Children’s behavioural problems and its associations with socioeconomic position and early parenting environment: findings from the UK Millennium Cohort Study

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Abstract

Aims. To investigate behavioural problems throughout childhood and adolescence, and its relationship with socioeconomic position (SEP) and early parenting environment.

Methods. Using data from the Millennium Cohort Study conducted in the UK, behavioural problems of 14,452 children were analysed using a growth curve model. The children were followed from birth to adolescence, and their behavioural problems were measured by the Strengths and Difficulties Questionnaire (SDQ). The SDQ was sub-scaled into externalising and internalising problems. After assessing the general trajectory of children’s behavioural problems, variables representing SEP and parenting environments were introduced to the model to analyse the association with children’s outcomes.

Results. Overall, children’s trajectories in externalising problems showed a decreasing trend while internalising problems increased as they aged. Household income and maternal education in early childhood were independently associated with children’s behavioural problems, while the association for maternal occupation was significantly weaker. Positive early parenting environments attenuated the association between SEP and children’s behavioural problems. Also, with regards to children’s behavioural problems, positive parenting explained more variance between children compared to SEP. Favourable parent–child relationship buffered the income gradient in children’s behavioural problems during early childhood, and although this buffering effect did not last until adolescence, those who had good parent–child relationships developed better outcomes regardless of their SEP.

Conclusions. The results of the study emphasise the importance of a positive early parenting environment for improving and reducing the socioeconomic gap in children’s behavioural problems and encourages policies to promote better parenting circumstances.

Introduction

In 2017, one in eight (12.8%) 5–19 year olds in the UK met the criteria for a mental disorder, and the prevalence of these disorders has kept an upward trend since the late 1990s (Sadler et al., 2018). It has also been shown that half of all-time mental health issues start by age 14, underscoring the substantial importance of childhood and adolescent socioemotional behaviour during the life-course (Kessler et al., 2005). The relevance of this issue to public health is shared by policy makers in the UK, as children and young people are targeted as priority groups for mental health promotion (The Mental Health Taskforce to the NHS in England, 2016).

Another important topic is the presence of health inequality. Studies have found worse socioemotional outcomes in children from lower incomes than those from higher incomes (McLeod and Shanahan, 1993; Korenman et al., 1995; Green et al., 2005; Kelly et al., 2011; Sadler et al., 2018). Although the number of studies may be less, comparable results have been shown regarding parent’s educational or occupational status (von Rueden et al., 2006; Perna et al., 2010).

A key factor affecting these issues is children’s parenting environment. Studies on early to mid-childhood have revealed that negative parenting styles, such as those with harsh, punitive and controlling attitudes, increases the risk of developing socioemotional difficulties, whilst warm and positive parenting has a protective effect for the child (Weiss et al., 1992; Gazelle et al., 2005; McKee et al., 2007; Boedt et al., 2012; van der Sluis et al., 2015; Reuben et al., 2016). This may also have a long-term impact on children, since some studies indicate that parenting in early childhood is associated with outcomes in pre-adolescence and young adulthood (Beckwith et al., 1992; Keiley et al., 2001; Lorber and Egeland, 2009; Petersen et al., 2015). Considering this longstanding impact and the importance of early child development, a positive early parenting environment could have an impact in reducing the socioeconomic
gap between children with regards to their socioemotional outcomes in later stages of life. Studies trying to look at this association suggest that income gradients in children’s socioemotional difficulties and competence can be partly explained by parenting activities (Gershoff et al., 2007; Kelly et al., 2011; Granero et al., 2015). Parenting practices were also shown to mediate the association between family economy and children’s mental health among adolescents as well (Bøe et al., 2014).

Despite these findings, there are several limitations in previous studies. Conger et al. point out that most of the previous findings were based on cross-sectional studies, which makes it difficult to discuss long-term effects and causal relationships (Conger et al., 2010). Also, they indicate that most of the past studies have constructed a latent factor for socioeconomic position (SEP) or focused solely on income, making it difficult to assess various aspects of SEP. Finally, studies on interaction between SEP and the parenting environment are limited and often small scale. This study aims to overcome some of these limitations and reveal the relationships between SEP, parenting environment and children’s behavioural problems in the UK. Based on available evidence, it is hypothesised that: (1) children from disadvantaged SEP are more likely to have worse outcomes throughout childhood and adolescence; (2) parenting environment will attenuate the association between SEP and children’s behavioural problems; (3) parenting environment will modify the association between SEP and children’s behavioural problems.

**Methods**

**Study population and study sample**

This study was performed using data from the Millennium Cohort Study (MCS). The MCS is a nationally representative prospective study of children born in the UK between September 2000 and January 2002 (Hansen, 2014). In total, 18,552 families were recruited to the cohort during this period. The first interview was conducted when the children were aged 9 months, and subsequent follow-up interviews were held at ages 3, 5, 7, 11 and 14. Since the main exposures used in this assessment were collected at sweep 1 and 2, those who were not present at these surveys, and those whose main respondents were not their mothers were excluded from this study. Second, since twins and triplets have moderated behavioural characteristics, they were excluded from the sample as well (Hansen and Joshi, 2007). Finally, participants who had never answered the Strengths and Difficulties Questionnaire (SDQ) were excluded. This resulted in a total of 14,452 participants in the whole assessment.

**Socioeconomic position**

There are three SEP variables: household income, maternal education and maternal occupation used as the main explanatory variable in the analysis. All the SEP variables were taken from sweep 1 collected through the main respondent’s interview when the cohort members were aged 9 months. Household income was categorised into quintiles from the lowest to the highest after being equivalised by the modified Organisation for Economic Co-operation and Development scales (Hansen, 2014). Data on maternal education were measured using the five category National Vocational Qualification (NVQ) classification, alongside with categories defining ‘overseas qualification’ and ‘no qualification’ (Macratos, 2016). NVQ is a competence-based qualification built on UK national occupational standards, where level-1 is the lowest level which involves the application of knowledge and skills for routine and predictable works, and level-5 being the highest level which involves the application of skills and significant range of fundamental principles and complex techniques with substantial autonomy and significant responsibility for the work of others. Occupational class was categorised into six categories, which is ‘managerial and professional’, ‘intermediate’, ‘small employer and self-employed’, ‘lower supervisory and technical’, ‘semi-routine and routine’ and ‘not doing any paid work’, based on the National Statistics Socioeconomic Classification (NS-SEC) (Office for National Statistics, 2005). The NS-SEC is a widely used classification in the UK, and it aims to differentiate positions within labour markets in terms of their employment relations (e.g. routine occupations, such as waiters, have the least need for employee discretion and employees are regulated by a basic labour contract).

**Parenting environment**

There are 17 items from three domains of parenting domains used in the analysis: ‘learning activities’, ‘family routines’ and ‘psychosocial environment’. These variables were chosen based on previous research and were obtained in sweep 2 through the main respondent’s interview (Kelly et al., 2011).

**Learning activities**

A total of eight questions were asked regarding the child’s learning activities. The questions were collected based on the ‘home learning environment index’ developed by the Effective Provision of Pre-school Education (EPPE) study conducted in England (Melhuish et al., 2008; De La Rochebrochard, 2012). Whether someone reads to the child or helped the child learn sport was answered in binary terms; ‘Yes’ or ‘No’. Other questions on learning activities were the frequency of involvement in reading, learning alphabets, counting, singing and painting which were answered in eight ordered categories ranging from ‘do not’ to ‘7 times a week/constantly’.

**Family routines**

Family routines were measured by how often the child went to bed or had meals on a routine time schedule. The two items are also from the EPPE study, and the answers are categorised in five levels ranging from ‘missing’ to ‘always’ (Johnson et al., 2015).

**Psychosocial environment**

The child’s psychosocial environment was measured by the following seven markers. Mother’s parenting competence in five categories ranging from ‘not very good at being a parent’ to ‘a very good parent’. Parent distress measured by Kessler’s Psychological distress scale (K6), which is a widely used measure of non-specific psychological distress (Kessler et al., 2002; Mitchell and Beals, 2011). Child–parent relationship measured by the scale developed by Pianta (CPRS) (Pianta, 1992). Family rules based on questions on the number of rules and how they were enforced. A composite score based on nine items from the Home Observation for Measurement of the Environment (HOME) inventory (Linver et al., 2004), and discipline practices constructed by seven items from the Straus’s conflict tactics scale (Straus and Hamby, 1997). The nine items taken from the HOME inventory were whether: the mother’s voice was positive
when they were speaking to the child; the mother converses at least twice with the child; the mother answers to the child’s questions verbally; the mother praises the child spontaneously; the mother scolds the child more than once; the mother used physical restraint on child; the mother introduced the interviewer to the child; the mother slapped or spanked the child (Chronbach’s $\alpha = 0.6$). Similarly, the seven items taken from the Straus’s conflict tactics scale were how often the mothers: ignored their child; smacked the child; shouted at the child; sent the child to the bedroom/naughty chair; took away treats; told them off; bribed the child with sweets (Chronbach’s $\alpha = 0.7$).

Demographic indicators

Child’s sex and items which may be associated with both household/maternal SEP and children’s behavioural problems such as ‘mother’s age at the time of birth’, ‘whether the child was a first-born’, and the ‘language spoken at home’ were included as demographic variables, based on previous research, to reduce possibilities of confounding (Kelly et al., 2011). Also, the child’s age was used as the time-variant variable in the analysis.

Behavioural problems

Children’s behavioural problems were measured using the SDQ score from sweeps 2 to 6. The SDQ is a brief behavioural screening questionnaire widely used to identify children’s psychological morbidity and to assess their behavioural problems (Goodman, 1997). It is used for children aged 3–16 years old and is constructed by a total of 25 questions from five domains of behaviour: emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviours. Since the interest of the study is the behavioural problem of the general population, the scores were sub-scaled into ‘externalising problems’ and ‘internalising problems’ (Goodman et al., 2010). Externalising problems generally represent behavioural aspects of children’s behavioural problems such as aggression and disruption, while internalising problems stand for emotional aspects such as anxiety and depression. Scores for both externalising and internalising problems range from 0 to 20, and lower score suggests positive outcomes.

Data management

Missing data in the study sample were multiply imputed using multiple imputation by chained equations (MICE) (Azur et al., 2011). All the variables used in the regression analysis were introduced to the imputation model, including the dependent, independent and design variables considering the clustered nature of the data. Imputed values of the dependent variable were excluded afterwards, because the growth curve model can handle unbalanced data and complete data were not required for the dependent variable. Since the amount of missing data ranged from 0 to 20% among the variables, 20 data sets were generated by MICE (White et al., 2011). The results of analysis using the imputed data sets were consolidated using Rubin’s combination rules (Rubin, 2004). Also, a stratum variable was included in the regression analysis to take into account the stratified sampling process of the MCS. This was based on the suggestion by the Centre of Longitudinal studies, responsible for the MCS (Hansen, 2014).

Analytical strategy

The children’s trajectory in behavioural problems was investigated by fitting a growth curve model with two levels (Table 1). The level-1 sub-model represents how the SDQ scores for child $i$ changes by time $j$. It is constructed with parameter $\pi_{ij}$ representing the intercept of the individual, and $\pi_1/\pi_2$ representing the linear/quadratic slope of the change trajectory. The level-2 sub-model represents how this trajectory may differ between individuals. The intercept ($\pi_0$) and the slope of the change trajectory ($\pi_1/\pi_2$) are considered as level-2 outcomes for each component of the model, and its association with predicting variables is assessed.

The assessment proceeded in five steps shown in Table 1. First, the unconditional means model was fit to assess where the systematic variation resided. Second, the time-related predictors and demographic variables were added to the model, and the general trajectory in children’s behavioural problem was investigated. The third step introduced SEP variables to the model, and an assessment was carried on addressing how the trajectory in behavioural problems differed between children with different SEP. The fourth step introduced parenting variables to the model. The variables were chosen based on previous research (Kelly et al., 2011), and it was investigated to what extent they may account for the association between SEP and children’s behavioural problems. The last step added the interaction term between SEP and parenting variables to identify any interaction between these variables. The interaction terms were introduced to the model in a stepwise way; they were added and excluded from the model one by one and kept in the model if the coefficient was statistically significant at the 0.05 level. The model was fit centring age at 3 when the parenting variables were collected, and at 14 to investigate the effect in adolescence. All the statistical assessment was carried out by Stata 15 (StataCorp, 2017).

Table 1. Summary of the models

| Model | Level-1 (within individual) | Level-2 (between individual) |
|-------|-----------------------------|-----------------------------|
| 1     | $y_{ij} = \pi_0 + \pi_1x_i + \epsilon_i$ | $\pi_0 + \text{Intercept}_0 + \zeta_0$ |
| 2     | $y_{ij} = \pi_0 + \pi_1x_i + \pi_2x_i^2 + \epsilon_i$ | $\pi_0 + \text{Intercept}_0 + \text{DEMOGRAPHICS}_0 + \zeta_0$ |
| 3     | $y_{ij} = \pi_0 + \pi_1x_i + \pi_2x_i^2 + \epsilon_i$ | $\pi_0 + \text{Intercept}_0 + \text{DEMOGRAPHICS}_0 + \pi_2 + \text{SEP}_0 + \zeta_1$ |
| 4     | $y_{ij} = \pi_0 + \pi_1x_i + \pi_2x_i^2 + \epsilon_i$ | $\pi_0 + \text{Intercept}_0 + \text{DEMOGRAPHICS}_0 + \pi_2 + \text{SEP}_0 + \pi_2$ |
| 5     | $y_{ij} = \pi_0 + \pi_1x_i + \pi_2x_i^2 + \epsilon_i$ | $\pi_0 + \text{Intercept}_0 + \text{DEMOGRAPHICS}_0 + \pi_2 + \text{SEP}_0 + \pi_2 + \text{PARENTING}_0 + \zeta_2$ |

Results

The descriptive statistics of the data are summarised in Appendix 1 and Appendix 2. In general, children with disadvantaged household/maternal SEP had a higher mean SDQ score. The SDQ
|                    | Model-1      | Model-2      | Model-3      | Model-4      |
|--------------------|--------------|--------------|--------------|--------------|
| Fixed effects: coefficients (standard errors) |              |              |              |              |
| Initial status, $\pi_0$ | Intercept    | 5.20** (0.026) | 10.26** (0.17) | 10.32** (0.19) | 18.72** (0.46) |
|                      | Household income |              |              |              |
| Lowest quintile      | –            | –            | –            | –            |
| Second quintile      | $-0.54^{**}$ (0.084) | $-0.20^{*}$ (0.068) |              |              |
| Third quintile       | $-0.96^{**}$ (0.095) | $-0.43^{*}$ (0.077) |              |              |
| Fourth quintile      | $-1.11^{**}$ (0.10) | $-0.52^{*}$ (0.083) |              |              |
| Fifth quintile       | $-1.25^{**}$ (0.11) | $-0.64^{**}$ (0.092) |              |              |
| Maternal education   |              |              |              |              |
| None of below        | –            | –            | –            | –            |
| Overseas quality only| $-0.31$ (0.19) | $-0.29$ (0.16) | $-0.29^{*}$ (0.097) | $-0.29^{*}$ (0.097) |
| NVQ level 1          | $-0.38^{*}$ (0.12) | $-0.19$ (0.097) |              |              |
| NVQ level 2          | $-0.91^{**}$ (0.033) | $-0.48^{**}$ (0.077) |              |              |
| NVQ level 3          | $-1.14^{**}$ (0.11) | $-0.63^{**}$ (0.087) |              |              |
| NVQ level 4          | $-1.48^{**}$ (0.10) | $-0.95^{**}$ (0.086) |              |              |
| NVQ level 5          | $-1.58^{**}$ (0.17) | $-1.12^{**}$ (0.14) |              |              |
| Maternal occupation  |              |              |              |              |
| Not in work/on leave | –            | –            | –            | –            |
| Semi-routine and routine | 0.29* (0.86) | 0.21* (0.069) |              |              |
| Lower supervisory and technical | 0.11 (0.17) | 0.24 (0.14) |              |              |
| Small employers and self-employed | $-0.58^{*}$ (0.17) | $-0.32^{*}$ (0.14) |              |              |
| Intermediate         | $-0.060$ (0.96) | 0.058 (0.076) |              |              |
| Managerial and professional | $-0.21^{*}$ (0.087) | $-0.0097$ (0.068) |              |              |
| Linear rate of change, $\pi_1$ | Intercept | $-0.79^{**}$ (0.055) | $-0.80^{**}$ (0.062) | $-2.10^{**}$ (0.19) |
|                      | Household income |              |              |              |
| Lowest quintile      | –            | –            | –            | –            |
| Second quintile      | 0.0085 (0.028) | $-0.018$ (0.028) |              |              |
| Third quintile       | 0.0097 (0.031) | $-0.032$ (0.031) |              |              |
| Fourth quintile      | $-0.0092$ (0.034) | $-0.052$ (0.034) |              |              |
| Fifth quintile       | 0.0088 (0.037) | $-0.037$ (0.037) |              |              |
| Maternal education   |              |              |              |              |
| None of below        | –            | –            | –            | –            |
| Overseas quality only| 0.049 (0.064) | 0.069 (0.062) |              |              |
| NVQ level 1          | 0.066 (0.040) | 0.056 (0.039) |              |              |
| NVQ level 2          | 0.081* (0.032) | 0.059 (0.031) |              |              |
| NVQ level 3          | 0.078* (0.036) | 0.057 (0.036) |              |              |
| NVQ level 4          | 0.11* (0.035) | 0.096* (0.035) |              |              |
| NVQ level 5          | 0.15* (0.056) | 0.14* (0.055) |              |              |
| Maternal occupation  |              |              |              |              |
| Not in work/on leave | –            | –            | –            | –            |
| Semi-routine and routine | $-0.012$ (0.028) | $-0.010$ (0.028) |              |              |
| Lower supervisory and technical | 0.064 (0.056) | 0.056 (0.055) |              |              |
| Small employers and self-employed | 0.12* (0.056) | 0.10 (0.055) |              |              |

(Continued)
|                      | Model-1 | Model-2 | Model-3 | Model-4 |
|----------------------|---------|---------|---------|---------|
| Intermediate         | 0.0081 (0.031) | −0.0054 (0.030) |         |         |
| Managerial and professional | 0.049 (0.028) | 0.023 (0.027) |         |         |
| Quadratic rate of change, \( \sigma_2 \) Interception | 0.058** (0.0051) | 0.058** (0.0057) | 0.13** (0.018) |         |
| Household income     |         |         |         |         |
| Lowest quintile      | −0.0022 (0.0026) | −0.00074 (0.0026) |         |         |
| Second quintile      | −0.0027 (0.0029) | −0.00040 (0.0029) |         |         |
| Third quintile       | −0.00079 (0.0031) | 0.0014 (0.0031) |         |         |
| Fourth quintile      | −0.0014 (0.0034) | 0.0011 (0.0034) |         |         |
| Fifth quintile       | −0.0022 (0.0026) | −0.00074 (0.0026) |         |         |
| Maternal education   |         |         |         |         |
| None of below        | −0.0033 (0.0058) | −0.0048 (0.0057) |         |         |
| Overseas quality only | −0.0028 (0.0037) | −0.0026 (0.0037) |         |         |
| NVQ level 1          | −0.0045 (0.0029) | −0.0037 (0.0030) |         |         |
| NVQ level 2          | −0.0045 (0.0033) | −0.0039 (0.0034) |         |         |
| NVQ level 3          | −0.0076* (0.0032) | −0.0076* (0.0033) |         |         |
| NVQ level 4          | −0.011* (0.0051) | −0.012* (0.0051) |         |         |
| NVQ level 5          |         |         |         |         |
| Maternal occupation  |         |         |         |         |
| Not in work/on leave | 0.00058 (0.0026) | 0.00056 (0.0026) |         |         |
| Semi-routine and routine | 0.0062 (0.0052) | −0.0059 (0.0051) |         |         |
| Lower supervisory and technical | −0.0065 (0.0052) | −0.0053 (0.0051) |         |         |
| Small employers and self-employed |           |         |         |         |
| Intermediate         | 0.00028 (0.0029) | 0.0012 (0.0028) |         |         |
| Managerial and professional | −0.0038 (0.0026) | −0.0022 (0.0025) |         |         |

Variance components: standard deviations and correlation coefficients (standard errors)

|                      | Model-1 | Model-2 | Model-3 | Model-4 |
|----------------------|---------|---------|---------|---------|
| Level-1 Within-person (\( \sigma_\varepsilon \)) | 2.49 (0.0084) | 1.97 (0.0096) | 1.97 (0.0096) | 1.97 (0.0096) |
| Level-2 Initial status (\( \sigma_0 \)) | 2.76 (0.020) | 2.86 (0.022) | 2.76 (0.022) | 1.94 (0.019) |
| Linear rate of change (\( \sigma_1 \)) | 0.60 (0.012) | 0.59 (0.012) | 0.54 (0.012) |         |
| Corr (linear – initial) | −0.26 (0.015) | −0.25 (0.015) | 0.057 (0.022) |         |
| Quadratic rate of change (\( \sigma_2 \)) | 0.045 (0.0013) | 0.045 (0.0013) | 0.042 (0.0013) |         |
| Corr (quadratic – initial) | 0.12 (0.019) | 0.11 (0.020) | −0.20 (0.027) |         |
| Corr (quadratic – linear) | −0.94 (0.0035) | −0.94 (0.0035) | −0.93 (0.0042) |         |

Pseudo \( R^2 \) statistics

|                      | Model-1 | Model-2 | Model-3 | Model-4 |
|----------------------|---------|---------|---------|---------|
| \( R^2 \)           | 0.38    | 0.38    | 0.37    |         |
| \( R^2_c \)         | 0.07    | 0.54    |         |         |
| \( R^2_p \)         | 0.007   | 0.19    |         |         |
| \( R^2_E \)         | 0.006   | 0.13    |         |         |

\*p < 0.05, \**p < 0.001.

Model-1: empty.

Model-2: demographics.

Model-3: demographics + SEP.

Model-4: demographics + SEP + parenting.
|               | Model-1 | Model-2 | Model-3 | Model-4 | Model-5 |
|---------------|---------|---------|---------|---------|---------|
| **Fixed effects: coefficients (standard errors)** |         |         |         |         |         |
| Initial status, $\pi_0$ | Intercept | 3.00** (0.019) | 4.13** (0.11) | 4.36** (0.12) | 10.09** (0.36) | 11.39** (0.44) |
| **Household income** |         |         |         |         |         |
| Lowest quintile | – | – | – | – | – |
| Second quintile | –0.32** (0.057) | –0.13* (0.053) | –0.76 (0.43) |         |         |
| Third quintile | –0.60** (0.064) | –0.26** (0.060) | –2.24** (0.46) |         |         |
| Fourth quintile | –0.80** (0.069) | –0.41** (0.065) | –2.95** (0.49) |         |         |
| Fifth quintile | –0.82** (0.076) | –0.42** (0.071) | –2.93** (0.50) |         |         |
| **Maternal education** |         |         |         |         |         |
| None of below | – | – | – | – | – |
| Overseas quality only | –0.47** (0.13) | –0.43** (0.12) | –0.43** (0.12) |         |         |
| NVQ level 1 | –0.49** (0.080) | –0.35** (0.074) | –0.34** (0.074) |         |         |
| NVQ level 2 | –0.77** (0.063) | –0.50** (0.059) | –0.48** (0.059) |         |         |
| NVQ level 3 | –0.92** (0.072) | –0.59** (0.068) | –0.58** (0.068) |         |         |
| NVQ level 4 | –1.03** (0.070) | –0.68** (0.067) | –0.68** (0.067) |         |         |
| NVQ level 5 | –0.92** (0.12) | –0.65** (0.11) | –0.64** (0.11) |         |         |
| **Maternal occupation** |         |         |         |         |         |
| Not in work/on leave | – | – | – | – | – |
| Semi-routine and routine | –0.013 (0.058) | –0.0066 (0.053) | 0.0030 (0.053) |         |         |
| Lower supervisory and technical | –0.084 (0.11) | –0.0085 (0.11) | –0.0055 (0.11) |         |         |
| Small employers and self-employed | –0.046 (0.12) | 0.11 (0.11) | 0.10 (0.11) |         |         |
| Intermediate | –0.27** (0.064) | –0.18* (0.059) | –0.19* (0.059) |         |         |
| Managerial and professional | –0.22** (0.058) | –0.10 (0.53) | –0.11* (0.053) |         |         |
| **(Household income) × (CPRS)** |         |         |         |         |         |
| Lowest quintile | – | – | – | – | – |
| Second quintile | 0.010 (0.0067) |         |         |         |         |
| Third quintile | 0.031** (0.0071) |         |         |         |         |
| Fourth quintile | 0.040** (0.0075) |         |         |         |         |
| Fifth quintile | 0.39** (0.0077) |         |         |         |         |
| **Linear rate of change, $\pi_1$** | Intercept | –0.18** (0.046) | –0.21** (0.052) | –0.66** (0.16) | –0.83** (0.16) |         |         |
| **Household income** |         |         |         |         |         |
| Lowest quintile | – | – | – | – | – |
| Second quintile | –0.0027 (0.024) | 0.0055 (0.024) | 0.032 (0.081) |         |         |
| Third quintile | –0.022 (0.026) | –0.013 (0.027) | 0.25* (0.087) |         |         |
| Fourth quintile | –0.041 (0.028) | –0.028 (0.029) | 0.35** (0.093) |         |         |
| Fifth quintile | –0.043 (0.031) | –0.029 (0.032) | 0.30* (0.096) |         |         |
| **Maternal education** |         |         |         |         |         |
| None of below | – | – | – | – | – |
| Overseas quality only | 0.11 (0.53) | 0.12* (0.053) | 0.12* (0.053) |         |         |
| NVQ level 1 | 0.011 (0.34) | 0.013 (0.034) | 0.013 (0.034) |         |         |
| NVQ level 2 | 0.036 (0.027) | 0.041 (0.027) | 0.039 (0.027) |         |         |
| NVQ level 3 | 0.073* (0.030) | 0.080* (0.031) | 0.079* (0.031) |         |         |

(Continued)
|                      | Model-1         | Model-2         | Model-3         | Model-4         | Model-5         |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| NVQ level 4          | 0.084* (0.029) | 0.094* (0.030) | 0.093* (0.030) |
| NVQ level 5          | 0.087 (0.047)  | 0.096* (0.047) | 0.094* (0.047) |

Maternal occupation

|                      |                |                |                |                |                |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| Not in work/on leave | –              | –              | –              |                |                |
| Semi-routine and routine | 0.00093 (0.024) | 0.0056 (0.024) | 0.0040 (0.024) |
| Lower supervisory and technical | 0.0075 (0.047) | 0.014 (0.047) | 0.014 (0.047)  |
| Small employers and self-employed | 0.0070 (0.047) | 0.013 (0.047) | 0.013 (0.047)  |
| Intermediate | –0.0049 (0.026) | 0.00031 (0.026) | 0.00082 (0.026) |
| Managerial and professional | –0.021 (0.023) | –0.019 (0.023) | –0.017 (0.023) |

(Household income) × (CPRS)

|                      |                |                |                |                |                |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| Lowest quintile      |                |                |                |                |                |
| Second quintile      |                | –0.00046 (0.0012) |                |                |
| Third quintile       |                | –0.0047* (0.0013) |                |                |
| Fourth quintile      |                | –0.0060** (0.0014)|                |                |
| Fifth quintile       |                | –0.0051* (0.0014)|                |                |
| Quadratic rate of change, $\pi_{0i}^2$ | Intercept | 0.025** (0.0045) | 0.024** (0.0051) | 0.049* (0.015) | 0.049* (0.015) |

Household income

|                      |                |                |                |                |                |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| Lowest quintile      |                |                |                |                |                |
| Second quintile      |                | –0.0094 (0.0023) | –0.0016 (0.0024) | –0.0016 (0.0024) |
| Third quintile       | 0.00023 (0.0026) | –0.00053 (0.0026) | –0.00057 (0.0026) |
| Fourth quintile      | 0.00062 (0.0028) | –0.00045 (0.0028) | –0.00049 (0.0028) |
| Fifth quintile       | –0.00023 (0.0030) | –0.0013 (0.0031) | –0.0014 (0.0031) |

Maternal education

|                      |                |                |                |                |                |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| None of below        |                |                |                |                |                |
| Overseas quality only | –0.0063 (0.0051) | –0.0071 (0.0051) | –0.0070 (0.0051) |
| NVQ level 1          | 0.0016 (0.0033) | 0.0011 (0.0033) | 0.0011 (0.0033) |
| NVQ level 2          | –0.00049 (0.0026) | –0.0015 (0.0027) | –0.0015 (0.0027) |
| NVQ level 3          | –0.0042 (0.0030) | –0.0055 (0.0030) | –0.0055 (0.0030) |
| NVQ level 4          | –0.0063* (0.0029) | –0.0079* (0.0030) | –0.0079* (0.0030) |
| NVQ level 5          | –0.0085 (0.0045) | –0.010* (0.0046) | –0.010* (0.0046) |

Maternal occupation

|                      |                |                |                |                |                |
|----------------------|----------------|----------------|----------------|----------------|----------------|
| Not in work/on leave | –              | –              | –              |                |                |
| Semi-routine and routine | –0.00070 (0.0023) | –0.0011 (0.0023) | –0.0011 (0.0023) |
| Lower supervisory and technical | –0.00052 (0.0046) | –0.0011 (0.0046) | –0.0012 (0.0046) |
| Small employers and self-employed | 0.0012 (0.0046) | 0.00086 (0.0046) | 0.00085 (0.0046) |
| Intermediate | 0.000062 (0.0025) | –0.00035 (0.0025) | –0.00039 (0.0025) |
| Managerial and professional | –0.00018 (0.0023) | 0.0016 (0.0023) | 0.0016 (0.0023) |

Variance components: standard deviations and correlation coefficients (standard errors)

|                      | Level-1 | Level-2 | Level-2 |
|----------------------|---------|---------|---------|
| Within-person ($\sigma_i$) | 2.15 (0.0072) | 1.77 (0.0086) | 1.77 (0.0086) | 1.77 (0.0086) | 1.76 (0.0086) |
| Initial status ($\sigma_0$) | 1.91 (0.015) | 1.71 (0.017) | 1.63 (0.017) | 1.39 (0.017) | 1.42 (0.017) |
| Linear rate of change ($\sigma_1$) | 0.42 (0.012) | 0.42 (0.012) | 0.41 (0.012) | 0.42 (0.012) | 0.42 (0.012) |
| Corr (linear – initial) | 0.075 (0.025) | 0.085 (0.025) | 0.11 (0.028) | 0.12 (0.028) | (Continued) |
model-3 shows that children with advantaged household/increased trend in SDQ scores. As in externalising problems, and shorter in internalising problems, indicating a generally decreasing trend in the early ages was much milder that the decreasing trend in the early ages was much milder maternal education and maternal occupation. Model-2 shows Model-3: demographics + SEP + parenting + interaction term. Model-2: demographics. Model-1: empty. Model-1: empty. Model-2: demographics. Model-2: demographics + SEP + parenting. Model-3: demographics + SEP + parenting + interaction term. Model-3: demographics + SEP. Model-4: demographics + SEP + parenting. Model-1: empty. Model-2: demographics. Model-3: demographics + SEP. Model-4: demographics + SEP + parenting. Model-5: demographics + SEP + parenting + interaction term.

quadratic rate of change suggests that these differences may nar-
row during early childhood, but widen thereafter. Evaluation of interactions

|       | Model-1 | Model-2 | Model-3 | Model-4 | Model-5 |
|-------|---------|---------|---------|---------|---------|
| Corr (quadratic – initial) | 0.037 (0.0012) | 0.037 (0.0012) | 0.036 (0.0012) | 0.036 (0.0012) |
| Corr (quadratic – linear) | −0.14 (0.027) | −0.16 (0.028) | −0.19 (0.031) | −0.20 (0.031) |

Pseudo $R^2$ statistics

|        | $R^2_1$ | $R^2_2$ | $R^2_3$ | $R^2_4$ |
|--------|---------|---------|---------|---------|
| $R^2$  | 0.33    | 0.33    | 0.33    | 0.33    |
| $R^0_{1}$ | 0.08 | 0.34 | 0.34 | 0.34 |
| $R^0_{2}$ | 0.007 | 0.02 | 0.02 | 0.02 |

* $p < 0.05$, ** $p < 0.001$. Model-1: empty. Model-2: demographics. Model-3: demographics + SEP. Model-4: demographics + SEP + parenting. Model-5: demographics + SEP + parenting + interaction term.

Table 4. Attenuation of socioeconomic gradient in children’s SDQ score by the introduction of parenting variables

|                    | Externalising problems | Internalising problems |
|--------------------|------------------------|------------------------|
|                    | Age 3   | Age 14  | Age 3 | Age 14 |
| Household income   | −49%    | −31%    | −49%  | −32%   |
| Maternal education | −29%    | −26%    | −30%  | −17%   |
| Maternal occupation| −95%    | −82%    | −55%  | −50%   |

score for externalising problems generally showed a steady decrease from age 3 to 14, while those for internalising problems showed a mild increase after age 5.

Socioeconomic gradient in children’s behavioural problems

Table 2 shows the results for externalising problems and its association with the three SEP variables: household income maternal education and maternal occupation. The general trajectory of children’s SDQ score was evaluated by model-2, showing that the scores tend to decrease in early childhood, but would slightly increase in later childhood and adolescence. Model-3 shows that children from an advantaged household/maternal SEP tend to have lower SDQ scores. For example, the SDQ score of children from the 5th income quintile had lower scores by −0.82 (95% confidence interval −0.97 to −0.67) compared to those from the lowest quintile. Similarly, children whose mothers were NVQ level 5 had −0.92 (95% confidence interval −1.15 to −0.70) lower scores than those with mothers of no educational qualification. However, as in externalising problems, the difference between maternal occupation was milder than the other two SEP variables.

Early parenting environment and socioeconomic gradient in children’s behavioural problems

For externalising problems, the introduction of variables for parenting environment attenuated the association between SDQ scores and SEP by 49% for household income, 29% for maternal education and 95% for maternal occupation at age 3, and 31, 26 and 82%, respectively, at age 14 (Table 4). Considering the variance components, there was an additional 47% reduction in the level-2 variance of the initial status (Table 2: model-4). Parenting environment seems to have explained a larger part of the difference in SDQ scores between children than SEP (Fig. 1).

For internalising problems, the introduction of parenting variables attenuated the association between SDQ scores and SEP by 49% for household income, 30% for maternal education and 55% for maternal occupation at age 3, and 32, 17 and 50%, respectively, at age 14 (Table 4). There was an additional 26% reduction in the level-2 variance of the initial status, showing that parenting environment explained a certain degree of difference in SDQ scores between children (Table 3: model-4).

Evaluation of interactions

There was no statistically significant interaction between household/maternal SEP and parenting environment with regards to externalising problems. On the contrary, there was a statistically significant interaction regarding internalising problems where parent–child relationship modified the effect of household income (Table 3: model-5). There was a more modest income gradient among those with better parent–child relationship in early childhood. However, the income gradient within this group
grew as children aged. By the time they reached adolescence, the difference in SDQ scores between children from 1st and 5th income quintiles was larger within children who were under a better parent–child relationship than those under poor parent–child relationships. Nonetheless, the SDQ score was better for those who had good parent–child relationship than those who had a poor one, irrespective of their SEP (Fig. 2).

**Discussion**

**Summary of findings and comparison with other studies**

The aim of this study was to reveal the relationships between SEP, parenting environment and children’s behavioural problems. For both internalising and externalising problems, children under disadvantaged SEP during early childhood were more likely to have worse behavioural problems. However, the socioeconomic gradient differed between measures of SEP, showing a greater gap between those in advanced and disadvantaged categories for household income and maternal education, and a smaller gap for maternal occupation. Second, early parenting environment had a stronger independent association with children than parental SEP and also attenuated the socioeconomic gradient in children. The aim of this study was to reveal the relationships between SEP, parenting environment and children’s behavioural problems.

Although previous studies have shown that parenting may attenuate the income gradient in children’s behavioural problems, most of these studies have been cross-sectional studies and therefore its temporality and long-term effects were not clear (Gershoff et al., 2007; Kelly et al., 2011; Bøe et al., 2014). Perhaps reflecting the rising influence from other factors such as school activity and peer relationships, this study showed that the effect of attenuation weakened as children aged. Nonetheless, early parenting environment still explained a certain degree of socioeconomic gradient in SDQ scores among adolescents. Another strength of this study is the multiple measures used to assess SEP. A cross-sectional pathway analysis conducted on Norwegian adolescents showed that maternal education did not have a direct effect on either internalising or externalising problems after introducing parenting variables, while household income had a direct association with internalising problems (Bøe et al., 2014). This is somewhat different from this study, where both SEP variables preserved a significant association with behavioural problems. Since the model in the Norwegian study only explained half the variance of the children’s behavioural problems explained in this study, this difference may be due to a smaller amount of inequality and a powerful social security system in the Nordic countries. Finally, this study assessed whether there was an interaction between SEP and parenting environment, finding evidence in internalising problems. Harsh parenting, for which some studies found significant interaction, was not shown to moderate the effect, possibly because of the broader aspects of parenting covered in this study (MacKenzie et al., 2014; Flouri and Midouhas, 2017). For example, Flouri and Midouhas investigated the roll of harsh parenting in moderating the effects of socioeconomic disadvantage and adverse life events on children’s behavioural problems, and have found some evidence of support (Flouri and Midouhas, 2017). However, since their interest was focused on harsh parenting, they did not include much variables to control for other parenting activities which contrasts to this study. The interaction on internalising problems found in this study was consistent with a former study which showed that parent–child relationship buffered the socioeconomic disadvantage in 3-year-old children (Malmberg and Flouri, 2011). However, this study has revealed that this buffering effect declines as children grow. Since parenting data were taken when children were 3 years old, this decrease in the buffering effect might possibly be reflecting the difficulty of maintaining good parent–child relationship in disadvantaged families.

**Meaning of the study**

In general, this study has shown that a low-quality parenting environment in early childhood is a considerable risk for
developing behavioural problems, regardless of children’s familial/maternal SEP. Therefore, it is crucial to improve the parenting environment to prevent children from developing behavioural problems. Interventions such as home visiting programmes and community programmes providing parents with support and guidance may contribute to improving this environment, and at the end, this might also narrow the socioeconomic gradient among them. Second, for those programmes and interventions which take targeted strategies, this study suggests that in childhood, children in lower parenting environment are under higher risk than those from disadvantaged SEP families. However, as children age, those from lower household income may require consideration, because they will be under increased risk in developing internalising problems even if they were under favourable parenting environment. Finally, when considering importance between policies to improve children’s socioeconomic circumstances, this study suggests that policies focusing on maternal occupation may be less important in raising their behavioural outcomes. Furthermore, since household income seems to have more effect than maternal education as children grow older, income-related policies may require the most importance in the long run.

**Strengths and limitations**

A distinct strength of this study is that it is a prospective longitudinal analysis, based on large-scale samples from a nationally representative cohort. This makes the temporality of the association clearer and the external validity stronger. The number of sweeps and variables collected in the MCS has also led to strengths. It has contributed in reducing the possibility of residual bias and enabled this study to apply a growth curve model which, compared to traditional techniques, has an advantage in handling missing data and modelling trajectories in the individual level rather than the aggregate level (StataCorp, 2017). Also, data for MCS were collected through trained interviewers to improve the quality of the data. On the contrary, there are some limitations. One of them is regarding the selection of the study sample and missing data. The initial response rate of the MCS ranged between 60 and 70%, which may cause bias in the result of the study (Hansen, 2014). However, evaluation of the known characteristics in those lost before issue to field did not seem to be systematically biased (Plewis et al., 2007; Hansen, 2014). Also, missing data within the study sample were either accounted for by the growth curve model or by multiple imputation. Another possible limitation of this study was that the SDQ scores used in this study were based on parent report. In a previous study using the MCS, the socioeconomic gradient in the SDQ score was stronger in parent report compared to teacher report, which may be demonstrating reporting bias (Plewis et al., 2007). Nevertheless, the socioeconomic gradient was statistically significant in both parent and teacher report, and the scores were well correlated in their study. Also, SDQ is widely known as a validated and reliable measure of children’s behavioural status (Goodman, 2001; Plewis et al., 2007).

Some topics which were not covered by this study may provide implications for further research. Regarding SEP, this study did not cover paternal measures. Some study indicates that paternal SEP may have an independent effect on children’s behavioural problems, and may have a pathway different from those for maternal SEP (Boe et al., 2014). Also, further follow-up may be important to assess the long-term effect of parenting environment, since some small-scaled study found a rebound in the strength of association after adolescence (Lorber and Egeland, 2009). Finally, although early parenting explained a certain degree of gradient in behavioural problems of adolescents, much of the variance is still unexplained. Further research may be called for to reveal how this socioeconomic gradient is fully explained.

**Data.** The full dataset used for this study is available from the UK Data Service under standard conditions: https://discovery.ukdataservice.ac.uk/series/?sn=2000031#access.

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**Conflict of interest.** Non.

**Ethical standards.** The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional guides on the care and use of laboratory animals.

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## Appendix

### Appendix 1. Descriptive data for exposures

|                          | N (%)   | Mean (S.D.) |
|--------------------------|---------|-------------|
| **Mother’s age at child’s birth** |         |             |
| Missing                  | 2 (0.01)| –           |
| Valid                    | 14 450 (99.99) | 28.66 (5.87) |
| **Child’s sex**          |         |             |
| Male                     | 7388 (51.12) |             |
| Female                   | 7064 (48.88) |             |
| **First child**          |         |             |
| Not first child          | 8458 (58.52) |             |
| First child              | 5994 (41.48) |             |
| **Household language**   |         |             |
| Missing                  | 67 (0.46) |             |
| English only             | 12 267 (84.88) |             |
| Any other language spoken| 2118 (14.66) |             |
| **Household income**     |         |             |
| Missing                  | 38 (0.26) |             |
| Lowest quintile          | 3235 (22.38) |             |
| Second quintile          | 3113 (21.54) |             |
| Third quintile           | 2799 (19.37) |             |
| Fourth quintile          | 2728 (18.88) |             |
| Fifth quintile           | 2539 (17.57) |             |
| **Maternal education**   |         |             |
| Missing                  | 21 (0.15) |             |
| None of below            | 2055 (14.22) |             |
| Overseas quality only    | 384 (2.66) |             |
| NVQ level 1              | 1193 (8.25) |             |
| NVQ level 2              | 4174 (28.88) |             |
| NVQ level 3              | 2097 (14.51) |             |
| NVQ level 4              | 4015 (27.78) |             |
| NVQ level 5              | 513 (3.55) |             |
| **Maternal occupation**  |         |             |
| Missing                  | 71 (0.49) |             |
| Not in work/on leave     | 7288 (50.43) |             |
| Semi-routine and routine | 1860 (12.87) |             |
| Lower supervisory and technical | 362 (2.50) |             |
| Small employers and self-employed | 351 (2.43) |             |
| Intermediate             | 1539 (10.65) |             |
| Managerial and professional | 2981 (20.63) |             |
| **Mother’s reading**     |         |             |
| Missing                  | 68 (0.47) |             |
| Every day                | 8279 (57.29) |             |

(Continued)
### Appendix 1. (Continued)

|                          | N (%)     | Mean (s.d.) |
|--------------------------|-----------|-------------|
| Teaching songs           |           |             |
| Missing                  | 69 (0.48) |             |
| Do not                   | 665 (4.60)|             |
| Occasionally/less than one a week | 560 (3.87) |             |
| 1–2 days per week        | 1512 (10.46)|           |
| 3 times a week           | 1316 (9.11)|           |
| 4 times a week           | 1097 (7.59)|           |
| 5 times a week           | 1008 (6.97)|           |
| 6 times a week           | 617 (4.27)|            |
| 7 times a week/constantly| 7608 (52.64)|           |
| Child drawing            |           |             |
| Missing                  | 69 (0.48) |             |
| Do not                   | 286 (1.98) |             |
| Occasionally/less than one a week | 566 (3.92) |           |
| 1–2 days per week        | 2042 (14.13)|           |
| 3 times a week           | 1716 (11.87)|           |
| 4 times a week           | 1434 (9.92)|            |
| 5 times a week           | 1227 (8.49)|            |
| 6 times a week           | 801 (5.54)|             |
| 7 times a week/constantly| 6311 (43.67)|           |
| Regular bed times        |           |             |
| Missing                  | 68 (0.47) |             |
| Never/almost never       | 1112 (7.69)|           |
| Sometimes                | 1988 (13.76)|           |
| Usually                  | 5417 (37.48)|           |
| Always                   | 5867 (40.60)|           |
| Regular meal times       |           |             |
| Missing                  | 68 (0.47) |             |
| Never/almost never       | 306 (2.12) |             |
| Sometimes                | 1083 (7.49)|            |
| Usually                  | 6166 (42.67)|           |

### Appendix 1. (Continued)

|                          | N (%)     | Mean (s.d.) |
|--------------------------|-----------|-------------|
| Always                   | 6829 (47.25)|           |
| Family rules             |           |             |
| Missing                  | 69 (0.48) |             |
| Lots of rules            | 4201 (29.07)|           |
| Not many rules           | 6292 (43.54)|           |
| It varies                | 3890 (26.92)|           |
| Enforcement of rules     |           |             |
| Missing                  | 69 (0.48) |             |
| Strictly enforced        | 6601 (45.68)|           |
| Not very strictly enforced| 3806 (26.34)|           |
| It varies                | 3976 (27.51)|           |
| Parenting competence     |           |             |
| Missing                  | 1619 (11.20)|           |
| Not very good            | 36 (0.25)  |             |
| Have some trouble being a parent | 371 (2.57) |           |
| Average parent           | 4844 (33.52)|           |
| Better than average parent| 3290 (22.77)|           |
| Very good parent         | 4292 (29.70)|           |
| K6 score                 |           |             |
| Missing                  | 1511 (10.46)|           |
| Valid                    | 12 941 (89.54)|         |
| CPRS                     |           |             |
| Missing                  | 1649 (11.41)|           |
| Valid                    | 12 803 (88.59)|         |
| HOME inventory           |           |             |
| Missing                  | 1892 (13.09)|           |
| Valid                    | 12 560 (86.91)|         |
| Discipline strategy      |           |             |
| Missing                  | 2868 (19.85)|           |
| Valid                    | 11 584 (80.15)|         |

(Continued)
### Appendix 2. Descriptive data for outcomes (mean SDQ scores) by SEP

|                          | Age 3 | Age 5 | Age 7 | Age 11 | Age 14 |
|--------------------------|-------|-------|-------|--------|--------|
| **Internalising problems** |       |       |       |        |        |
| Household income         |       |       |       |        |        |
| Lowest quintile          | 3.88  | 3.37  | 3.67  | 4.13   | 4.84   |
| Second quintile          | 3.28  | 2.82  | 3.10  | 3.64   | 4.24   |
| Third quintile           | 2.72  | 2.31  | 2.57  | 3.07   | 3.59   |
| Fourth quintile          | 2.31  | 1.97  | 2.11  | 2.59   | 3.09   |
| Highest quintile         | 2.20  | 1.91  | 2.05  | 2.47   | 2.84   |
| Maternal education       |       |       |       |        |        |
| None of below            | 4.17  | 3.58  | 3.85  | 4.16   | 4.81   |
| Overseas quality only    | 3.64  | 3.29  | 3.63  | 3.95   | 4.68   |
| NVQ level 1              | 3.46  | 3.04  | 3.28  | 3.74   | 4.59   |
| NVQ level 2              | 2.96  | 2.47  | 2.72  | 3.31   | 3.89   |
| NVQ level 3              | 2.70  | 2.30  | 2.54  | 3.10   | 3.59   |
| NVQ level 4              | 2.29  | 1.99  | 2.16  | 2.60   | 3.02   |
| NVQ level 5              | 2.32  | 2.11  | 2.09  | 2.48   | 2.77   |
| Maternal occupation      |       |       |       |        |        |
| Not in work/on leave     | 3.33  | 2.84  | 3.13  | 3.58   | 4.21   |
| Semi-routine and routine | 3.04  | 2.63  | 2.83  | 3.38   | 3.83   |
| Lower supervisory and technical | 2.75 | 2.27 | 2.68 | 3.14 | 3.73 |
| Small employers and self-employed | 2.58 | 2.26 | 2.44 | 2.96 | 3.63 |
| Intermediate             | 2.42  | 2.12  | 2.25  | 2.78   | 3.29   |
| Managerial and professional | 2.19 | 1.89  | 2.00  | 2.48   | 2.90   |

Appendix 2. (Continued.)

|                          | Age 3 | Age 5 | Age 7 | Age 11 | Age 14 |
|--------------------------|-------|-------|-------|--------|--------|
| **Externalising problems** |       |       |       |        |        |
| Household income         |       |       |       |        |        |
| Lowest quintile          | 8.25  | 6.09  | 5.99  | 5.78   | 5.65   |
| Second quintile          | 7.30  | 5.26  | 5.21  | 4.96   | 4.86   |
| Third quintile           | 6.53  | 4.50  | 4.54  | 4.32   | 4.05   |
| Fourth quintile          | 5.88  | 4.14  | 4.03  | 3.71   | 3.66   |
| Highest quintile         | 5.39  | 3.71  | 3.71  | 3.39   | 3.31   |
| Maternal education       |       |       |       |        |        |
| None of below            | 8.39  | 6.22  | 5.92  | 5.64   | 5.52   |
| Overseas quality only    | 7.67  | 5.54  | 5.56  | 4.89   | 5.02   |
| NVQ level 1              | 7.96  | 5.81  | 5.84  | 5.55   | 5.61   |
| NVQ level 2              | 6.98  | 4.99  | 4.90  | 4.78   | 4.60   |
| NVQ level 3              | 6.57  | 4.60  | 4.58  | 4.29   | 4.19   |
| NVQ level 4              | 5.61  | 3.83  | 3.85  | 3.55   | 3.38   |
| NVQ level 5              | 5.07  | 3.58  | 3.61  | 3.17   | 3.13   |
| Maternal occupation      |       |       |       |        |        |
| Not in work/on leave     | 7.31  | 5.25  | 5.16  | 4.89   | 4.80   |
| Semi-routine and routine | 7.27  | 5.12  | 5.11  | 4.90   | 4.67   |
| Lower supervisory and technical | 6.65 | 4.88 | 4.88 | 4.41 | 4.40 |
| Small employers and self-employed | 5.44 | 3.89 | 4.11 | 3.75 | 3.90 |
| Intermediate             | 6.33  | 4.33  | 4.38  | 4.19   | 4.03   |
| Managerial and professional | 5.42 | 3.79  | 3.73  | 3.47   | 3.29   |

(Continued)