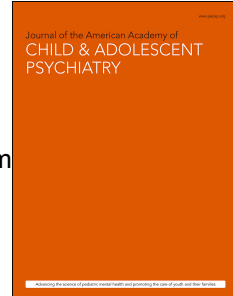# Journal Pre-proof

Enduring Mental Health in Childhood and Adolescence: Learning From the Millennium Cohort Study

Professor Jessica Deighton, PhD, Doctor Suzet Tanya Lereya, PhD, Professor Miranda Wolpert, DClin

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Enduring Mental Health in Childhood and Adolescence: Learning From the Millennium
Cohort Study
RH = Enduring Mental Health in Childhood

Jessica Deighton, PhD, Suzet Tanya Lereya, PhD, Miranda Wolpert, DClin

Editorial

Profs. Deighton, Wolpert, and Dr. Lereya are with UCL and Anna Freud National Centre for
Children and Families, London, United Kingdom. Prof. Wolpert is also with Wellcome Trust,
London, United Kingdom.

Author Contributions
Conceptualization: Deighton, Lereya, Wolpert
Formal analysis: Lereya
Writing – original draft: Deighton, Lereya, Wolpert
Writing – review and editing: Deighton, Lereya, Wolpert

ORCID
Jessica Deighton, PhD: https://orcid.org/0000-0002-9516-7545
Suzet Tanya Lereya, PhD:
Miranda Wolpert, DClin:

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Correspondence to Jessica Deighton, PhD, Anna Freud National Centre for Children and
Families, Kantor Centre of excellence, 4-8 Rodney Street, N1 9JH; e-mail:
Jessica.DeightonPhD@annafreud.org.

Abstract

Objective: Enduring mental health (EMH) is a relatively new concept, which refers to a long-term state of not experiencing a mental illness (ie, enduring mental wellness). No analysis using this concept has been undertaken on UK data nor specifically in the childhood years. The present study seeks to consider the extent and predictors of EMH in children aged 9 months to 14 years who were part of the UK-wide Millennium Cohort Study (MCS).

Method: Data derived from 13,310 children (49·4% girls) at ages 9 months and 3, 5, 7, 11, and 14 years were pooled to create with three categories: Enduring mental health (EMH), Some instances of mental health problems (SIMHP) and many instances of mental health problems (MIMHP).

Results: Less than half of children (41%) fell into the category of EMH, the rest had at least some periods of mental health problems. Factors associated with EMH relative to those with some instances of mental health problems (SIMHP) or many instances of mental health problems (MIMHP) included cognitive ability, lack of special educational needs, good emotion regulation, cooperation and enjoyment of school. Parenting and maternal mental health were also associated with EMH but only in comparison to those with MIMHP.

Conclusion: Findings suggests that EMH is not the norm during childhood. Identification of the high association between both educational wellbeing and emotional regulation with EMH offer the opportunity for a potentially powerful combination of community and individual initiatives. These might include: supporting positive mental health of the primary care giver, systems to support early recognition, supporting positive parenting in the early years, enhancing school engagement, and strengthening the child's social and emotional skills, including cooperation, and self-regulation to prevent later mental health problems.

INTRODUCTION

Background/rationale

Enduring mental health (EMH) is a relatively new concept introduced by Schaefer et al and refers to a long term state of *not* experiencing a mental illness.[1] In their analysis of data from the longitudinal Dunedin Study, they found only 17% of people never met diagnostic criteria for a well-specified mental health problem during repeated assessments conducted between the ages of 11 and 38 years. For comparison to EMH, two other categories were created: those diagnosed with a mental disorder at 1-2 study waves (modal group) and those diagnosed at 3 or more waves. This allowed the authors to explore factors that predicted a better-than-average mental health history (EMH) in comparison with a more "typical" mental health history (1-2 instances of mental health problems) versus those with severe and persistent disorder. A range of factors were associated with this rare state of EMH, including positive temperament characteristics, lack of family history of mental disorder, and good quality relationships. These findings provide much needed prominence for the notion that experience of mental illness at some point throughout the lifespan is common, whilst an enduring state of mental wellness is comparatively rarer.

However, this study focused on mid-childhood to middle adulthood. The phenomenon of EMH has not yet been explored in cohorts including measures at early childhood and no studies have focused specifically on EMH in childhood and adolescence. This period is of particular interest because it represents formative years for mental health with around 50% of mental health problems being apparent before the age of 14, and over this period mental health problems in young people begin to increase.[2-5] This debate has included competing views on whether findings represent real increases in mental disorders amongst children and adolescents,[3] or are explained by labelling common experiences of distress or stress as mental health problems.[6] However, the focus thus far is on point prevalence, not on long term mental illness and on mental health problems rather than mental wellness. One exception involves the study of symptom development typologies and their antecedents in early childhood.[4] This study provides a helpful differentiation between clusters of symptom trajectories in childhood and their early predictors but greater emphasis on positive adaptation and predictors of this in later childhood is warranted.

Further evidence of predictors of mental health problems comes from a range of prevalence studies, which commonly cite risk factors including deprivation, negative parent–child

relationships, parental mental health problems, and learning difficulties.[7-9] Whilst some studies exist exploring predictors of mental health competence,[10] comparatively few studies have focused on predictors of enduring mental health.[1, 11] Correlates identified include absence of conduct problems in early life, temperament, and absence of parental mental health problems. However, none of these have explored predictors of EMH throughout childhood.

Objectives

To examine the childhood predictors of Enduring Mental Health across childhood, we used data from the Millennium Cohort Study (MCS). Although the MCS sample was too large to assess participants for psychopathology through formal diagnostic interviews (as in Schaefer et al., 2017), an age-appropriate measure of mental health and behavioural problems was administered at ages 3, 5, 7, 11, and 14, allowing us to categorize children as either showing evidence of mental health problems at a particular wave or not, depending on whether they scored above pre-determined "cut-offs" on any of this measure's five-item subscales. Responses across these multiple waves were then further categorised to reflect EMH – an uncommon state free from mental health problems at all time points; some instances of mental health problems (SIMP) – a more typical mental health history and many instances of mental health problems (MIMHP) – severe or persistent mental health problems.

This approach was used to answer the following research questions:

1) What is the prevalence of EMH as indexed by not scoring above the cut-off point on any SDQ problem subscales across any of the five assessment periods between the ages of 3 and 14?

2) What is the prevalence of MIMHP as indexed by mental health problems at four or more of the five assessment periods?

3) What is the prevalence of SIMHP as indexed by mental health problems at one to three of the five assessments?

4) What predicts membership of the above groups?

METHOD

Design

This study draws on data collected as part of the MCS - a UK birth cohort study of individuals born in the UK between September 2000 and January 2002. The study uses a stratified cluster design and includes all regions and countries of the United Kingdom. Ethical

approval for the MCS was received from a Research Ethics Committee at each sweep.[12] Data were obtained from the UK Data Archive in June 2018.

At the first contact (MCS1), when the children were 9 months of age, 18,552 families were interviewed. A further five surveys have since been carried out at 3, 5, 7, 11 and 14 years of age. More details of the study design, variables, and attrition can be found at www.cls.ioe.ac.uk.[12]

Data statement

The dataset is available through application to the UK Data Service.

Participants and statistical methods

For this research, the sample was limited to children who had complete data on Strengths and Difficulties Questionnaire (SDQ) for at least two out of the five waves (between waves 2–6; 3–14 years of age) to ensure adequate data availability and have the necessary survey weights. This requirements reduced the available sample from 19,243 to 13,310 children (49·4% girls). Multiple imputation with chained equations (n = 20) were used to impute missing values (using the mi package in Stata 15).[13] To ensure plausibility of the missing at random assumption, our imputation model included a number of auxiliary sociodemographic and mental health variables predictive of incomplete variables and/or missingness (full list available as supplementary material). Compared with the full MCS sample at sweep 1 (age 9 months, N = 18,818), weighted proportions indicate that the analysed sample had slightly fewer children from lower income households (16·3% in the analysed sample compared with 17·2% in the original sample) and fewer children from ethnic minorities (12·1% in the analysed sample compared with 13·5% in the original sample). Complete case analyses were performed before using imputed data sets. Since the two sets of findings were similar, analyses using the imputed dataset are presented here. Overall, missing cells were at 9·97% of the total, with missingness varying from 0·0006% for ethnicity to 32·0% for child's temperament approach/withdrawal (for more information see Table 1). Given the stratified clustered sample design of the MCS and to account for subgroup oversampling and attrition over waves, all analyses including the imputation were conducted by accounting for the survey design and applying weights (using svy commands in Stata 15). In order to investigate what predicts enduring mental health, multinomial regression analysis have been conducted using STATA, mlogit command.

Measures

Outcome variable: Strengths and Difficulties Questionnaire (SDQ)

At ages 3, 5, 7, 11, and 14, the child's main caregiver completed the age appropriate SDQ, a tool used to assess mental health and behavioural problems in children and adolescents.[14] The SDQ consists of five subscales: emotional difficulties, conduct difficulties, hyperactivity/inattention difficulties, difficulties with peers, and prosocial behaviour, each consisting of five items on a three-point scale. The four problem subscales" have been used in the analysis. These subscales have thresholds for 'abnormal' scoring ranges indicating children and young people at high risk of experiencing mental health problems (for wave 2 (3 years old) the abnormal cut offs were: conduct problems 5 and above, peer problems 4 and above, emotional problems 4 and above and inattention/hyperactivity 7 and above; for the other waves: abnormal cut offs: conduct problems 4 and above, peer problems 4 and above, emotional problems 5 and above and inattention/hyperactivity 7 and above). These thresholds were used to create binary variables of above (1) versus below (0) threshold. In each wave, if children were above the threshold for any of the four difficulties, they were classified as having a mental health problem. Then children were categorised into EMH (no mental health problem in any of the five sweeps), MIMHP (mental health problems in at least four out of the five sweeps), and SIMHP (health problems in one to three sweeps). It should be noted that this method was different from that used by Schaefer et al[1] as it relied on self-reported difficulties being above cut off and a smaller number of difficulties than those considered by Schaefer et al who used diagnostics interview data.

Variables predicting mental health were based on pre-existing literature for risk and protective factors.[15] Descriptive statistics and details of which sweep of each measure has been selected are presented in Table 1. Please note, age 7 (sweep 4) was taken as the default sweep for predictor variables as a mid-point in the period being studied. This was supplemented by information from sweep 1 in order to capture predictors most relevant to early infancy and where data at age 7 were not available.

Child Demographics. Child demographic characteristics included sex, age at assessment (7 years), and ethnicity (White, Asian, Black, mixed, and other ethnic groups).

Socioeconomic Factors. Household income was represented in UK equivalized quintiles (1 = lowest income quintile, 5 = highest income quintile). Employment status of parents was represented as neither parent works (compared to either or both parents working). Parent education was categorised by the highest National Vocational Qualifications level in the household (levels 1–5, where level 1 represents the lowest level qualification and 5 represents the highest), with separate categories for overseas qualifications and no qualifications. Housing status was categorized as living in own home versus rented or other property (1 = not own home).

Prenatal- and infancy-level factors included maternal smoking during pregnancy (0 = no smoking, 1 = smoking one cigarette per day; 2 = smoking more than one cigarette per day), account of breastfeeding (less than one week, less than six months, more than six months), immunisations (whether the child had all immunisations needed for his/her age; 1 = yes), number of hospital visits due to accidents and injuries (0 = no visits, 1 = one visit, 2 = two or more visits), number of GP visits due to health problems (0 = no visits, 1 = one visit, 2 = two or more visits).

Child-level factors

Cognitive Factors. Children's cognitive ability was assessed using an aggregate latent score derived from the British Ability Scales[16] - the pattern construction and word reading scores and the National Foundation for Educational Research (NFER) number skills score at 7 years old. All these assessments were administered by the interviewer, who demonstrated how to perform the test before the child attempted. The analyses used the age-adjusted scores, which reflect the raw score and the difficulty of the items administered. Special educational need status was considered present if the child had a statement.

Individual Factors. At the first sweep (9 months old), parents reported on the child's temperament (regularity, approach-withdrawal, adaptability, and mood) by answering four subscales of the Carey Infant Temperament Scale[17]: mood (five items; example item: he makes happy sounds (coos, laughs) when having his nappy changed, or being), approachability-withdrawal (three items; example item: he is still wary or frightened of strangers after 15 minutes.), adaptability (two items; example item: he appears bothered (cries/squirms) when first put down in a different sleeping place), and regularity (four items; example item: His naps are about the same length from day to day). High scores indicate

better mood, better regularity, poorer adaptability, and poorer approachability/withdrawal. Child self-regulation (independence and self-regulation, cooperation, and emotional dysregulation) were measured with the subscales of the Child Social Behaviour Questionnaire used on the EPPE and EPPNI projects for 7 and 10-year olds.[18] Example items include for independence and self-regulation: likes to work things out for self, does not need much help with tasks, and chooses activities on their own; for cooperation: works/plays easily with others, waits his/her turn in games/activities, Co-operates with requests; for emotional dysregulation: shows mood swings, gets over being upset quickly, acts impulsively. High scores indicate better independence and self-regulation, better cooperation, and more emotional dysregulation. Child's enjoyment of school was measured with a single question of whether the child enjoys school reported by the mother (yes: always and usually = 0; no: sometimes and not at all = 1).

Health. Gross developmental motor delay was estimated from parent-reported motor development (delay in moving, sitting, or standing) at 9 months of age. The child's body mass index (at 7 years old) was coded as normal, below the underweight threshold, and above the overweight threshold for the child's age and sex based on the classification of the International Obesity Task Force.[19] The child's height was assessed at 7 years old.

Family Structure. Family characteristics included in the analyses were whether the child was in a single-parent household (1 = yes) (at age 7), number of siblings (0, 1, 2, or + 3) (assessed at year 7), and birth parity (eldest child) (assessed at 9 months).

Home Environment. Mothers reported on attachment with select items from the Condon Maternal Attachment questionnaire at 9 months[20] which has been used to measure postpartum attachment in a variety of populations[21] an example items include: "...when I am not with [the child's name], I find myself thinking about him/her. Higher scores indicate higher attachment. Parent–child interaction was measured with six items asking the frequency of parents telling stories, musical activities, art activities, games, physical play, and visits to the park or playground. Higher scores indicate more parent–child interaction. Maladaptive parenting composite was constructed with seven items from the Straus's Conflict Tactics Scale (ignore the child, smack the child, shout at the child, send child to bedroom when naughty, take away treats when child is naughty, tell child off when naughty, and bribe child when naughty).[22] Higher scores indicate higher maladaptive parenting. Inter-parental

relationship was measured at 9 months with a shortened version of the Golombok Rust Inventory of Marital State,[23] which measures closeness, communication and satisfaction with one's partner. Domestic abuse was measured with a single item asking whether they have used force to their partner. If either the mother or her partner responded yes at any wave (waves 1–4), abuse was considered as present.

Maternal Health. Maternal general health was measured using the General Health item from the SF-8 ("How would you describe your health generally?"). Higher scores indicate lower general health. Maternal chronic illness was coded as present if the mother answered yes to the question: "Do you have a longstanding illness, disability or infirmity. Longstanding mean anything that has troubled you over a period of time or that is likely to affect you over a period of time?" at wave 1 (at 9 months old). Maternal mental health difficulties were assessed with a brief measure developed as mental health screen for the general population, the Kessler K6 scale (example items include: during the last 30 days, about how often did you feel hopeless?; during the last 30 days, about how often did you feel restless or fidgety?).[24] Higher scores indicate higher mental health difficulties. Maternal psychosocial distress was measured with a nine-item reduced Rutter Malaise Inventory, a validated instrument that assess levels of anxiety and distress (example items include: do you feel tired most of the time?; do you often feel miserable or depressed?). A score of at least four points was used to classify high levels of psychological distress as in previous work.[25] Lastly, maternal life satisfaction was measured using a single-item measurement of life satisfaction ("On a scale from 0 to 10, how satisfied are you about the way your life has turned out so far?"), where higher scores indicate greater life satisfaction.

[INSERT TABLE 1]

RESULTS

Out of 13,310 children, 40·5% were classified as EMH, 13·7% as having MIMHP, and the remaining 45·8% shown to have SIMHP.

Table 1 presents descriptive statistics for all the predictive variables.

To investigate what distinguishes those who experience EMH from those who experience mental health difficulties, multinomial regression analysis was conducted (Table 2). In order

to examine whether the chosen variables were representing distinct aspects of the child's environment and development and to limit concerns regarding collinearity in the regression model, correlations between the predictor variables were examined. The correlations were below ± 0·3. The exceptions were socioeconomic factors (where correlations ranged from 0·31 to 0·52), adaptability (which correlated 0·39 with approachability), independence and self-regulation (which correlated -0·33 with emotional dysregulation and 0·46 with cooperation), cooperation (which correlated -0·50 with emotional dysregulation and -0·34 with inter-parental relationship), emotional dysregulation (which correlated 0·41 with interparental relationship), and lastly maternal mental health (which correlated 0·33 with maternal general health, -0·43 with maternal life satisfaction and 0·32 with maternal distress). Overall, the low correlations between the predictor variables limit concerns regarding collinearity between the predictors in the regression analysis. In order to account for multiple testing, Bonferroni corrections were used for interpretative guidelines, where a significance cut-off (0·05 divided by the number of tested associations) was set at <·00033.

In terms of sociodemographic factors, after the Bonferroni adjustment, no significant association has been identified. We found no evidence of a relationship between sex, ethnicity, parental employment, or education and odds of experiencing enduring mental health.

Considering key available prenatal (smoking during pregnancy, maternal chronic illness) and early infancy (receiving immunisations, being breast fed, mother-child attachment, number of hospital visits) factors, no significant differences were found between those with EMH and those without.

Considering child-level factors in infancy, the following aspects of temperament were considered: regularity (gets sleepy/naps/eats at regular times), approachability (not frightened of strangers/not shy), adaptability (settles in new places), and mood (content, calm temperament). After the Bonferroni adjustment, no significant association between EMH and temperament were identified. In terms of later child-level factors, neither body mass nor height affected MH group membership. On the other hand, those with high levels of cognitive ability and those without SEN were more likely to have EMH (as opposed to SIMHP or

MIMHP). Children with high cooperation, low emotion dysregulation, and high school enjoyment were all more likely to have EMH (as opposed to SIMHP or MIMHP).

With regard to family-level factors, being part of a single parent household made no difference to group membership, nor did being the oldest child. However, growing up in a in a household characterized by non-maladaptive parenting and conflict and having a mother who did not suffer from mental health difficulties were both associated with increased chance of EMH compared to MIMHP but not compared to SIMHP.

[INSERT TABLE 2]

DISCUSSION

Less than half of the study sample had had EMH (40·5%). Consistent with Schaefer et al, we did not find evidence for effect of parental SES, as indexed by education level, home ownership, employment status or income, on EMH.[1] We also found no evidence for any of the pre-natal or infancy factors in predicting EMH.

A range of child characteristics predicted EMH, including high cognitive ability and lack of special educational needs. Consistent with Schaefer et al's study,[1] we found the prominent result that children with good self-regulation were much more likely to have EMH. Other studies have also noted the potentially pivotal role of self-regulation in the resilience and mental wellbeing of children and young people.[4, 26] We also found high cooperation was associated with increased likelihood of EMH, which is consistent with previous findings linking sociability and lack of social isolation to more positive psychological adaptation[1]. Findings also indicated that those with EMH also derived more enjoyment from school than others, potentially reinforcing existing evidence from developmental cascades literature which highlights the bidirectional pathways between mental health and educational adaptation.[27]

Perhaps unsurprisingly, given the extensive literature around the impact of negative family environments on child mental health,[28] children who experienced maladaptive parenting were

less likely to experience EMH as opposed to MIMHP. Furthermore, maternal mental health also discriminated between the EMH and MIMHP, such that children whose mothers had poor mental health were more likely to be MIMHP than EMH. Again, these findings are consistent with the extensive literature on risk factors for mental health problems which highlights parent mental illness as a particularly potent risk factor.[29, 30]

As with any cohort study, we are limited by the data collected, such as very broad categorization of family type and limited data collected on, for example, adverse childhood events. This may also explain why we failed to find an effect of a relationship between attachment and EMH while previous literature has identified attachment as an important factor.[31] In addition, the nature of the exploration meant the inclusion of a large number of predictor variables in the present analysis, this large number of parameters may have limited our ability to identify predictors of EMH with modest effects. Lastly, mental health difficulties were assessed with SDQ; although it is good at predicting child psychiatric disorders, more direct questions regarding diagnosis could have increased the detection of child psychiatric disorders.

These results highlight that even in the limited period of childhood and adolescence, fewer people than expected experience EMH. This suggest the need for increased public awareness that mental health problems are the norm for most people at least at some points in the lifespan and for most people will occur at some point before the age of 14. This highlights the need to support children and their families to expect mental health challenges and to have access not just to professional support but a greater awareness of self and community strategies they can draw on to manage mental health problems as they arise.[32]

This is the first study of EMH that has been undertaken a child sample and a UK population. It highlights the fact that even before the age of 14 EMH is not the norm, and that experience of at least some periods of mental health difficulty are to be expected by most children in this period. It identifies a range of factors associated with the status of EMH highlighting the potential for both public health and clinical interventions targeting family relationships and social and emotional skills. It also highlights the need for special attention for children with learning challenges.

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Table 1: Descriptive Statistics, Age of Measurement and Missing Data for All Study Variables

Predictors	N	% or mean (95% CI)	Age (study wave)	% with missing data out of N = 13,310
Sociodemographic factors				
Sex (female)	13,310	49.4 (48.4, 50.5)	9 months (1)	0
Age	12,459	7.2 (7.2, 7.2)	7 years (4)	6.4
Ethnicity	13,309		9 months (1)	.0006
White		87.9 (85.5, 89.9)		
Asian		3.1 (2.7, 3.6)		
Black		5.4 (4.1, 7.1)		
Mixed		2.5 (1.7, 3.6)		
Other		1.2 (0.8, 1.6)		
Parent employment status (unemployed)	12,459	13.4 (12.4, 14.5)	7 years (4)	6.4
Parent education	9,658		7 years (4)	27.4
None		2.3 (1.9, 2.8)		
NVQ 1		2.9 (2.5, 3.4)		
NVQ 2		19.3 (17.8, 20.7)		
NVQ 3		16.0 (15.0, 17.2)		
NVQ 4		42.7 (41.1, 44.2)		
NVQ 5		15.7 (14.3, 17.2)		
Overseas		1.1 (0.9, 1.4)		
Household income	12,449		7 years (4)	6.5
Lowest quintile		16.3 (15.0, 17.6)		
Second quintile		18.3 (17.1, 19.5)		
Third quintile		20.4 (19.4, 21.6)		
Fourth quintile		22.0 (20.9, 23.2)		
Highest quintile		22.9 (21.0, 25.0)		
Home ownership (own)	12,383	66.0 (64.1, 67.7)	7 years (4)	7.0
Prenatal and infancy level factors				
Maternal smoking during pregnancy	11,725		9 months (1)	11.9
No smoking		84.0 (83.9, 85.1)		
One cigarette per day		1.4 (1.2, 1.7)		
More than one cigarette per day		14.5 (13.5, 15.7)		
Being breastfed	8,964		9 months (1)	32.7
Less than one week		16.1 (15.7, 17.6)		
Less than six months		50.2 (48.6, 51.7)		
Six months or more		33.7 (31.9, 35.5)		
Up to date immunisations (yes)	12,642	96.9 (96.5, 97.2)	9 months (1)	5.0
Hospital visits due to accident/injury	12,788		9 months (1)	3.9
No visit		92.2 (91.6, 92.8)		
One time		7.3 (6.8, 7.9)		
Two or more times		0.4 (0.3, 0,6)		
GP visits due to health problems	12,785		9 months (1)	3.9
No visit		21.9 (20.1, 23.8)		
One time		34.0 (32.6, 35.4)		
Two or more times		44.1 (42.1, 46.2)		
Child level factors				
Cognitive ability	11,973	-0.1 (-0.7, 0.4)	7 years (4)	10.0

Table 2, continued

Predictors	N	% or mean (95% CI)	Age (study wave)	% with missing data out of N = 13,310
Special education need (yes)	12,392	3.8 (3.5, 4.3)	7 years (4)	6.9
Regularity	12,278	13.1 (13.0, 13.1)	9 months (1)	7.8
Approachability - withdrawal	9,051	5.3 (5.2, 5.3)	9 months (1)	32.0
Adaptability	10,404	8.4 (8.3, 8.5)	9 months (1)	21.8
Mood	11,544	19.4 (19.3, 19.5)	9 months (1)	13.3
Independence and self-regulation	12,296	2.5 (2.5, 2.5)	7 years (4)	7.6
Emotional dysregulation	12,298	1.7 (1.7, 1.7)	7 years (4)	7.6
Cooperation	12,298	2.6 (2.6, 2.6)	7 years (4)	7.6
Child enjoys school (no)	12,409	6.7 (6.2, 7.2)	7 years (4)	6.8
Gross motor delay (yes)	12,349	8.4 (7.8, 9.0)	9 months (1)	7.2
Body mass	12,298		7 years (4)	7.6
Normal		72.6 (71.6, 73.5)		
Underweight		5.5 (5.0, 6.1)		
Overweight		21.9 (21.0, 22.8)		
Height (cm)	12,344	123.7 (123.5, 123.8)	7 years (4)	7.3
Family level factors				
Single-parent household (yes)	12,459	19.7 (18.6, 20.8)	7 years (4)	6.4
Number of siblings	12,459		7 years (4)	6.4
No siblings		12.8 (12.0, 13.6)		
One sibling		46.5 (45.2, 47.8)		
Two siblings		27.0 (26.0, 28.0)		
Three or more siblings		13.8 (12.7, 14.7)		
Eldest child (yes)	12,793	42.2 (40.9, 43.5)	9 months (1)	3.9
Mother-child attachment	10,790	18.5 (18.4, 18.6)	9 months (1)	18.9
Mother-child interaction	12,415	26.6 (26.5, 26.8)	7 years (4)	6.7
Maladaptive parenting	11,665	17.8 (17.7, 17.9)	7 years (4)	12.4
Inter-parental relationship	9,941	9.45 (9.4, 9.5)	9 months (1)	25.3
Abuse (yes)	12,111	21.0 (20.2, 21.9)	9 months – 7 years (1 – 4)	9.0
Maternal general health	12,425	2.3 (2.3, 2.4)	7 years (4)	6.6
Maternal chronic illness (yes)	12,784	21.7 (20.6, 22.8)	9 months (1)	4.0
Maternal mental health	12,057	3.1 (3.0, 3.2)	7 years (4)	9.4
Maternal psychosocial distress (yes)	12,484	13.4 (12.6, 14.2)	9 months (1)	6.2
Maternal life satisfaction	12,080	7.5 (7.4, 7.5)	7 years (4)	9.2

Table 2: Multinomial Regression Models Predicting Symptoms of Mental Health Difficulties

Predictors	EMH vs. SIMHP		EMH vs. MIMHP		SIMHP vs. MIMHP	
	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p
Sociodemographic factors						
Sex (female)	0.99 (0.88, 1.11)	.867	0.98 (0.78, 1.21)	.819	0.98 (0.81, 1.20)	.878
Age	1.00 (0.79, 1.25)	.969	1.02 (0.67, 1.54)	.927	1.02 (0.70, 1.51)	.903
Ethnicity (Asian)[a]	1.09 (0.76, 1.55)	.647	1.65 (0.84, 3.25)	.143	1.52 (0.85, 2.72)	.152
Ethnicity (Black)[a]	0.72 (0.54, 0.98)	.035	0.95 (0.60, 1.49)	.811	1.31 (0.88, 1.94)	.177
Ethnicity (Mixed)[a]	1.48 (0.92, 2.38)	.101	1.59 (0.74, 3.43)	.228	1.07 (0.58, 1.99)	.815
Ethnicity (Other)[a]	1.08 (0.58, 2.03)	.795	0.94 (0.34, 2.64)	.910	0.87 (0.29, 2.60)	.799
Parent employment status (unemployed)	0.89 (0.66, 1.19)	.420	0.66 (0.42, 1.04)	.074	0.74 (0.53, 1.04)	.079
Parent education (None)[b]	0.93 (0.47, 1.82)	.820	0.56 (0.22, 1.44)	.222	0.61 (0.34, 1.08)	.087
Parent education (NVQ 1)[b]	1.03 (0.65, 1.66)	.886	0.50 (0.25, 1.00)	.050	0.48 (0.27, 0.88)	.018
Parent education (NVQ 2)[b]	1.03 (0.81, 1.30)	.831	0.74 (0.47, 1.18)	.202	0.72 (0.49, 1.06)	.095
Parent education (NVQ 3)[b]	1.22 (0.98 1.53)	.077	0.85 (0.50, 1.44)	.541	0.70 (0.44, 1.10)	.118
Parent education (NVQ 4)[b]	1.15 (0.96, 1.38)	.124	0.98 (0.65, 1.45)	.902	0.85 (0.59, 1.21)	.361
Parent education (overseas)[b]	0.99 (0.40, 2.43)	.975	0.56 (0.17, 1.88)	.340	0.57 (0.20, 1.66)	.291
Household income (second quintile)[c]	1.06 (0.83, 1.36)	.623	1.13 (0.75, 1.72)	.543	1.07 (0.79, 1.45)	.668
Household income (third quintile)[c]	1.15 (0.86, 1.53)	.334	1.19 (0.76, 1.88)	.439	1.04 (0.71, 1.52)	.839
Household income (fourth quintile)[c]	1.34 (1.03, 1.75)	.029	1.31 (0.81, 2.11)	.263	0.98 (0.65, 1.47)	.904
Household income (highest quintile)[c]	1.61 (1.21, 2.16)	.002	1.48 (0.86, 2.53)	.156	0.91 (0.56, 1.48)	.711
Home ownership (not own)	0.77 (0.65, 0.91)	.002	0.67 (0.49, 0.91)	.011	0.87 (0.66, 1.16)	.348
Prenatal and infancy level factors						
Maternal smoking during pregnancy (one cigarette per day)[d]	1.06 (0.59, 1.90)	.836	0.67 (0.29, 1.57)	.350	0.63 (0.26, 1.52)	.294
Maternal smoking during pregnancy (more than one cigarette per day)[d]	0.89 (0.70, 1.11)	.293	0.80 (0.57, 1.11)	.177	0.90 (0.67, 1.21)	.473
Being breastfed (less than 1 week)[e]	0.96 (0.73, 1.26)	.738	0.90 (0.58, 1.40)	.622	0.94 (0.67, 1.32)	.708
Being breastfed (less than six months)[e]	0.96 (0.81, 1.13)	.603	0.89 (0.66, 1.19)	.421	0.93 (0.71, 1.21)	.574
Immunisations (yes)	1.15 (0.76, 1.72)	.507	0.89 (0.51, 1.55)	.666	0.77 (0.48, 1.24)	.280
Hospital visits due to accident/ injury (one time)[f]	0.98 (0.78, 1.22)	.837	0.94 (0.62, 1.43)	.784	0.97 (0.67, 1.39)	.852
Hospital visits due to accident/ injury (two or more times)[f]	0.31 (0.07, 1.39)	.122	0.36 (0.06, 1.96)	.230	1.14 (0.36, 3.61)	.824

Table 2, continued

Predictors	EMH vs. SIMHP		EMH vs. MIMHP		SIMHP vs. MIMHP	
	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p
GP visits due to health problems (one time) [g]	0.90 (0.77, 1.05)	.197	0.67 (0.51, 0.87)	.003	0.74 (0.58, 0.94)	.013
GP visits due to health problems (two or more times) [g]	0.92 (0.79, 1.07)	.268	0.77 (0.57, 1.04)	.094	0.84 (0.66, 1.08)	.180
Child level factors						
Cognitive ability	**1.01 (1.01, 1.02)**	**< .001**	**1.03 (1.02, 1.04)**	**< .001**	**1.02 (1.01, 1.03)**	**< .001**
Special education need (yes)	**0.38 (0.24, 0.62)**	**< .001**	**0.21 (0.12, 0.37)**	**< .001**	0.56 (0.38, 0.81)	.002
Regularity	1.04 (1.01, 1.08)	.015	1.10 (1.04, 1.16)	<.001	1.06 (1.01, 1.10)	.010
Approachability – withdrawal	0.99 (0.95, 1.03)	.673	0.95 (0.91, 1.00)	.069	0.96 (0.92, 1.01)	.108
Adaptability	0.98 (0.95, 1.01)	.239	0.97 (0.92, 1.03)	.383	0.99 (0.94, 1.05)	.839
Mood	1.02 (1.00, 1.04)	.020	1.02 (0.99, 1.05)	.258	1.00 (0.96, 1.03)	.824
Independence and self-regulation	1.39 (1.14, 1.71)	.002	**2.27 (1.55, 3.33)**	**< .001**	1.63 (1.19, 2.23)	.003
Emotional dysregulation	**0.28 (0.23, 0.33)**	**< .001**	**0.04 (0.03, 0.06)**	**< .001**	**0.15 (0.12, 0.20)**	**< .001**
Cooperation	**2.04 (1.62, 2.56)**	**< .001**	**4.79 (3.25, 7.06)**	**< .001**	**2.35 (1.70, 3.26)**	**< .001**
Child enjoys school (no)	**0.57 (0.43, 0.75)**	**< .001**	**0.38 (0.26, 0.55)**	**< .001**	0.66 (0.51, 0.87)	.003
Gross motor delay (yes)	0.84 (0.66, 1.06)	.138	0.69 (0.49, 0.96)	.030	0.82 (0.59, 1.15)	.252
Body mass (underweight) [h]	0.93 (0.73, 1.20)	.588	0.85 (0.54, 1.34)	.477	0.91 (0.59, 1.41)	.663
Body mass (overweight) [h]	0.89 (0.75, 1.05)	.156	0.84 (0.65, 1.08)	.166	0.94 (0.76, 1.18)	.607
Height (cm)	1.00 (0.99, 1.02)	.481	1.00 (0.98, 1.02)	.681	1.00 (0.98, 1.02)	.997
Family level factors						
Single-parent household (yes)	0.86 (0.68, 1.08)	.191	0.76 (0.54, 1.08)	.124	0.89 (0.68, 1.17)	.389
Number of siblings (one sibling) [i]	1.36 (1.09, 1.69)	.007	1.69 (1.22, 2.34)	.002	1.24 (0.94, 1.66)	.132
Number of siblings (two siblings) [i]	1.54 (1.19, 1.99)	.001	1.69 (1.14, 2.52)	.010	1.10 (0.79, 1.53)	.568
Number of siblings (three or more siblings) [i]	1.41 (1.02, 1.94)	.038	1.89 (1.16, 3.08)	.011	1.34 (0.86, 2.11)	.196
Eldest child (yes)	1.04 (0.89, 1.21)	.633	1.01 (0.76, 1.34)	.951	0.97 (0.76, 1.24)	.819
Mother-child attachment	1.01 (0.97, 1.04)	.717	1.03 (0.98, 1.08)	.254	1.02 (0.98, 1.07)	.280
Mother-child interaction	1.02 (1.00, 1.03)	.007	1.02 (1.00, 1.04)	.026	1.00 (0.99, 1.02)	.578
Maladaptive parenting	0.97 (0.95, 0.99)	.003	**0.92 (0.89, 0.94)**	**< .001**	**0.94 (0.91, 0.97)**	**< .001**
Inter-parental relationship	1.00 (0.98, 1.03)	.700	1.00 (0.96, 1.05)	.908	1.00 (0.96, 1.04)	.929

Table 2, continued

Predictors	EMH vs. SIMHP		EMH vs. MIMHP		SIMHP vs. MIMHP	
	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p	Risk ratio (95% CI)	p
Abuse (yes)	0.85 (0.73, 0.99)	.032	0.88 (0.69, 1.13)	.311	1.04 (0.83, 1.30)	.722
Maternal general health	0.90 (0.84, 0.96)	.002	0.87 (0.79, 0.96)	.006	0.97 (0.88, 1.07)	.547
Maternal chronic illness (yes)	0.96 (0.82, 1.12)	.625	0.93 (0.72, 1.19)	.556	0.96 (0.76, 1.22)	.755
Maternal mental health	0.97 (0.95, 0.99)	.001	**0.93 (0.91, 0.96)**	**< .001**	0.96 (0.94, 0.99)	.007
Maternal psychosocial distress (yes)	0.73 (0.58, 0.91)	.006	0.61 (0.44, 0.85)	.003	0.84 (0.66, 1.07)	.165
Maternal life satisfaction	1.02 (0.98, 1.06)	.282	1.04 (0.98, 1.10)	.249	1.02 (0.96, 1.07)	.585
Constant	0.13 (0.01, 1.55)		2.22 (0.04, 120.63)		17.14 (0.35, 830.47)	

Note: NVQ, National Vocational Qualifications. Only associations that are significant after multiple testing adjustment (p < 0.00033) have been marked with bold.
[a] Reference category: Ethnicity (White); [b] Reference category: Parent education (NVQ5); [c] Reference category: Income (lowest quintile); [d] Reference category: Maternal smoking during pregnancy (no smoking); [e] Reference category: Being breastfed (more than six months); [f] Reference category: Hospital visits due to accident/ injury (none); [g] Reference category: GP visits due to health problems (none); [h] Reference category: Body mass (normal body weight); [i] Reference category: Number of siblings (none)

Enduring mental health in childhood and adolescence: learning from the Millennium Cohort Study

Professor Jessica Deighton, PhD[1]; Doctor Suzet Tanya Lereya[1], PhD; Professor Miranda Wolpert[1,2], DClin

[1]Evidence Based Practice Unit, UCL and Anna Freud National Centre for Children and Families, London, UK (Jessica Deighton, PhD, Suzet Tanya Lereya, PhD, Miranda Wolpert, PsychD)

[2]Wellcome Trust, 215 Euston Rd, Bloomsbury, London NW1 2BE, UK

Correspondence to: Prof. Jessica Deighton: Anna Freud National Centre for Children and Families, Kantor Centre of excellence, 4-8 Rodney Street, N1 9JH; Jessica.DeightonPhD@annafreud.org, 020 7443 2211

Contributors

Jessica Deighton was responsible for the paper's conception and the overall drafting of the paper, and took ultimate responsibility for revisions and final approval of the paper.

Suzet Tanya Lereya carried out the analysis for the paper and contributed significantly to the drafting of the paper, especially the results and methods sections.

Miranda Wolpert supported the initial drafting of the paper, particularly the introduction and discussion sections, and made significant revisions during the drafting of the paper.

All authors oversaw and agreed the final draft of the paper.

Declaration of interest

The authors have no conflicts of interest to declare.