in section 3.1 indicated that familial and development issues, including experiences which occurred earlier in the child’s life, were associated with social and behavioural characteristics at entry to primary school. Indeed, signs of poor general health and delay in language development at age 2 were predictors of some of the highest difficulty scores at school entry. This suggests therefore, that for many children the particular patterns of social, emotional and behavioural characteristics observed at school entry are determined at an earlier stage in their lives. This section explores, in more detail, the relationship between early patterns of social development with those seen at school entry and, for a small proportion of the children, in the first term of primary two.

#### 4.1 Key findings

- Children’s difficult behaviour tends to decrease, and pro-social behaviour increase as they move from the pre- to primary school stage although the changes are small. Emotional problems show a small increase between pre-school and entry to primary school.
- There is a strong correlation between a child’s total difficulties scores at pre-school and primary school suggesting that the particular social, emotional and behavioural characteristics which children exhibit at pre-school remain, for the most part, at the point they start primary school.
- The strongest correlation in sub-scales occurs on the hyperactivity score suggesting that this is the behaviour least likely to change during that period.
- There were no significant differences in mean SDQ scores between entry to primary one and entry to primary two indicating that children’s social and behavioural characteristics remain more similar over the first two years of primary school than they do in the period from pre-school into primary school and that those children who have difficulties in relation to social, emotional and behavioural development at entry to primary school tend to still have them at entry to primary two.

#### 4.2 Comparing social, emotional and behavioural development at pre-school and entry to primary school

GUS has included the SDQ annually in the child cohort questionnaire since sweep 2 (age 3), at which point 99% of children in the cohort were attending some form of pre-school or nursery provision. The proportion of children whose scores were classified as normal, borderline or abnormal at age 3, and the corresponding proportions at school entry, are shown in Table 4.1. Analysis was undertaken to explore the relationship between social, emotional and behavioural development at the pre-school stage with that seen at entry to primary school. The results of these analyses are shown in Table 4.2.

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Overall, as may be expected, the data from both Table 4.1 and Table 4.2 suggest that on average children's difficult behaviour decreases, and pro-social behaviour increases as they move from the pre- to primary school stage. Whilst the differences between the time-points are small, they are all statistically significant. Despite this, the differences, at this broad population level, are not considered large enough to be particularly notable.

Issues related to conduct problems are those which show the largest decrease whereas smaller decreases occur in hyperactivity/inattention and peer problems. Emotional symptoms is the only scale which shows a small increase between pre-school and entry to primary. A strong correlation between the total difficulties scores suggests that scores recorded at pre-school are closely related to scores returned at entry to primary school indicating therefore, that the particular social, emotional and behavioural characteristics which children exhibit at pre-school remain, for the most part, at the point they start primary school. That is, there is very little change in behavioural development for most children during this time. The strongest correlation within sub-scales occurs on the hyperactivity score suggesting that this is the behaviour least likely to change in the period observed.

**Table 4.1 Classifications on all SDQ scales at pre-school and entry to primary school**

	SDQ scale					
	Emotional symptoms %	Conduct problems %	Hyperactivity %	Peer problems %	Total Difficulties %	Pro-social %
<b><i>Pre-school score</i></b>						
Normal	92	65	80	81	<b>87</b>	89
Borderline	4	19	8	12	<b>7</b>	8
Abnormal	4	16	11	7	<b>6</b>	3
<i>Bases</i>						
<i>Weighted</i>	2488	2488	2480	2476	2464	2485
<i>Unweighted</i>	2487	2487	2480	2476	2465	2484
<b><i>Primary school score</i></b>						
Normal	90	73	83	85	<b>89</b>	93
Borderline	5	15	7	8	<b>6</b>	5
Abnormal	5	12	10	7	<b>5</b>	2
<i>Bases</i>						
<i>Weighted</i>	2069	2067	2062	2063	2056	2067
<i>Unweighted</i>	2074	2072	2069	2068	2063	2072

**Table 4.2 Mean scores on SDQ scales at pre-school and entry to primary school and correlations between the two scores**

SDQ scale	Mean score				Correlation*	Bases (unweighted)
	Pre-school	Entry to primary school	Positive or negative change <sup>7</sup>	Statistical significance		
Conduct problems	2.0	1.7	+	<.001	0.569	2113
Emotional symptoms	1.2	1.3	-	<.001	0.463	2114
Hyper-activity	3.5	3.4	+	<.001	0.624	2106
Peer problems	1.2	1.1	+	<.01	0.426	2104
Total difficulties	7.9	7.4	+	<.001	0.647	2091
Pro-social	7.8	8.3	+	<.001	0.480	2113

\*These figures illustrate the correlation between scores at pre-school and scores at entry to primary school. The closer the figure is to 1, the stronger the correlation, and the more closely related a child's pre-school score is to their primary school score.

### 4.3 Extending the analysis: behaviour at entry to primary two

As the GUS cohort is spread across two school year groups, at the point of sweep 4 data collection around one third of the cohort had started their first term in primary two. The data for this group allows an extension of the previous analysis to look at the continuity of behavioural development from pre-school through primary one and into primary two. In this way, some assessment can be made about the possible impact of the first year of schooling on behavioural development.

The data indicate no significant differences in mean SDQ scores between entry to primary one and entry to primary two. Correlations between the scores are much higher in this instance than with the previous comparison, indicating that children's social and behavioural characteristics remain more similar over the first two years of primary school than they do in the period from pre-school into primary school. These findings also suggest, therefore, that those children who have difficulties in relation to social, emotional and behavioural development at entry to primary school tend to still have them at entry to primary two.

<sup>7</sup> Note: for all SDQ scales, except pro-social, a higher score indicates greater difficulties and should be considered more negative. For the pro-social scale, a higher score is more positive. Thus, on the difficulty scales, where the mean score decreases between pre-school and primary school this is considered a positive improvement in behaviour whereas an increase in scores between sweeps is considered negative.

## 4.4 The persistence of difficult behaviour

The analysis undertaken and described in section 4.2 uses average scores for the whole sample. Whilst these are useful to explore overall change in behaviour over time, they do not pick up on more detailed movement between categories by individuals – that is, the extent to which particular children's scores improve by moving from borderline or abnormal into the normal range, or get worse by moving from the normal range into borderline or abnormal. Table 4.3 illustrates the proportion of children with scores in the normal, borderline and abnormal ranges at pre-school whose score fell into each of those ranges at entry to primary school.

To examine patterns of change in social, emotional and behavioural characteristics between pre-school and entry to primary school in more detail, children were again divided into three groups according to their score on each of the scales at age 3 and at primary school entry indicating different severities of difficult behaviour (normal, borderline or abnormal, see Appendix 2 for details of the score ranges each SDQ scale for these classifications). To explore movement between, or persistence within groups over time, first a child's score classification at age 3 was compared with the corresponding classification at primary school entry. This permits, for example, examination of what proportion of children whose age 3 score was classified as normal had a score at school entry which was also classified as normal. The results are shown in Table 4.3. The table should be read in rows starting from the left hand-side. For example, looking at the 'Normal' row under 'Conduct problems' we can see that 85% of children whose conduct problems score at age 46 months was in the normal range also had a conduct score in the normal range at entry to primary school, but 11% moved from having a normal score at pre-school to having a borderline score at entry to primary school.

**Table 4.3 SDQ score classification (normal, borderline or abnormal) at pre-school by SDQ score classification at entry to primary school**

<i>Row percentages</i>		Classification of score at entry to primary school				
Classification of score at pre-school (age 46 months)		Normal	Borderline	Abnormal	<i>Bases</i>	
	(%)				<i>Weighted</i>	<i>Unweighted</i>
<b>Conduct problems</b>						
Normal	(%)	85	11	4	1360	1398
Borderline	(%)	57	25	19	376	371
Abnormal	(%)	31	27	42	325	296
<b>Emotional symptoms</b>						
Normal	(%)	91	5	4	1906	1926
Borderline	(%)	65	18	17	75	69
Abnormal	(%)	46	15	39	79	71
<b>Hyperactivity</b>						
Normal	(%)	89	7	4	1658	1695
Borderline	(%)	61	12	27	176	169
Abnormal	(%)	39	16	45	216	194
<b>Peer problems</b>						
Normal	(%)	89	6	5	1664	1700
Borderline	(%)	71	13	16	234	216
Abnormal	(%)	44	16	35	153	141
<b>Total difficulties</b>						
Normal	(%)	94	4	2	1775	1819
Borderline	(%)	60	19	21	150	135
Abnormal	(%)	37	16	47	109	90
<b>Pro-social</b>						
Normal	(%)	95	4	1	1844	1851
Borderline	(%)	83	14	3	165	165
Abnormal	(%)	67	20	14	51	49

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The data illustrate a number of key issues. As initially indicated by the comparison of mean scores seen in Table 4.2, there is an overall decrease in difficult behaviour in children in the period between pre-school and entry to primary school. The vast majority of those children whose scores were in the normal range at pre-school also scored in the normal range at entry to primary school, particularly in relation to the pro-social and total difficulties scores; 94% of children whose total difficulty score at age 3 was classified as normal also had a score in the normal range at school entry. Furthermore, for all scales most children in the borderline group at pre-school had moved into the normal range by entry to primary school. For example, 61% of those children whose scores were in the borderline range for hyperactivity at age 3 had moved into the normal range at entry to primary school. Many children with scores in the abnormal range at pre-school had also moved into either the normal or borderline range by entry to primary school demonstrating an improvement in social development over that time. Thirty-nine percent of children whose hyperactivity score at age 3 was in the abnormal range had a score in the normal range at school entry.

The second way of exploring movement between, or persistence within groups over time, is to consider the extent to which problems that existed at school entry were already present at pre-school. That is, for example, what proportion of children whose score at school entry was classified as abnormal also had a score at pre-school which was classified as abnormal. Around two-fifths (42%) of those with scores in the abnormal range for total difficulties at primary school entry also had scores in that classification at pre-school (data not shown in table). Conduct problems and hyperactivity/inattention were the difficulties most likely to have been present already at pre-school and to have persisted in the period to primary school entry. Fifty-two per cent of children with conduct problem scores in the abnormal range at school entry also had scores in the abnormal range at pre-school. The corresponding figure for hyperactivity was 46%.

In contrast, difficulties with emotional symptoms or peer problems were significantly more likely to have come to light during the pre-school or early primary school period. Around two-thirds (65%) of the 123 children with emotional symptoms scores in the abnormal range at *school entry* had scored in the normal range at pre-school. This increase is also illustrated, in part, by the overall change in mean scores for emotional symptoms shown in Table 4.2 (a very slight increase of 1.2 to 1.3). Forty-seven percent of children with scores in the abnormal range for peer problems at school entry had no such difficulties according to their score at pre-school. The corresponding figures for conduct problems and hyperactivity are 21% and 31% respectively.

Notably, and as seen in section 2.1 above, the overall proportions of children with scores in the abnormal range for emotional symptoms and peer problems is quite small. Notwithstanding this issue, it is clear that in a large number of these cases these difficulties have developed in the latter pre-school or very early primary school period. In contrast, difficulties associated with conduct problems and hyper-activity are considerably more likely to have been present whilst the child was in pre-school and perhaps beforehand.

#### **4.5 Modelling the relationship between early and later behavioural development**

To what extent are earlier assessments of social, emotional and behavioural development predictive of later assessments whilst controlling for the other possible confounding factors? Analysis in section 3.1 illustrated that children with particular types and combinations of difficult behaviour vary in their socio-economic and socio-demographic characteristics and in their experiences of different parenting styles and early development. Indeed, these background characteristics have been shown to have an important influence on a child's behavioural development up to school entry. So far, our analysis of early and later scores on the SDQ have not controlled for these additional influencing factors.

To examine this, the child's classification on the relevant SDQ subscale at age 3 was added to the existing regression models which were used for analysis in section 3.<sup>8</sup> The results show that for each of the SDQ difficulty scales, those children who scored in the borderline or abnormal range were very likely to also have a score in the borderline or abnormal range at school entry. Children scoring in the abnormal range in any domain at age 3 have around 10 times the odds of scoring in the borderline or abnormal range at school entry than do children whose scores were not in those ranges at age 3. The highest associations between early and later scores were observed in relation to the total difficulties scale where those with borderline scores and those with abnormal scores at age 3 had odds 8 and 17 times higher than those with normal scores of having a score in the higher ranges at age 5.

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<sup>8</sup> The results of the regression analysis are shown in Table A1.2 in Appendix 1.

We have already seen, in Table 4.3, the extent to which children's scores on the SDQ change between pre-school and primary school; this analysis offers some explanation of the factors which are associated with those changes. Figure 4-A provides a summary of the factors which were significantly associated with a change in score between ages 3 and 5 (see also table A1.2 in Appendix 1).

In relation to conduct problems, the results of the revised model suggest that children who live in stable lone parent or repartnered lone parent families, those with poorer general health and those who have experienced harsh discipline are all at a greater risk of their conduct problems increasing in the pre-school to primary school period. In contrast, parents of children whose mothers are non-white, who live in higher income households and/or who experience higher levels of parent-child social interaction are more likely to report a lower conduct score at age 5 compared to age 3. Analysis in section 4.4 showed that difficulties with emotional symptoms were particularly likely to have developed in the pre-school to early primary school period. Findings here suggest that the presence of siblings and living in a higher income household can protect against the development of such difficulties in this period whereas having poorer general health and multiple delays in early motor development are associated with a greater risk of developing emotional difficulties. Ethnicity continues to affect difficulties with peers. Children with a non-white background are at a greater risk of developing peer problems during the pre-school period, as are those children with early language difficulties and those who experienced fewer visits to households with other children. It is possible that the language difficulties present earlier have persisted to some extent amongst these children making it more difficult for them to interact with peers and to form friendships. A lack of early social contact with other children may also limit a child's ability to successfully interact with peers.

## 4.6 Summary

In general, children's behavioural characteristics at entry to primary school were similar to those reported when they were aged 3. Average scores on each of the SDQ scales did not change much between the two time points, and scores were also shown to be very closely correlated. Whilst changes were small, the overall impression suggested by the data is that children's behaviour generally improves between pre-school and entry to primary school.

However, for a significant minority of children, difficulties which are present at pre-school remain at entry to primary school. Almost half of all children (47%) whose total difficulties score at pre-school was in the abnormal range also had a score in the abnormal range at school entry. For a further minority group, difficulties are shown to develop during this time particularly in relation to emotional symptoms and peer problems.

**Figure 4-A Factors significantly associated with an increase or decrease in SDQ scores between age 3 and age 5**

### **Conduct problems**

#### *Increase*

- Family type transitions: living in a stable lone parent or repartnered lone parent family.
- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Discipline: children who experienced shouting and/or smacking between birth and age 3.

#### *Decrease*

- Equivalised household income: living in a higher income household.
- Parent-child social interaction: children who experienced higher levels of social interaction.
- Mother's ethnicity: children whose mother is non-white.

### **Emotional symptoms**

#### *Increase*

- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Delays in early motor development: delayed on 3 or more developmental milestones at age 2.

#### *Decrease*

- Number of children in the household: having two or more siblings.
- Equivalised household income: living in a higher income household.

### **Hyperactivity/inattention**

#### *Increase*

- Child's general health: children whose health was temporarily or always fair, bad or very bad.

#### *Decrease*

- Child's gender: being a girl.
- Parent-child social interaction: children who experienced higher levels of social interaction.

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## **Peer problems**

*Increase*

- Mother's ethnicity: children whose mother is non-white.
- Language difficulties at age 2.
- Visits to other households with children: children taken on visits less often than fortnightly.

## **Total difficulties**

*Increase*

- Child's general health: children whose health was temporarily or always fair, bad or very bad.
- Language difficulties at age 2.
- Visits to other households with children: children taken on visits less often than fortnightly.

*Decrease*

- Equivalised household income: living in a higher income household.



chapter  
CONCLUSION

5

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Most children entering primary school in Scotland do not display any particular difficulties in their social, emotional and behavioural development. Amongst the difficulty scales, between 73% and 90% of children return scores within the 'normal' classification. However, it is clear that a small proportion of children do have quite severe difficulties at this point; between 5% and 12% of children are reported by their parents to have behaviour which places them in the abnormal classification on any scale. Furthermore, a significant minority (around 21%) display difficulties simultaneously across a range of behavioural domains. Whilst the largest behavioural groupings were those in which the children had no, or only singular difficulties (clusters 2 and 5) two groups of children with multiple concerning difficulties emerged. These were cluster 3 – where children had significantly higher than average hyperactivity/inattention scores along with conduct problems, peer and pro-social difficulties – and cluster 4 – where children had severe emotional difficulties alongside issues with conduct, peers and hyperactivity. Results of the cluster analysis are similar to those found elsewhere with children of this age group. Sonunga-Barke and colleagues (1997), on conducting cluster analysis of pre-school children's scores on an instrument similar to the SDQ, also found that two similarly problematic groups emerged – one with hyperactivity as the core problem, and the other with emotional problems.

The socio-economic and demographic characteristics of children with higher difficulties in each domain varied from those with lower or no difficulties. However, on the whole these characteristics were not independently associated with behavioural outcomes at school entry. Level of household income was the measure most consistently and independently associated with behavioural development with children in lower income households at higher risk of difficulties with conduct, emotional development and hyperactivity than those in higher income households.

Whilst socio-economic and demographic characteristics had limited direct impact they may yet be influential but in an indirect manner affecting the parenting, health and development factors which are shown, in section 3.3, to be more directly associated with outcomes in these domains.

Health and development factors also affected different behavioural domains in different ways: the condition of the child's general health over the period from age 2 to age 5 was consistently and strongly associated with a number of difficulties at age of school entry; delays in motor development at age 2 were associated with emotional difficulties; and delays in language development at age 2 were associated with difficulties in hyperactivity and peer problems as well as a high score on the total difficulties scale. The significance of early health problems and developmental delays to behavioural outcomes is notable. These findings show that children with identifiable health and developmental issues at age 2 are at an increased risk of displaying behavioural difficulties at age of school entry.

There is a key link, in particular, between poor health and motor delay in the early years and a higher incidence of emotional problems at school entry.

Parenting approaches are also shown to impact on behavioural outcomes at school entry, particularly in relation to hyperactivity and conduct problems. Those children who experienced no harsh discipline, higher levels of parent-child social interaction, and a higher frequency of social visits were less likely to score in the borderline or abnormal ranges of the conduct and hyperactivity scales. The direction of the relationship is not clear here. Increased use of harsh discipline among parents whose children display higher conduct problems and hyperactivity/inattention may be an attempt to control already difficult behaviour rather than a pre-cursor of it. In addition, lower levels of parent-child social interaction could be due to difficulties sustaining the child's attention to engage in these interactions or simply because these types of interaction are difficult to manage and thus pursued less often. Relatedly, visits to other children may be curtailed because of issues around controlling behaviour away from the home. However, lack of early peer contact may contribute to children having later problems interacting with peers and thus a higher incidence of peer-related difficulties at school entry.

Differences in the average difficulty scores of children who started school at different ages were not statistically significant. Neither were these children more or less likely to have scores classified into each of the normal, borderline and abnormal ranges. Thus the difference in age within a typical school year group does not appear to significantly explain variations in social, emotional and behavioural development at school entry. However, it is possible that variations in behavioural development by age at school entry will develop in later years.

In general, there is a decrease in difficult behaviour between pre-school and entry to primary school but this is not the case for *all* children; some children experience no change in behaviour and others experience an increase in difficulties. Emotional problems, in particular, show an increase in this period. More detailed analysis of movement between normal, borderline and abnormal classifications indicated that 65% of children with an emotional symptoms score in the abnormal range at school entry had scored in the normal range at age 3. As emotional development is perhaps quite closely related to maturity levels, such an increase in difficulties in this domain is perhaps expected throughout this period and it may be likely that the prevalence of such issues will continue to grow as the children age. Despite this increase, emotional problems are the difficulty least prevalent across all of the domains at school entry. The data indicate, in fact, that scores in each sub-scale at age 3 are quite closely related to corresponding scores at school entry. Thus children with higher scores at age 3 tend to also have higher scores at school entry. This suggests, therefore, that children displaying more difficult behaviour at age 3 continue to do so at school entry. Forty-seven percent of

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children with a total difficulties score in the abnormal range at age 3 also had a score in the abnormal range at school entry. This finding is supported by the results of the regression analysis which show that a previous score in the borderline or abnormal range is strongly associated with a similar score at age of school entry. So for some children, difficult behaviour at school entry is persistent through their early years and observable at age 3, possibly before.

These results should be considered in light of two methodological weaknesses to the data. First, the children in the cohort actually span two school year groups. Thus to obtain a measure of development at school entry, data was merged from two sweeps of data collection each corresponding with the child's first year at primary school. As the spread of age at entry when the two groups are combined is similar to that of any single school year group, this is not considered to be too problematic but is nonetheless not ideal. Secondly is that all SDQ data obtained is from the child's main carer interview. As such, the data does not reflect observations of school-based behaviour as recorded by the teacher, but parent-report data of the child's behaviour and interactions in a largely out-of-school context.

The findings have a number of important implications. The first is that, whilst the majority of children display no problematic behaviour at school entry, a small proportion showed severe difficulties. Those who displayed the most problematic behaviour often had higher than average difficulties in several domains although their core difficulty was different – one being hyperactivity, the other emotional symptoms. Each of these core difficulties was shown to have a different developmental pathway. Difficulties with hyperactivity/inattention were considerably more likely to have been present at age 3 and persist through to school entry. Emotional difficulties, in contrast, had a greater likelihood of developing between pre-school and entry to primary school. These children are likely to respond to the transition to school, and the early and continuing school experience in different ways. Children with hyperactivity and conduct difficulties in particular, may find it difficult to adapt to the educational and social constraints of the classroom impacting on their adjustment, further behaviour and later attainment (Sonuga-Barke *et al.*, 1994). Given the often long-term nature of these difficulties, it appears there would be benefit to early screening, in the preliminary pre-school period for example, of these behaviours and their patterns of co-occurrence. Those children displaying difficulties matching the most problematic groupings could, along with their parents, be provided with the necessary support to manage and improve such difficulties. Furthermore, a more tailored transition process to ensure that moving into the school environment does not encourage deterioration of behaviour may be advisable.

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## APPENDIX 1 – REGRESSION TABLES

### ***Note on interpreting odds ratios***

The regression results are presented as odds ratios for each independent variable, all of which have a significance value and 95% confidence intervals attached. Odds ratios estimate the effect of each individual independent variable on the outcome variable, adjusted for all other independent variables in the regression model. Logistic regression compares the odds of a reference category (shown in the tables in brackets) with that of the other categories. An odds ratio of greater than one indicates that the group in question is more likely to demonstrate this characteristic than is the chosen reference category, an odds ratio of less than one means they are less likely. For example, in the second column of Table A.1, which contains the results of the regression model seeking to identify factors related to the sample child having a conduct problems score in the borderline or abnormal range at school entry, the category of temporarily or always fair, bad or very bad health returns an odds ratio of 2.09. This indicates that the odds of children whose health was temporarily or always poor having a conduct problems score in the borderline or abnormal range at school entry are 2.09 times greater than they are for children whose health is always good or very good (the reference category). Categories which have a value of greater than 0.05 are not considered to be significant.

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**Table A1.1 Associations key demographic, socio-economic, parenting and development characteristics and a borderline or abnormal score in each scale at primary school entry**

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties
<b>Sex of child (ref: male)</b>					
Female	0.90	1.23	0.66**	0.92	0.88
<b>Mother's ethnicity (ref: white)</b>					
Non-white	0.52	1.33	0.77	4.31***	1.05
<b>Age of mother at birth of cohort child (ref: under 25)</b>					
25 - 29	1.02	1.40	0.95	1.08	0.79
30 - 34	0.82	0.87	0.56**	0.78	0.68
35 or older	0.76	0.79	0.59**	0.81	0.85
<b>Number of children in household at age 2 (ref: 1)</b>					
Two	1.34	0.76	0.82	0.74	0.96
Three or more	1.11	0.45**	0.70	0.85	0.64
<b>Family type transitions from age 2 to 5 (ref: stable couple)</b>					
Couple who separate	1.22	2.11	0.82	1.10	1.07
Stable lone parent	1.86**	1.24	1.23	1.33	1.48
Lone parent who repartnered	2.23***	0.98	1.51	1.29	1.86
<b>Equivalised annual household income (ref: &lt; £11,875)</b>					
2nd Quintile (>=£11,875<£19,444)	0.60**	0.89	0.53**	0.90	0.79
3rd Quintile (>=£19,444< £25,625)	0.62**	0.55*	0.51**	0.65	0.43**
4th Quintile (>=£25,625< £37,500)	0.56**	0.64	0.47**	0.62	0.51*
Top Quintile (>=£37,500)	0.51**	0.37**	0.52**	0.66	0.34**
<b>Child's age when started school (ref: age 5yrs 0mths to 5yrs 5mths)</b>					
Age 4yrs 6mths to 4yrs 11mths	1.03	1.06	1.14	1.07	1.10
Age 5yrs 6mths to 6yrs 0mths	1.07	0.97	1.10	1.13	0.91

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties
<b>Child's general health at age 5</b> (ref: always good/very good)					
Temporarily or always fair, bad or very bad	2.09***	2.38***	2.50***	1.42	2.89***
<b>Delay in motor developmental at age 2</b> (ref: none)					
1 milestone	0.91	1.32	1.32	0.88	0.95
2 milestone	1.27	1.11*	1.11	0.85	0.94
3 or more milestones	1.33	1.54**	1.54	1.21	1.88
<i>(Information missing)</i>	1.05	1.33	1.33	1.15	1.41
<b>Child's speech difficult for others to understand at age 2</b> (ref: No)					
Yes	1.26	1.00	1.40*	1.58**	1.98***
<b>Use of harsh discipline at age 3</b> (ref: None)					
Shouting only	2.37**	1.23	1.42	0.77	1.01
Smacking only	1.80***	1.11	1.62**	1.16	1.61
Shouting and smacking	3.59***	1.47	1.90**	1.49	2.18**
<b>Frequency of parent-child interaction</b>					
More often	0.91***	0.96	0.95*	1.68	0.95
<b>Frequency child taken to visit other people with children at age 2</b> (ref: fortnightly or more)					
Less often	1.44*	1.26	1.50*	1.68***	1.83**

Notes: Asterisks represent statistical significance: \*\*\* =  $p < 0.001$ , \*\* =  $p < 0.01$ , \* =  $p < 0.05$ , ~ = borderline (just over 0.05)

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**Table A1.2 Associations between pre-school SDQ score, key demographic, socio-economic, parenting and development characteristics and borderline and abnormal score in each scale at primary school entry**

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties
<b>Behaviour score classification at pre-school – 46 mths (ref: Normal)</b>					
Conduct problems - Borderline	3.76***	-	-	-	-
Conduct problems - Abnormal	10.02***	-	-	-	-
Emotional symptoms - Borderline	-	5.62***	-	-	-
Emotional symptoms - Abnormal	-	9.93***	-	-	-
Hyperactivity/inattention - Borderline	-	-	4.37***	-	-
Hyperactivity/inattention Abnormal	-	-	9.15***	-	-
Peer problems - Borderline	-	-	-	2.61***	-
Peer problems - Abnormal	-	-	-	9.51***	-
Total difficulties - Borderline	-	-	-	-	7.88***
Total difficulties - Abnormal	-	-	-	-	17.23***
<b>Sex of child (ref: male)</b>					
Female	0.91	1.17	0.69*	0.93	0.83
<b>Mother's ethnicity (ref: white) Non-white</b>					
	0.38*	1.42	0.63	3.91***	0.86
<b>Age of mother at birth of cohort child (ref: under 25)</b>					
25 - 29	1.18	1.50	1.11	1.15	1.04
30 - 34	1.01	0.92	0.74	0.90	1.00
35 or older	0.95	0.89	0.79	0.91	1.23
<b>Number of children in household at age 2 (ref: 1)</b>					
Two	1.24	0.70~	0.78	0.77	0.89
Three or more	1.01	0.40**	0.65	0.88	0.61
<b>Family type transitions from age 2 to 5 (ref: stable couple)</b>					
Couple who separate	1.38	1.83	0.79	1.25	1.04
Stable lone parent	2.09***	1.14	1.35	1.45	1.33
Lone parent who repartnered	2.26**	0.96	1.55	1.17	1.75

	Conduct problems	Emotional symptoms	Hyper-activity	Peer problems	Total difficulties
<b>Equivalised annual household income (ref: &lt; £11,875)</b>					
2nd Quintile (>=£11,875<£19,444)	0.56*	0.84	0.57	1.04	0.90
3rd Quintile (>=£19,444< £25,625)	0.70	0.53*	0.61	0.67	0.43*
4th Quintile (>=£25,625< £37,500)	0.60*	0.64	0.56	0.68	0.60
Top Quintile (>=£37,500)	0.54**	0.38*	0.57	0.68	0.39*
<b>Child's age when started school (ref: 5)</b>					
Age 4yrs 6mths to 4yrs 11mths	1.09	1.07	1.20	0.97	1.14
Age 5yrs 6mths to 6yrs 0mths	1.09	1.04	1.12	1.12	1.13
<b>Child's general health at age 5 (ref: always good/very good)</b>					
Temporarily fair, bad or very bad	1.75**	1.84**	2.35***	1.17	2.14**
<b>Delay in motor developmental at age 2 (ref: none)</b>					
1 milestone	0.79	1.57	1.34	0.96	1.00
2 milestone	1.00	2.26	1.11	0.95	0.82
3 or more milestones	1.29	3.78**	1.46	1.15	1.86
<i>(Information missing)</i>	1.01	2.29	1.28	1.18	1.35
<b>Child's speech difficult for others to understand at age 2 (ref: No)</b>					
Yes	1.07	0.90	1.27~	1.46*	1.74**
<b>Use of harsh discipline at age 3 (ref: None)</b>					
Shouting only	2.24	1.14	1.25	0.54	0.88
Smacking only	1.70	1.22	1.37	1.06	1.55
Shouting and smacking	2.56	1.53	1.55	1.42	1.92
<b>Frequency of parent-child interaction</b>					
More often	0.92***	0.94~	0.95*	0.98	0.95
<b>Frequency child taken to visit other people with children at age 2 (ref: fortnightly or more)</b>					
Less often	1.30	1.17	1.38~	1.55**	1.65*

Notes: Asterisks represent statistical significance: \*\*\* = p<.001, \*\* = p<0.01, \* = p<0.05, ~ = borderline (just over 0.05)

## APPENDIX 2 – FURTHER DETAILS OF EXPLANATORY AND OUTCOME VARIABLES

### Strengths and Difficulties Questionnaire – Normal, Borderline and Abnormal score bandings for parent-completed version

Scale	Normal	Borderline	Abnormal
Total Difficulties Score	0-13	14-16	17-40
Emotional Symptoms Score	0-3	4	5-10
Conduct Problems Score	0-2	3	4-10
Hyperactivity Score	0-5	6	7-10
Peer Problems Score	0-2	3	4-10
Pro-social Behaviour Score	6-10	5	0-4

#### Family type transitions

Using information on family type (couple family or lone parent household) collected at every sweep, a variable was constructed which measured stability or changes in family type between the ages of 2 and 5 (sweeps 1 to 4). Four classifications were derived: stable couple family, couple who separate, stable lone parent and lone parent who repartnered.

#### Equivalised annual household income

The income that a household needs to attain a given standard of living will depend on its size and composition. For example, a couple with dependent children will need a higher income than a single person with no children to attain the same material living standards. "Equivalisation" means adjusting a household's income for size and composition so that we can look at the incomes of all households on a comparable basis.

#### Children's general health

At each sweep of fieldwork, parents are asked to rate their child's general health on a five-point scale ranging from very good through to very bad. The measure used in this report captures changes in child's health status between the ages of 2 and 5 (sweeps 2 to 4). Children who were reported to have fair, bad or very bad health at any or all time points were categorized as temporarily or always having fair, bad or very bad health.

#### Delays in motor development

Developmental milestones are a set of functional skills or age-specific tasks that most children can do at a certain age range. Although each milestone has an age level, the actual age when a normally developing child reaches that milestone can vary considerably. For example, some children may walk as early as 11 months, while others may not walk until they are 15 months old. Both cases are still considered normal. Statistically speaking about 3% of children will not reach a milestone on time, but most of them will eventually develop normally over time, although a little later than expected.

The milestones were assessed by main respondents' reports on their child's developmental status at age 2 (34 months), using 14 items derived from the Denver Development Screening Test and which covered gross and fine motor skills. For each item, the respondent was asked to indicate whether or not the child could perform the action. The actions included are:

- Walk on the level without difficulties
- Walk up steps like an adult, one foot on each step
- Balance on one foot for at least four seconds
- Hop at least twice on one foot
- Throw a ball
- Grasp and handle small objects such as a pencil and scissors
- Undo big buttons
- Draw a circle
- Hold a pencil and scribble
- Copy a square
- Drink from a cup
- Brush his/her teeth without help at least some of the time
- Put on a T-shirt by him/herself
- Get dressed without any help

Negative responses on each item were counted and a variable was constructed which indicated whether the child, at 34 months, had not yet reached any milestones. Categories on this variable were none (indicating the child had reached all milestones), 1, 2, or 3 or more.

## Language difficulties at age 2

Difficulties with the child's speech and language at age 2 was measured through a set of three questions included at sweep 1 where the main respondent was asked to assess the extent to which the child could be understood when speaking by the respondent, by other friends and family, and by strangers. The available responses were 'mostly', 'sometimes' and 'rarely'. The variable used in this report combined data from across the three items to a binary variable indicating any difficulties with the child's speech being understood. Children who were said to be only sometimes or rarely understood on any of the three items were categorised as having some language difficulties.

## Harsh discipline

At age 3 (46 months, sweep 2), parents were asked the extent to which they had *ever* used a range of discipline approaches with the cohort child. The approaches included were:

- Time out
- Reward system/sticker chart
- Ignoring bad behaviour
- Smacking
- Naughty step/room/corner
- Raising your voice or shouting
- Removing treats or privileges

Responses to the items on smacking and shouting were combined to create a single variable indicating whether any or both of these approaches had been used.

## Parent-child social interaction

Parent-child social interaction at age 3 (46 months, sweep 2) was measured using four items which asked the main respondent how frequently they talked to, read to, played with, and cuddled the cohort child. The 5-item response set ranged from 'less than once a week' to 'more than once a day'. Responses were recoded, standardised and combined into a single scale. A high score on the scale indicated a high frequency of parent-child social interaction.

## Frequency child taken to visit other people with children at age 2

This variable was derived from a question included at sweep 1 (age 34 months) which asked how often the main respondent or his/her partner took the child to visit friends with young children. Responses were on a 9-point scale from 'Every day/most days' to 'Never'. The data was recoded to separate out children who experienced this kind of social visit at least fortnightly and those who did so less often.

## APPENDIX 3 – DESCRIPTION OF CLUSTER ANALYSIS

The children were grouped into clusters using k-means<sup>9</sup> clustering in SPSS v15. The desired number of clusters is specified beforehand. Random starting points are used as cluster centres and the data are grouped around these points. An iterative procedure is then used to re-calculate the cluster centres and re-group the data until the variance between the cluster members is as low as possible. A number of different groupings were run, from 4 to 7 clusters. A five cluster solution was eventually chosen as best representing the shared patterns of behaviour and best differentiating between different types of children.

Table 2.2 in section 2.3.1 shows mean individual scores for each cluster on each of the SDQ scales, plus scores for the the overall sample. Table A3.1 shows the median and range of scores for each cluster. The tables demonstrate the differences between the profiles of different clusters in detail. A summary of the behavioural characteristics of the children in each cluster is also provided in section 2.3.1

**Table A3.1 Median scores (and range) on SDQ scales by cluster**

SDQ scale	Cluster				
	1	2	3	4	5
Conduct problems	2 (0 - 6)	1 (0 - 4)	3 (0 - 9)	3 (0 - 8)	2 (0 - 6)
Emotional symptoms	1 (0 - 4)	0 (0 - 5)	1 (0 - 7)	4 (2 - 10)	1 (0 - 4)
Hyper-activity	3 (0 - 6)	1 (0 - 3)	7 (4 - 10)	4 (0 - 10)	4 (3 - 8)
Peer problems	1 (0 - 6)	0 (0 - 6)	2 (0 - 10)	3 (0 - 8)	0 (0 - 5)
Pro-social	6 (0 - 9)	10 (6 - 10)	7 (0 - 10)	9 (4 - 10)	9 (7 - 10)
<i>Base (unweighted)</i>	377	820	251	220	565

To validate the groupings defined by the cluster analysis a series of checks were run on the data. Table A3.2 shows the mean, minimum and maximum distances of individual cases from the cluster centres. The distance measures are based on the SDQ scores that were used to cluster the children. These data can be used to examine how similar the children are in each cluster as ideally the individuals within each cluster should be alike. The more similar are children in each cluster the lower the distances between them.

<sup>9</sup> We also attempted to use hierarchical clustering (where the number of clusters is not specified beforehand but is dictated by the data), however, this method did not produce satisfactory clusters. Those which were produced tended to consist of one very large cluster that made up 95% of the data and a number of tiny clusters that contained individuals who were in fact very different. K-means clustering gave more relevant results.

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**Table A3.2 Distance of cases from the cluster centre**

		Distance of case from its classification cluster centre		
		Mean	Minimum	Maximum
Cluster number	1	2.53	0.41	6.99
	2	1.96	0.72	5.89
	3	3.39	1.24	10.14
	4	3.45	0.91	7.25
	5	2.17	0.63	4.85

The table suggests that individuals within Cluster 3 are the most dispersed, whereas Cluster 2 has the lowest mean, suggesting the children within this cluster are the most alike. Overall, the difference between clusters is not huge, as such there is no overwhelming evidence to suggest that any single cluster should be further split. As a final check the children on the cluster peripheries were excluded and mean SDQ scores for each cluster were re-calculated. Individuals on the periphery are more likely to be outliers with scores at the extreme ends of the scale ranges, this could affect the profile of the cluster. The analysis showed that the means were unchanged, hence the outliers were not impacting on the overall profile of the cluster, indicating the clusters are robust.



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