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Maternal health and child socio-emotional development: findings from the growing up in New Zealand study

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Abstract

We study the influence of maternal chronic illness and disability on the socio-emotional development of children across early to mid-childhood using the Growing Up in New Zealand study. Controlling for a host of relevant maternal, household and child characteristics, our results show a negative link between maternal chronic illness and disability and child socio-emotional outcomes at eight years of age. At earlier ages, the evidence of a relationship between maternal health and child socio-emotional outcomes is weaker. We also find that maternal parenting style and depression mediate the relationship between maternal chronic illness and disability and child socio-emotional outcomes. Specifically, parenting style mediates the relationship between maternal chronic illness and disability and child socio-emotional outcomes in early childhood, at age 2, but not at age 5, and for boys after commencement of formal education, at age 8. In contrast, maternal depression consistently mediates the relationship between maternal chronic illness and disability and child socio-emotional outcomes from early to mid-childhood, and for both boys and girls. Our findings stress the need to better understand both direct and indirect effects of maternal health on the formation of skills in childhood that influence future life chances.

Keywords Maternal chronic illness · Maternal disability · Maternal depression · Child socio-emotional outcomes · Parenting style

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1 Introduction

In many OECD countries, the prevalence of chronic illness among young adults is high, disproportionately affects women, and follows an increasing trend (Harris et al., 2021, Chowdhury et al., 2023). In the US and Canada, one in five women of reproductive age have multiple chronic conditions. In the UK and New Zealand, thirteen percent of women in this age group have multiple chronic conditions (Gunja et al., 2022). Living with chronic illness or disability influences one's life outcomes and can also affect those of family members, including children. Poor maternal health and associated economic, parent-child and peer relationship factors, might influence the development of children's socio-emotional or behavioural skills that are key predictors of life outcomes, including education and labour market success (Borghans et al., 2008; Deming, 2017; Edin et al., 2022). Given the high and increasing prevalence of long-term health conditions among women of childbearing age, it is important to examine the extent to which young children's developmental trajectory in terms of socio-emotional skills is affected when their mother, often their primary care giver, suffers from a long-term illness or disability.

In this paper, we conduct the first investigation on the link between maternal chronic illness and disability and the development of socio-emotional skills of New Zealander children. Like other OECD nations, New Zealand has a high prevalence of chronic illness and disability in the adult population, which makes our investigation timely and relevant.[1] We use the Growing Up in New Zealand (GUiNZ) study, which is a representative longitudinal study of child health and well-being that follows pregnant mothers and their future born children across their childhood. The GUiNZ study includes information on maternal health and repeated standard measurements of child socio-emotional outcomes from early to mid-childhood, and after commencement of formal education, at ages 2, 5 and 8. This allows us to examine the influence of maternal health on child socio-emotional outcomes at different developmental stages, on a large representative cohort panel sample while accounting for other relevant household, maternal and child characteristics. Child socio-emotional outcomes are proxied by repeated measurements of the widely used and cross-nationally validated Strengths and Difficulties Questionnaire (Woerner et al., 2004; Vostanis, 2006).

Our results suggest that maternal chronic illness or disability is consistently linked with poorer child socio-emotional outcomes at age 8. At ages 2 and 5 the evidence of a relationship between poor maternal health and child socio-emotional outcomes is weaker. Moreover, we find that maternal parenting style and depression are important mediators at age 2—parenting style and maternal depression underlie the small negative effects of poor maternal health on child socio-emotional outcomes in early childhood. At age 5, however, our results suggest that only maternal depression mediates the relationship between maternal chronic illness or disability and child socio-emotional outcomes. At age 8, and after commencement of formal education,

[1] Of New Zealander adults, one in ten adults report having medicated high cholesterol, 17 percent report having medicated high blood pressure (Ministry of Health, 2021), one in four report experiencing multimorbidity (Stanley et al., 2018), and one in four adults report living with a disability (Statistics New Zealand, 2014).

parenting style mediates the stronger relationship between maternal chronic illness or disability and child socio-emotional outcomes only for boys, whereas maternal depression is an important mediator for both boys and girls.

Our study contributes to an international body of research on the influence of parental health on the formation of child behavioural skills. Given the non-exogenous nature of parental health status, the existing evidence, like our study, is primarily descriptive. Several studies using data from different countries report that parental illness is negatively associated with child socio-emotional outcomes, including higher internalising symptoms and externalising behaviour[2], lower self-esteem and social competence, and higher emotional and conduct problems and hyperactivity (Chen 2017; Haker et al., 2022; Morris et al., 2016; Pakenham & Cox, 2014; Visser et al., 2004; Visser et al., 2007; Umberger, 2014). Past research also suggests that maternal, relative to paternal, physical illness is more consistently associated with worse socio-emotional symptoms for children (Watson et al., 2006).

Previous studies using data from New Zealand have focussed on the relationship between poor maternal mental health and child outcomes, rather than chronic illness and disability more generally. Furthermore, they were cross-sectional in research design. For instance, in a study of Pacific Islander families, Gao et al. (2007) found a negative effect on internalising symptoms (but not externalising behaviour) among two-year-old children. Past research using the GUiNZ study also found that children whose mother reported more severe prenatal and postnatal psychological distress experienced more behavioural difficulties in early childhood (D'Souza et al., 2019). To our knowledge, no research using a New Zealand cohort has previously examined how long-term conditions influence socio-emotional development of children from early to mid-childhood.

There is, however, no consensus in the literature on the role that parental illness plays for child developmental outcomes. Some studies find that parental chronic illness and disability may be associated with no difference or even better socio-emotional outcomes for children (e.g., Collings & Llewellyn, 2012; Visser et al., 2004). There is also no consensus on whether the effect of parental health on child socio-emotional outcomes depends on the child's age (e.g., Sieh et al., 2010, Purc-Stephenson & Lyseng, 2016, Haker et al., 2022).[3] The few studies that try to measure a causal relationship also do not provide a consistent picture of the consequences of maternal health for child socio-emotional outcomes (Mühlenweg et al., 2016; Le & Nguyen, 2017; García-Miralles & Gensowski, 2023).

Together, these findings call for more clarity on how and when parental illness influences child socio-emotional development. Our study adds to the evidence on the role of child age for the consequences of maternal health on child socio-emotional

[2] Internalising symptoms include experiencing sadness, anxiety, fear, and social withdrawal, while externalizing behaviours include aggression, hyperactivity, and hostility (Eisenberg et al., 2001).

[3] Möller et al. (2014) found that emotional and behavioural symptoms of children of parents with cancer were higher for children aged 6-10 compared to adolescents. Contrastingly, another study on parental cancer found that older adolescent children with an ill parent reported worse outcomes compared to younger adolescent children (Rainville et al., 2012). A meta-analysis by Sieh et al. (2010) found that the effects were larger among younger children. In contrast, a meta-analysis on the relationship between maternal breast cancer and child socio-emotional outcomes did not find that child age plays a significant role (Purc-Stephenson & Lyseng, 2016). Similarly, a review on parental multiple sclerosis and child development found no effect in socio-emotional development in early childhood (Haker et al., 2022).

outcomes, by examining the link between maternal chronic illness and disability and children's outcomes using repeated measurements at ages 2, 5 and 8. Our results suggest that the negative relationship between poor maternal health and child socio-emotional outcomes varies by child age, demonstrating that it is small in early childhood and larger in mid-childhood.

Conceptually, there are several reasons why maternal chronic illness or disability could affect child developmental outcomes. It might imply lower household disposable income and children's lower access to things money can buy that contribute to child developmental outcomes. Examples are adequate housing and regular access to activities, such as high-quality childcare, that promote socio-emotional development (Felfe & Lalive, 2018). Moreover, financial insecurity might affect the level of stress and conflict in the household, with negative consequences for the children's well-being and socio-emotional skills. Children whose parents suffer from chronic illness or disability might also have poorer peer relationships and might be more likely to suffer from stigmatisation and bullying. Finally, maternal chronic illness or disability and associated factors, such as financial insecurity and general well-being, could influence the quantity and quality of time spent with children, generally, parenting style, as well as maternal mental health.

Parenting style is known to be a key factor in shaping child socio-emotional development (Chen, 2017; Chen & Fish, 2013).[4]Studies have shown that families with ill parents engage in more negative parenting styles, such as inconsistent and harsh parenting, leading to higher internalising and externalising problems, and conduct disorders in children (Umberger, 2014; Masarik & Conger, 2017).[5] Our study examines the importance of parenting style in explaining the relationship between maternal health and child socio-emotional outcomes. To measure the mediating role of parenting style, we use information on parenting style included in the GUiNZ and reported by mothers at various ages of a child's early to mid-childhood development. Our results show evidence that parenting style mediates the relationship between maternal health and child socio-emotional outcomes, an effect that varies across child age and gender.

Chronic illness or disability often co-occur with depression (Moussavi et al., 2007). Even though the direction of the relationship has not been empirically established, living with chronic illness or disability and its associated factors and stressors increase the risk of suffering from depression (Schaakxs et al., 2017). Depression, in turn, when experienced by mothers of young children, is likely to affect children's socio-emotional outcomes. Therefore, maternal depression might mediate the relationship between maternal chronic illness or disability and child socio-emotional outcomes. In line with this hypothesis, our findings reveal a consistent and strong mediating role of maternal depression.

The contribution of our study is threefold. First, we add knowledge on the factors that affect the formation of key behavioural skills in childhood known to affect long-run outcomes (Smithers et al., 2018). Second, we track the effect of maternal health on child developmental outcomes from early to mid-childhood, which is a key innovation to the extant literature. Third, we shed light on the role of parenting and maternal depression as underlying transmission channels.

[4] See also Armistead et al. (1995); Conrad & Hammen (1993).

[5] See also Möller et al. (2014).

The paper proceeds as follows. In Section 2 we describe the GUiNZ dataset and the specific measures used in our analysis, present descriptive statistics and our method. In Section 3 we present our results and in Section 4 we discuss the implications of our findings and conclude.

2 Data and method

2.1 Data

2.1.1 Growing up in New Zealand dataset

We use data from the Growing Up in New Zealand (GUiNZ) study, a child-focused longitudinal and representative study of New Zealander families. The GUiNZ study aims to understand the pathways leading to equitable and healthy child development in New Zealand. It commenced in 2009/10 and families were recruited during the cohort's mothers' pregnancy (Growing Up in New Zealand, 2020). A cohort of 6,853 children were included in the study. At the time of this study, the GUiNZ study has collected data for their cohort up to eight years of age. We use data from five waves of the study, which include the antenatal wave, and each wave corresponding to the data collection at 9 months, 2, 5, and 8 years of age. At the 9 month wave, the GUiNZ study includes 6,847 children and at the age 8 wave, the study includes 5,004 children (the gap is due to sample attrition). Below, we describe the measures used in our analysis, present descriptive statistics and explain our empirical method.

2.1.2 Measures of maternal health and socio-demographic characteristics

We obtain our measures of maternal chronic illness and disability using the 9 month survey wave. This is the single time in which mothers were specifically asked about both their chronic illness and disability status. To identify mothers with a chronic illness, we used their responses to the question "*Do you currently have an illness that is long term, lasting 6 months or more?*".[6] In the full sample, out of 6,455 mothers, 662 reported having a chronic illness. To identify mothers with a disability, we used their responses to the question "*Do you currently have a disability that is long term, lasting 6 months or more?*".[7] In the sample, 266 mothers reported a disability (this group included 82 mothers who also had a chronic illness). A total of 846 mothers in the sample reported living with chronic illness or disability.[8]

[6] Responses included the options Yes, No, Refused, and Don't know. Although not disaggregated in this study, respondents provided exact diagnoses which were classified according to International Classification of Diseases Version 10 chapters.

[7] Responses included the options Yes, No, Refused, and Don't know.

[8] We checked whether reports of chronic illness at the 9 months wave were related to short-term pregnancy-related illness, using the data from the antenatal wave. Only 88 mothers who reported having a chronic illness at the 9 months wave also reported a pregnancy-related condition in the antenatal wave (13% of the sample of mothers with chronic illness). This small number suggests that our measure of chronic illness is not capturing short-term pregnancy-related health issues, but rather long-lasting conditions that have a larger potential to influence child development.

We present sociodemographic characteristics of the mothers included in our sample in Table 1. We consider mothers with chronic illness/disability and the reference group (i.e., mothers who did not report a chronic illness/disability) separately, and report the statistical significance of the difference in characteristics between the two groups.[9] On average, mothers in the two groups are around 31 years old. There is a tendency for mothers with chronic illness/disability to be slightly more disadvantaged in terms of educational attainment, household income and single mother status (but not statistically significantly so in most cases). The distribution in pre-pregnancy body mass index (BMI) is reflective of poorer physical health, with a 7-percentage point gap in obesity rate, among mothers with chronic illness/disability compared to the reference group. Given the differences in maternal and household sociodemographic characteristics between the group of mothers with chronic illness/disability and the reference group, we will control for maternal and household characteristics in our analysis.

As shown in Table 1, mothers with chronic illness/disability are significantly more likely to suffer from depression in all waves in which it is measured (9 month, 5 and 8 years).[10] At the 9 months wave, mothers with chronic illness/disability are 14 percentage points more likely to suffer from depression. The gap is smaller, 7 and 6 percentage points, in waves 5 and 8 years, respectively.

2.1.3 Measures of parenting style

For parenting style, we use the measures available in each wave of the GUiNZ study, up to the age 8 wave. From the 9 month wave, we use a measure of interest in the baby, constructed based on the mother's responses to twelve survey items (e.g., *"I talk to my baby in a warm and affectionate way"*) (Davies et al., 2002). From the age 2 wave, we use the measures of confidence in parenting and parenting enjoyment. The first measure is based on the mother's answer to the question: *"Overall, do you feel that as a parent you are: Not very good at being a parent, A person who has some trouble being a parent, An average parent, A better than average parent, A very good parent"*. The measure of parenting enjoyment consists of the sum of the responses to four survey items (e.g., *"On the whole, I enjoy being a parent"*) (Martin, 2003). From the age 5 and 8 waves, we use the measures of warm, authoritarian and hostile parenting, and efficacy in parenting (Paterson & Sanson, 1999). The measures of warm and hostile parenting each consist of the sum of the responses to eight survey items (e.g., *"I am responsive to his/her feelings and needs"* for warm parenting, and *"I guide him/her by punishment more than by reason"* for hostile parenting). The measure of authoritarian parenting consists of the sum of the responses to six survey items (e.g., *"There should be a clear line of authority within the family and no doubt about who decides"*). Finally, the measure of parenting

[9] Due to the small number of mothers in the sample with a disability, maternal health is assessed through a binary measure (living with a chronic illness/disability versus not).

[10] Maternal depression was measured using the Edinburgh Depression Scale (Cox et al., 1987) at the 9 months wave and the Patient Health Questionnaire 9 (Kroenke & Spitzer, 2002) at the age 5 and 8 waves. Maternal depression is identified by scores above the cut-off points for each measure.

Table 1 Maternal socio-demographic characteristics and depression by chronic illness/disability status

	M Illness/disability (n = 846) (1) Mean (SD) [% Missing]	Reference (n = 5145) (2) Mean (SD) [% Missing]	*p*-value of difference (3)
Age[9m]	31.52 (6.03) [0.00]	30.96 (5.88) [0.00]	0.01[a]
	Percentage of the Sample[b] [% Missing]		
Education[0m]			
No secondary school	8.42	6.27	0.02[b]
Secondary school	21.47	23.47	0.20[b]
Diploma/Trade	33.21	30.33	0.09[b]
Bachelor	20.88	23.56	0.08[b]
Higher Degree	15.78	19.09	0.81[b]
[Missing]	[0.24]	[0.29]	0.02[b]
Household income[9m]			
Less than $20,000	3.19	4.09	0.21[b]
$20,000-$30,000	8.63	4.98	<0.001[b]
$30,000-$50,000	16.55	15.65	0.50[b]
$50,000-$70,000	20.33	18.21	0.14[b]
$70,000-$100,000	18.68	19.79	0.45[b]
$100,000-$150,000	13.36	14.42	0.41[b]
More than $150,000	7.33	8.42	0.28[b]
[Missing]	[11.94]	[14.44]	0.05[b]
Maternal relationship status			
Single[2y]	11.08 [0.00]	9.5 [0.02]	0.15[b]
Single[5y]	12.23 [0.00]	9.38 [0.21]	0.01[b]
Single[8y]	15.49 [7.37]	9.37 [8.44]	0.69[b]
Pre-pregnancy BMI[0m]			
Underweight	3.08	3.76	0.26[b]
Normal weight	44.48	49	<0.001[b]
Overweight	21	19.98	0.79[b]
Obese	21.35	14.42	<0.001[b]
[Missing]	[10.08]	[12.85]	0.02[b]
Urban[2y]	89.77 [1.22]	90.11 [1.82]	0.39[b]
Maternal depression			

Table 1 continued

	M Illness/disability (n = 846) (1) Mean (SD) [% Missing]	Reference (n = 5145) (2) Mean (SD) [% Missing]	*p*-value of difference (3)
Depression^{9m}	36.05 [0.00]	21.89 [0.00]	<0.001[b]
Depression^{5y}	14.65 [0.00]	7.37 [0.00]	<0.001[b]
Depression^{8y}	10.98 [0.00]	5.08 [0.00]	<0.001[b]

Notes: SD refers to standard deviation

[a]*p*-value of a t-test of equality of means

[b]*p*-values of equality of proportions tests

efficacy consists of the sum of the responses to five survey items (e.g., *"I am afraid that disciplining my child for misbehaviour will cause him/her to not like me"*).

We constructed a positive parenting index (ranging between 0 and 1), based on a weighted average of all parenting measures.[11] Our positive parenting index is a cumulative aggregate index of all parenting measures collected up until that wave. For example, for the age 2 wave, parenting measures from the antenatal wave up to the age 2 wave were combined and weighted based on the number of measures included in the index. A list of all parenting variables included in our positive parenting index and figures showing the distribution of the answers to the parenting style surveys are provided in Appendix.

In Table 2, we show the mean and standard deviation of parenting measures for the group of mothers with chronic illness/disability and the reference group, as well as the statistical significance of the differences between the two groups. This descriptive analysis suggests a negative link between maternal chronic illness/disability and positive parenting.

Mothers with chronic illness/disability report significantly lower parenting enjoyment and confidence at the 2 years wave. They also report lower parenting efficacy and higher authoritarian parenting (reverse-scored) at the 5 years wave. Finally, they report lower parenting efficacy and higher hostile parenting at the 8 years wave.

2.1.4 Measures of child socio-emotional outcomes

Our outcome variables include child socio-emotional outcomes, measured at ages 2, 5, and 8 years, using the Strengths and Difficulties Questionnaire (SDQ). The SDQ is a standard psychometric measure of child socio-emotional outcomes, based on mothers' assessment and is commonly used in the measurement of psychopathologies in children. The SDQ has been validated cross-nationally (Woerner et al., 2004; Vostanis, 2006) and is included in several major population surveys to assess child

[11] To construct the index of positive parenting, all items were transformed to be positively valenced (i.e., higher values indicated more positive parenting).

Table 2 Parenting style measures by maternal chronic illness/disability status

	M Illness/disability			Reference			*p*-value of difference
	Mean	SD	N	Mean	SD	N	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Interest in baby[9m]	0.91	0.14	5556	0.91	0.13	833	0.45
Parenting enjoyment[2y]	0.84	0.12	5326	0.86	0.12	817	0.00
Parenting confidence[2y]	0.74	0.23	5324	0.77	0.21	819	0.00
Warm parenting[5y]	0.82	0.14	5111	0.82	0.15	781	0.47
Parenting efficacy[5y]	0.72	0.16	5110	0.74	0.16	780	0.00
Authoritarian parenting[5y]	0.68	0.14	5107	0.70	0.13	782	0.00
Hostile parenting[5y]	0.26	0.13	5083	0.26	0.13	777	0.70
Warm parenting[8y]	0.82	0.15	3714	0.83	0.14	600	0.44
Parenting consistency[8y]	0.61	0.14	3545	0.61	0.13	575	0.97
Parenting efficacy[8y]	0.73	0.19	3681	0.76	0.17	595	0.00
Hostile parenting[8y]	0.40	0.17	3725	0.37	0.16	598	0.00

Notes: SD refers to standard deviation. *p*-value of a t-test of equality of means (column 7)

socio-emotional outcomes, including the German Socio-Economic Panel (e.g., Mühlenweg et al., 2016), the Avon Longitudinal Study of Parents and Children (MacKinnon et al., 2018), the Longitudinal Study of Australian Children (Le & Nguyen, 2017), and the UK Millennium Cohort Study (e.g., Croft et al., 2015). One important and unique feature of the SDQ is that it provides a consistent measure of children's socio-emotional skills from a very young age of 2 until the age of 17. A limitation of this measure is that it identifies socio-emotional problems and lacks discerning power for positive development.

We construct the subscales of the SDQ based on its original five dimensions: emotional symptoms, peer problems, hyperactivity-inattention, conduct problems, and prosociality (Goodman et al., 2011). The items from the SDQ were measured on a three-point scale (Normal/Borderline/Abnormal or Not true/Somewhat true/Certainly true) and summed to create each subscale. Each subscale ranges from 0 to 10. The total SDQ score is a sum of the total subscale scores for emotional symptoms, peer problems, hyperactivity-inattention, and conduct problems (full range 0 to 40).[12] The repeated inclusion of the SDQ in several waves of the survey allows us to study the link between maternal chronic illness/disability and child socio-emotional outcomes from early to mid-childhood.

We show in Table 3 the average score in each of the five socio-emotional outcomes measured by the SDQ – emotional symptoms, conduct problems, hyperactivity-inattention, peer problems and prosociality, as well as the total SDQ score[13] –, at age 2, 5 and 8 years, respectively. We present the average outcome separately for children

[12] The full range of the total SDQ score at age 5 is 0 to 38 due to the unintentional omission of one item from conduct problems at that wave of data collection. All outcome variables across all waves are standardised for regression analyses, thereby addressing this shortcoming.

[13] Total SDQ score is the sum of the scores from emotional symptoms, conduct problems, hyperactivity-inattention, and peer problems. Higher scores indicate poorer socio-emotional outcomes.

Table 3 Child SDQ measures by maternal chronic illness/disability status

	M illness/disability				Reference				*p*-value of difference
	Mean	SD	Min-Max	N	Mean	SD	Min-Max	N	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Age 2									
Conduct problems	3.13	1.95	0–10	820	3.10	1.96	0–9	5323	0.62
Hyperactivity-Inattention	4.44	2.15	0–10	820	4.29	2.13	0–10	5323	0.05
Emotional symptoms	1.89	1.65	0–9	820	1.81	1.6	0–8	5323	0.18
Peer problems	2.19	1.65	0–7	820	2.17	1.64	0–7	5323	0.69
Prosociality	6.97	1.98	0–10	820	7.07	1.85	1–10	5323	0.16
Total SDQ	11.66	5.2	0–30	820	11.36	5.1	1–29	5323	0.12
Age 5									
Conduct problems	1.91	1.41	0–7	785	1.77	1.35	0–8	5139	0.01
Hyperactivity-Inattention	4.02	2.37	0–10	785	3.88	2.24	0–10	5139	0.11
Emotional symptoms	2.04	1.74	0–10	785	1.95	1.77	0–9	5139	0.16
Peer problems	4.79	1.24	2–9	785	4.79	1.24	2–10	5139	0.92
Prosociality	7.75	1.87	0–10	785	7.74	1.8	2–10	5139	0.98
Total SDQ	12.76	4.48	4–28	785	12.38	4.44	4–30	5139	0.02
Age 8									
Conduct problems	2.75	1.09	1–7	603	2.53	0.99	1–8	3711	0.00
Hyperactivity-Inattention	3.95	1.40	1–10	603	3.85	1.35	1–8	3711	0.07
Emotional symptoms	1.97	2.02	1–10	603	1.64	1.78	0–8	3711	0.00
Peer problems	1.69	1.76	0–10	603	1.41	1.61	0–8	3711	0.00
Prosociality	8.14	1.94	0–9	603	8.14	1.81	2–10	3711	0.98
Total SDQ	10.36	4.21	2–27	603	9.42	3.86	4–24	3711	0.00

Notes: Due to errors in data collection in wave 5 years, the conduct problems subscale has four items instead of five (hence, the highest possible score for conduct problems at age 5 is 8 rather than 10)

whose mother has a chronic illness/disability and those whose mother has no chronic illness/disability (reference group). At age 2, children whose mother has a chronic illness/disability have higher hyperactivity-inattention scores relative to the reference group. At age 5, children whose mother has a chronic illness/disability, score statistically significantly higher in conduct problems and total SDQ relative to the reference group. At age 8, children whose mother has a chronic illness/disability have higher scores in emotional symptoms, conduct problems, hyperactivity-inattention, peer problems and total SDQ relative to the reference group. Compared to younger ages, at age 8 the gaps between the two groups are large and statistically significant.

To summarise, our descriptive analysis reveals that children whose mother has a chronic illness/disability—at various ages— score higher in socio-emotional problems compared to children whose mother does not have a chronic illness/disability. This gap becomes larger and more systematic at 8 years of age.

2.2 Method

2.2.1 OLS regression analyses

We examine the link between maternal chronic illness/disability and child socio-emotional outcomes using ordinary least squares (OLS) regression analyses. The main empirical caveats are imperfect measurement of our dependent variable (maternal chronic illness/disability status) and omitted variable bias. With respect to measurement, since we use self-reported measures of maternal health and child outcomes, our analysis could be biased if, for instance, mothers who are more pessimistic about their health status are also more pessimistic about their children's behaviour (Del Bono et al., 2024). We believe that this problem is attenuated in our study because awareness of suffering from a chronic illness or living with disability usually follows a clinical assessment. This increases the objectivity of our measure of maternal health relative to self-reports of general health status used in previous studies (e.g., Mühlenweg et al. 2016; Le & Nguyen, 2017).

An omitted variable bias could affect our results because living with chronic illness/disability is unlikely to be independent of other individual characteristics that also affect child socio-emotional outcomes (i.e., it is not an exogeneous shock). For instance, it is possible that chronic illness/disability is more prevalent among mothers of lower socioeconomic advantage and that socioeconomic advantage affects child socio-emotional outcomes. To minimise the omitted variable bias problem in our regression analysis, we control for observable maternal and household characteristics that could be related with both the incidence of maternal chronic illness/disability and child socio-emotional outcomes. These include, for example, maternal age, body mass index as a proxy for general health status, education, and household income.[14] In addition, we control for observable child characteristics that could be related to socio-emotional outcomes, including child gender, number of co-residential siblings, and birth order of the child. Even though we cannot fully eliminate the possible omitted variable threat (due to unobservable characteristics), controlling for observed relevant variables in the regression analysis allows us to better quantify the relationship between maternal health and child socio-emotional outcomes.

We estimate the following regression model:

$$\begin{aligned} SDQ_i^k = {} & \beta_0 + \beta_1 \boldsymbol{Mill/dis}_i^{9m} + \beta_2 HHinc_i^{9m} + \beta_3 \boldsymbol{Medu}_i^{0m} + \beta_4 \boldsymbol{Mage}_i \\ & + \beta_5 \boldsymbol{Mage}_i^2 + \beta_6 \boldsymbol{MBMI}_i^{0m} + \beta_7 \boldsymbol{Msingle}_i^k + \beta_8 boy_i \\ & + \beta_9 birthorder_i + \beta_{10} siblings_i^{2y,5y} + X_i^{2y} \delta_1 + \varepsilon_i \end{aligned} \quad (1)$$

SDQ_i^k correspond to the SDQ score of child i at age k (2, 5 or 8 years), $\boldsymbol{Mill/dis}$ is a binary variable that takes value 1 if the mother reported a chronic illness/disability in the 9 months wave and 0 otherwise. $HHinc$ is a categorical variable for household income, measured in the 9 months wave. $\boldsymbol{Medu}$, $\boldsymbol{Mage}$, $\boldsymbol{MBMI}$ and $\boldsymbol{Msingle}$, refer to maternal education (measured in the 9 months wave), age, pre-pregnancy body mass index and whether the mother is single or partnered at age k, respectively. boy takes

[14] To account for missing data in maternal body mass index, depression, and household income, we code for missing cases in these variables and include these cases in our analyses. As shown in the Appendix, our results are robust to excluding observations with missing values.

value 1 if the child is a boy and 0 if it is a girl, *birthorder* corresponds to the child birth order, and *siblings* is the child's number of coresidential siblings, measured at ages 2 and 5. X is a vector of residential location variables, including a binary measure of rurality and the New Zealand deprivation index, a measure of area-level material deprivation.

2.2.2 Mediation analysis

We conduct a mediation analysis to examine the role of parenting style and maternal depression (the mediators) as underlying pathways for the link between maternal chronic illness/disability and child socio-emotional outcomes (Hayes, 2013; Masarik & Conger, 2017).[15] The assumption is that, for many mothers of young children, living with chronic illness or disability creates financial and socio-emotional stress which may negatively affect mothers' parenting style and mental health. This may in turn affect children's socio-emotional outcomes, partly explaining disparities between children whose mother has a chronic illness or disability and other children. We examine the mediating role of parenting style and maternal depression at ages 2, 5, and 8. Assessing the mediation at different ages allows us to examine at which ages of child development the mediation occurs and how it evolves over time. To account for omitted variable bias, we control for all available, relevant maternal, household and child characteristics (as in Eq. (1)). Our analysis remains primarily a descriptive exercise because the relationship between maternal chronic illness/disability and maternal socio-emotional factors—parenting style and mental health—may not be causal. One needs to keep this in mind when interpreting our findings on the link between maternal chronic illness/disability and child socio-emotional outcomes and its possible underlying mechanisms.

A mediation analysis presumes two effects underlying a causal process. The *total direct effect* (also known as *Path c*) is the association between the presumed causal independent variable (maternal chronic illness/disability) and the dependent variable (child SDQ) (Baron & Kenny, 1986; Hayes, 2013). This is estimated without including any mediating variables in the model. We estimated Path c using Eq. (1).

The *indirect effect* is the association between the independent variable *through* the mediating variable (e.g., positive parenting or maternal depression) on the dependent variable. To model *indirect effects*, mediating variables are included in the model to reveal their role in explaining the association between the presumed causal independent variable and the dependent variable. The *indirect effect* is estimated by multiplying the coefficient estimate of the independent variable predicting the hypothesised mediating variable (also known as *Path a*) and the coefficient estimate of the hypothesised mediating variable predicting the dependent variable (also known as *Path b*). Thus, the *indirect effect* is a multiplication of *Path a* and *Path b*. This effect is also independent of any association remaining between the presumed causal independent variable (maternal chronic illness/disability) and the dependent variable (child SDQ) (also known as *Path c*). A diagram depicting these relationships is presented in the Appendix (Figure 11A in the Appendix). A statistically significant total direct effect (*Path c*) is not a necessary

[15] Following a referee's suggestion, we also considered as possible mediators parental time investment (at ages 2 and 5) and child experience of bullying (at age 8), and found no evidence of a mediating role for these variables.

requirement to establish a mediating effect (Hayes, 2013; Zhao et al., 2010). Instead, a mediating effect can be established as an indirect-only mediation wherein the mediation is observed solely through the mediated effect in the absence of a significant *total direct effect*. Only a significant indirect effect is required to determine a mediating effect (*indirect-only* type of mediation effect).

We estimate *Path a*, the effect of maternal chronic illness/disability on the mediator (positive parenting and maternal depression), controlling for socio-demographic characteristics (as in Eq. (1)), with the following regression model:[16]

$$\begin{aligned} mediator_i^k = {} & \alpha_0 + \alpha_1 \boldsymbol{M}ill/dis_i^{9m} + \alpha_2 HHinc_i^{9m} + \alpha_3 \boldsymbol{M}edu_i^{0m} \\ & + \alpha_4 \boldsymbol{M}age_i + \alpha_5 \boldsymbol{M}age_i^2 + \alpha_6 \boldsymbol{M}BMI_i^{0m} + \alpha_7 \boldsymbol{M}single_i^k \\ & + \alpha_8 boy_i + \alpha_9 birthorder_i \\ & + \alpha_{10}\, siblings_i^{2y,5y} + X_i^{2y}\gamma_1 + \mu_i \end{aligned} \tag{2}$$

We estimate *Path b*, the effect of the mediator on child socio-emotional outcomes, while controlling for maternal chronic illness/disability and sociodemographic characteristics (as in Eq. (1)), with the following regression model:

$$\begin{aligned} SDQ_i^k = {} & \lambda_0 + \lambda_1 \boldsymbol{M}ill/dis_i^{9m} + \lambda_2 HHinc_i^{9m} + \lambda_3 \boldsymbol{M}edu_i^{0m} + \lambda_4 \boldsymbol{M}age_i + \lambda_5 \boldsymbol{M}age_i^2 \\ & + \lambda_6 \boldsymbol{M}BMI_i^{0m} + \lambda_7 \boldsymbol{M}single_i^k + \lambda_8 boy_i + \lambda_9 birthorder_i + \lambda_{10} siblings_i^{2y,5y} \\ & + \lambda_{11}\, mediator_i^k + X_i^{2y}\theta_1 + \eta_i \end{aligned} \tag{3}$$

3 Results

We organise the presentation of our results as follows. We first examine the link between maternal health and child socio-emotional outcomes (five separate dimensions of SDQ and total SDQ) at age 2, 5, and 8, controlling for relevant other maternal, household and child characteristics (Section 3.1). We conduct this analysis for the whole sample of children, and separately by gender. We then examine the extent to which parenting style and maternal depression mediate the link between maternal chronic illness/disability and child socio-emotional outcomes (Section 3.2). Since at each age we conduct six tests of a link between maternal health and child SDQ scores (one test for each of the five separate dimensions of SDQ and one test for total SDQ), we systematically correct the *p*-values of our main independent variables (maternal chronic illness/disability) for multiple hypothesis testing. Specifically, we report on the statistical significance of our key variables of interest based on the family-wise error rate (FWER) *p*-values which are adjusted upwards to reduce the probability of a false

[16] When we consider maternal depression as the mediator, we take the continuous values of the depression measure. Moreover, in this analysis, we exclude 41 observations from our sample. These are mothers who reported that their chronic illness was a mental and behavioural condition as their sole illness (147 out of 846) and whose depression score on the Edinburgh Depression Scale indicates that they suffer from depression (41 out of 147). By doing so, we are excluding mothers from the sample whose chronic illness is very likely to be depression, so that we can focus on the mediating role of depression for the link between maternal chronic illness/disability and child SDQ outcomes.

rejection (Westfall & Young, 1993). Our results are generally consistent across the different methods (standard *p*-value and FWER *p*-value approach).[17]

3.1 Maternal health and child socio-emotional outcomes

Our first set of results show the relationship between maternal chronic illness/disability and child SDQ measures, controlling for maternal characteristics, including age, education, pre-pregnancy body mass index; household characteristics, including household income, rurality, area-level material deprivation and number of co-residential siblings of the study child; and child characteristics, including child gender and birth order.

We report our results in Tables 4–6 (columns 1–6). For brevity, we only report the estimated coefficients of our main variable of interest, maternal chronic illness/disability (**M** illness/disability), and key control variables including education (**M** education), household income and child gender (full set of results is provided in the Appendix in Tables 2A–4A). At age 2 (see Table 4) we find that maternal chronic illness/disability is statistically associated with higher hyperactivity-inattention (0.068 standard deviations, column 2), emotional symptoms (0.065 standard deviations, column 4), and lower prosociality (0.074 standard deviations, column 5) at the 10% significance level. At age 5 (see Table 5), maternal chronic illness/disability is statistically associated with higher conduct problems (0.080 standard deviations, column 1) at the 5% level and emotional symptoms (0.065 standard deviations, column 3) at the 10% significance level. Lastly, at age 8 (see Table 6), we find that maternal chronic illness/disability is statistically associated with higher conduct problems (0.209 standard deviations, column 1), emotional symptoms (0.155 standard deviations, column 3), peer problems (0.124 standard deviations, column 4), and total SDQ (0.201 standard deviations, column 6), consistently statistically significant at the 1% level.[18] All remaining coefficients between maternal chronic illness/disability and child SDQ were not significant.

The estimation results for the main control variables reveal that low household income (relative to the median at the time of data collection of $50–$70,000) is generally associated with higher child SDQ problems. In contrast, higher maternal education (bachelor degree or above) is generally associated with lower child SDQ problems (Tables 4–6).

We repeated the analysis separately for boys and girls, and report the results obtained for our main variables of interest in Table 7. Results for boys at age 2 are consistent with the full sample (columns 2, 3, and 5) whereas for girls, there are no significant associations between maternal chronic illness/disability and SDQ. At age 5, maternal chronic illness/disability is significantly associated with higher conduct problems for girls (0.139 standard deviations, column 1) and prosociality at the 10% significance level (0.099, column 5). For boys, maternal chronic illness/disability is significantly associated with *lower* prosociality (0.124, column 5). At age 8, maternal chronic illness/disability is significantly associated with higher conduct problems

[17] Like in the descriptive analysis, in the regression analysis we use a combined binary measure of maternal chronic illness/disability. Sensitivity analyses were run using the separate binary measures of chronic illness and disability status and the results were similar to those obtained with a combined binary indicator (results will be made available upon request).

[18] Sensitivity analyses were run without coding for missing cases on body mass index, maternal depression, and household income and the results were similar. Results are available on request.

Table 4 Maternal chronic illness/disability and child SDQ scores at age 2

Age 2	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.016	0.068*	0.065*	0.001	–0.074*	0.055
	(0.039)	(0.041)	(0.039)	(0.039)	(0.041)	(0.038)
Household income[a] (Ref: $50–70,000)						
< $20,000	0.109	0.122	0.337***	0.313***	–0.163*	0.299***
	(0.087)	(0.091)	(0.087)	(0.087)	(0.092)	(0.084)
$20–30,000	0.084	0.059	0.166**	0.232***	–0.035	0.183***
	(0.067)	(0.070)	(0.067)	(0.067)	(0.070)	(0.065)
$30–50,000	0.123***	0.083*	0.118**	0.124***	–0.078	0.159***
	(0.046)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
$70–100,000	0.003	–0.003	–0.052	–0.017	–0.017	–0.022
	(0.045)	(0.047)	(0.045)	(0.045)	(0.047)	(0.043)
$100–150,000	0.017	–0.044	–0.085*	–0.093**	–0.003	–0.068
	(0.047)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
>$150,000	0.024	–0.054	–0.111**	–0.115**	–0.011	–0.085*
	(0.052)	(0.054)	(0.051)	(0.052)	(0.054)	(0.050)
M Education (Ref: Secondary school)						
Below secondary school	0.326***	0.047	0.113*	0.223***	–0.071	0.251***
	(0.061)	(0.063)	(0.060)	(0.061)	(0.064)	(0.059)
Diploma/Trade	0.019	0.018	–0.052	0.036	0.047	0.010
	(0.037)	(0.038)	(0.037)	(0.037)	(0.039)	(0.036)
Bachelor	–0.137***	–0.070	–0.158***	–0.101**	–0.021	–0.164***
	(0.041)	(0.043)	(0.041)	(0.041)	(0.043)	(0.040)
Higher degree	–0.217***	–0.122**	–0.122***	–0.079*	0.001	–0.198***
	(0.047)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
Child is a boy	0.002	0.196***	–0.032	0.102***	–0.228***	0.105***
	(0.026)	(0.028)	(0.026)	(0.026)	(0.028)	(0.025)
Constant	1.262***	1.103***	0.390	1.017***	0.068	1.391***
	(0.380)	(0.397)	(0.378)	(0.382)	(0.400)	(0.367)
N	5040	5040	5040	5040	5040	5040

Notes: In the interest of space, the coefficient estimates for additional variables are omitted from this table. See Table 2A in the appendix for full results. Statistical significance of ***M*** *illness/disability* is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

[a]Missing values were coded as a category for this variable but the coefficient is omitted from the table in the interest of space

Table 5 Maternal chronic illness/disability and child SDQ scores at age 5

Age 5	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.080**	0.010	0.065*	–0.005	–0.017	0.054
	(0.041)	(0.040)	(0.040)	(0.039)	(0.041)	(0.038)
Household income[a] (Ref: $50–70,000)						
< $20,000	0.058	0.122	0.128	–0.062	–0.256*	0.113
	(0.139)	(0.136)	(0.135)	(0.132)	(0.141)	(0.130)
$20–30,000	0.087	0.028	0.146	0.122	0.039	0.133
	(0.093)	(0.091)	(0.090)	(0.088)	(0.094)	(0.087)
$30–50,000	0.103*	0.150***	0.088	0.103*	–0.075	0.171***
	(0.057)	(0.056)	(0.055)	(0.054)	(0.058)	(0.053)
$70–100,000	–0.047	0.011	–0.103**	–0.012	0.008	–0.052
	(0.049)	(0.048)	(0.048)	(0.047)	(0.050)	(0.046)
$100–150,000	–0.107**	–0.035	–0.091*	–0.034	0.092*	–0.096**
	(0.050)	(0.049)	(0.048)	(0.047)	(0.050)	(0.046)
>$150,000	–0.069	–0.035	–0.152***	–0.062	0.087	–0.116**
	(0.053)	(0.052)	(0.052)	(0.050)	(0.054)	(0.049)
M Education (Ref: Secondary school)						
Below secondary school	0.110*	0.134**	0.077	–0.007	0.031	0.129**
	(0.065)	(0.064)	(0.064)	(0.062)	(0.066)	(0.061)
Diploma/Trade	–0.007	–0.026	0.015	0.005	0.023	–0.008
	(0.039)	(0.038)	(0.038)	(0.037)	(0.039)	(0.036)
Bachelor	–0.161***	–0.228***	–0.077*	–0.183***	–0.098**	–0.247***
	(0.043)	(0.042)	(0.042)	(0.041)	(0.043)	(0.040)
Higher degree	–0.148***	–0.277***	0.029	–0.159***	–0.046	–0.218***
	(0.048)	(0.047)	(0.047)	(0.046)	(0.049)	(0.045)
Child is a boy	0.130***	0.247***	–0.068**	–0.012	–0.348***	0.134***
	(0.028)	(0.027)	(0.027)	(0.026)	(0.028)	(0.026)
Constant	0.200	1.175***	1.112**	1.704***	0.650	1.576***
	(0.457)	(0.446)	(0.444)	(0.434)	(0.461)	(0.425)
N	5032	5032	5030	5032	5030	5032

Notes: In the interest of space, the coefficient estimates for additional variables are omitted from this table. See Appendix for full results. Standard errors in brackets. Statistical significance of ***M** illness/disability* is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

[a]Missing values were coded as a category for this variable but the coefficient is omitted from the table in the interest of space

Table 6 Maternal chronic illness/disability and child SDQ scores at age 8

Age 8	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.209***	0.068	0.155***	0.124***	0.005	0.201***
	(0.047)	(0.047)	(0.047)	(0.045)	(0.047)	(0.046)
Household income[a] (Ref: $50–70,000)						
< $20,000	0.353***	0.359***	0.126	0.367***	–0.407***	0.427***
	(0.107)	(0.107)	(0.107)	(0.102)	(0.106)	(0.104)
$20–30,000	0.177	0.037	–0.061	0.212*	–0.121	0.119
	(0.117)	(0.116)	(0.116)	(0.111)	(0.116)	(0.113)
$30–50,000	0.015	–0.010	–0.039	0.075	–0.150*	0.013
	(0.078)	(0.078)	(0.078)	(0.074)	(0.078)	(0.076)
$70–100,000	–0.009	–0.002	–0.105	–0.089	–0.131**	–0.089
	(0.065)	(0.065)	(0.065)	(0.062)	(0.065)	(0.063)
$100–150,000	–0.010	–0.069	–0.142**	–0.150**	–0.002	–0.155**
	(0.063)	(0.063)	(0.063)	(0.060)	(0.063)	(0.061)
>$150,000	–0.052	–0.047	–0.171***	–0.192***	–0.060	–0.189***
	(0.064)	(0.063)	(0.063)	(0.061)	(0.063)	(0.062)
M Education (Ref: Secondary school)						
Below secondary school	–0.013	–0.115	–0.061	0.119	–0.070	–0.022
	(0.088)	(0.087)	(0.087)	(0.083)	(0.087)	(0.085)
Diploma/Trade	–0.069	–0.005	–0.081*	–0.001	0.063	–0.057
	(0.047)	(0.047)	(0.047)	(0.045)	(0.047)	(0.045)
Bachelor	–0.052	–0.086*	–0.093*	–0.078*	–0.023	–0.119**
	(0.050)	(0.049)	(0.049)	(0.047)	(0.049)	(0.048)
Higher degree	–0.047	–0.002	–0.060	–0.038	–0.020	–0.057
	(0.056)	(0.055)	(0.055)	(0.053)	(0.055)	(0.054)
Child is a boy	0.135***	0.150***	–0.079**	0.092***	–0.368***	0.089***
	(0.032)	(0.032)	(0.032)	(0.031)	(0.032)	(0.031)
Constant	0.873	0.054	0.424	1.742**	0.976	1.166
	(0.781)	(0.777)	(0.776)	(0.741)	(0.774)	(0.755)
N	3755	3755	3755	3755	3755	3755

Notes: In the interest of space, the coefficient estimates for additional variables are omitted from this table. See Appendix for full results. Standard errors in brackets. Statistical significance of ***M** illness/disability* is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

[a]Missing values were coded as a category for this variable but the coefficient is omitted from the table in the interest of space

Table 7 Maternal chronic illness/disability and child SDQ scores at ages 2, 5 and 8, by child gender

	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Child is a boy						
Age 2						
M illness/disability	0.048	0.153***	0.099*	0.009	–0.112*	0.116**
	(0.053)	(0.056)	(0.054)	(0.054)	(0.057)	(0.052)
Constant	0.704	0.745	0.742	0.790	0.028	1.067**
	(0.532)	(0.560)	(0.538)	(0.544)	(0.575)	(0.519)
N	2604	2604	2604	2604	2604	2604
Age 5						
M illness/disability	0.038	0.056	0.080	–0.059	–0.124**	0.055
	(0.055)	(0.056)	(0.054)	(0.054)	(0.060)	(0.052)
Constant	1.310**	0.875	1.792***	2.141***	–0.230	2.155***
	(0.636)	(0.643)	(0.621)	(0.621)	(0.689)	(0.599)
N	2597	2597	2595	2597	2595	2597
Age 8						
M illness/disability	0.161**	0.058	0.117*	0.203***	–0.119*	0.201***
	(0.069)	(0.070)	(0.066)	(0.066)	(0.069)	(0.067)
Constant	0.097	0.944	0.528	1.656	–0.027	1.288
	(1.170)	(1.180)	(1.116)	(1.115)	(1.174)	(1.136)
N	1911	1911	1911	1911	1911	1911
Panel B: Child is a girl						
Age 2						
M illness/disability	–0.021	–0.030	0.018	–0.007	–0.038	–0.017
	(0.058)	(0.060)	(0.056)	(0.057)	(0.059)	(0.055)
Constant	1.730***	1.604***	0.024	1.336**	–0.064	1.766***
	(0.547)	(0.568)	(0.534)	(0.540)	(0.559)	(0.523)
N	2436	2436	2436	2436	2436	2436
Age 5						
M illness/disability	0.139**	–0.036	0.056	0.062	0.099*	0.064
	(0.060)	(0.057)	(0.058)	(0.056)	(0.056)	(0.056)
Constant	–0.797	1.689***	0.414	1.396**	1.159*	1.165*
	(0.657)	(0.621)	(0.637)	(0.607)	(0.615)	(0.608)
N	2435	2435	2435	2435	2435	2435
Age 8						
M illness/disability	0.258***	0.065	0.187***	0.043	0.136**	0.193***
	(0.064)	(0.063)	(0.067)	(0.061)	(0.063)	(0.062)
Constant	1.475	–0.872	0.166	1.770*	1.768*	0.891
	(1.035)	(1.010)	(1.085)	(0.978)	(1.008)	(0.997)
N	1844	1844	1844	1844	1844	1844

Notes: In the interest of space, the coefficient estimates for additional variables are omitted from this table. See Appendix for full results. Standard errors in brackets. Statistical significance of ***M** illness/disability* is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

(0.161 for boys and 0.258 for girls, column 1), emotional symptoms (0.117 for boys and 0.187 for girls, column 3), and total SDQ scores for both boys and girls (0.201 for boys and 0.193 for girls, column 6). Maternal chronic illness/disability is significantly associated with higher peer problems for boys at age 8 (0.203, column 4) but not girls. Lastly, the association between maternal chronic illness/disability and prosociality deviate between boys and girls, with lower prosociality for boys (0.119 for boys, column 5) and higher prosociality for girls (0.136).

3.2 Mediation by parenting style and maternal depression

We explore the mediating effect of positive parenting and maternal depression on the relationship between maternal chronic illness/disability and child SDQ outcomes. Specifically, we test if there is an *indirect* effect of maternal chronic illness/disability on child SDQ, through positive parenting and maternal depression (the multiplication of *path a* and *path b* in the mediation analysis framework, see Section 2.2.2).[19] For brevity, the regression results showing the predictive power of maternal chronic illness/disability on positive parenting and maternal depression (*path a*, column 7), and the predictive power of positive parenting and maternal depression on child SDQ outcomes (*path b*, columns 1 to 6) of the mediation analysis are reported in the Appendix (Tables 11A–14A).

We report our results on the mediating role of positive parenting in Table 8. At age 2, we find that positive parenting significantly mediates the association between maternal chronic illness/disability and all child SDQ measures (Table 8, panel A). This suggest that, at age 2, maternal chronic illness/disability is associated with worse SDQ scores through its role in lowering maternal positive parenting. The same pattern emerges when considering boys and girls separately (Table 8, panels B and C).[20] The mediation analysis, however, reveals no significant mediation at age 5, for the full sample, nor boys or girl separately. This result is aligned with the fact that, at age 5, maternal chronic illness/disability is not statistically associated with positive parenting in the full sample as well as for boys and girls separately (results presented in Tables 11A–12A, column 7, in the Appendix).[21]

[19] As described in Section 2.2.2, a mediation effect can be tested in the absence of a consistent significant association between the presumed causal independent variable and the dependent variable. Our benchmark models in Section 3.1 showed that maternal chronic illness/disability is significantly associated with some of the child SDQ outcomes, but inconsistently across age and gender. An absence of a consistent total direct effect (*path c*) but significant mediations may suggest a distal, but nonetheless mediated by positive parenting or maternal depression, association between maternal chronic illness/disability and child SDQ. The stronger associations of maternal chronic illness/disability and the mediators as well as the association between the mediators and child SDQ suggests that maternal socio-emotional factors are critical in explaining the role of maternal health status in child socioemotional development.

[20] At age 2, maternal chronic illness/disability is statistically significantly associated with lower positive parenting (*path a*). Positive parenting is statistically significantly associated with less conduct problems, hyperactivity-inattention, emotional symptoms, peer problems, and total SDQ as well as higher prosociality (*path b*). This pattern of results is the same when examining boys and girls separately.

[21] At age 5, positive parenting is statistically associated with less conduct problems, hyperactivity-inattention, emotional problems, peer problems, total SDQ, and higher prosociality for the full sample as well as boys and girls separately (*path b*).

Table 8 Indirect effects (path a * path b) of maternal chronic illness/disability, mediated by positive parenting, on child SDQ scores for age 2, 5, and 8

Indirect effect	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)
Panel A: Full sample						
M illness/disability (age 2)	0.025***	0.025***	0.008**	0.013***	–0.027***	0.027***
	(0.008)	(0.008)	(0.003)	(0.005)	(0.009)	(0.009)
M illness/disability (age 5)	–0.015	–0.011	–0.008	–0.001	0.010	–0.014
	(0.016)	(0.012)	(0.008)	(0.001)	(0.010)	(0.015)
M illness/disability (age 8)	0.031**	0.011**	0.025**	0.024**	–0.043**	0.033**
	(0.014)	(0.005)	(0.012)	(0.011)	(0.020)	(0.015)
Panel B: Child is a boy						
M illness/disability (age 2)	0.023**	0.025**	0.007*	0.014**	–0.024**	0.026**
	(0.010)	(0.011)	(0.004)	(0.007)	(0.012)	(0.012)
M illness/disability (age 5)	–0.007	–0.005	–0.004	–0.001	0.005	–0.007
	(0.021)	(0.016)	(0.011)	(0.002)	(0.013)	(0.020)
M illness/disability (age 8)	0.065*** (0.022)	0.029***	0.047***	0.044***	–0.094***	0.067***
		(0.011)	(0.016)	(0.015)	(0.032)	(0.023)
Panel C: Child is a girl						
M illness/disability (age 2)	0.028**	0.025**	0.009*	0.013**	–0.027**	0.028**
	(0.013)	(0.012)	(0.005)	(0.006)	(0.013)	(0.013)
M illness/disability (age 5)	–0.018	–0.013	–0.009	–0.001	0.011	–0.016
	(0.024)	(0.018)	(0.012)	(0.002)	(0.015)	(0.022)
M illness/disability (age 8)	0.000	0.000	0.000	0.000	–0.001	0.001
	(0.018)	(0.004)	(0.017)	(0.017)	(0.023)	(0.021)

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

A different pattern emerges at age 8, where we find that positive parenting significantly mediates the relationship between maternal chronic illness/disability and child SDQ for the full sample and boys, but not for girls (Table 8, panel A for the full sample, panel B for boys, and panel C for girls). For boys, maternal chronic illness/disability is associated with *higher* conduct problems, hyperactivity-inattention, emotional symptoms, peer problems, total SDQ (Table 8, panel A, columns 1 to 4 and 6) and *lower* prosociality (column 5) through lower positive parenting.[22] The discrepancy by child gender in the mediation analysis is, like at age 5, aligned with the fact that maternal chronic illness/disability is associated with less positive parenting for boys at 8 years of age, but not for girls of the same age (Table 12A, column 7, in the appendix).

We now turn to our results on the mediating role of maternal depression. The results, reported in Table 9, show a consistent mediating effect of maternal depression on the relationship between maternal chronic illness/disability and child SDQ outcomes, across all ages and for both boys and girls. Maternal chronic illness/disability is associated with *higher* child conduct problems, hyperactivity-inattention, emotional symptoms, peer problems, and total SDQ (Table 9, columns 1–4, 6) and *lower* prosociality (Table 9, column 5), through its positive relationship with maternal depression (Tables 13A–14A, column 7, in the Appendix).[23]

Taken together, the results indicate that maternal depression is a strong mediator of maternal chronic illness/disability, from early to mid-childhood, and for both boys and girls. The mediating role of positive parenting is less clear cut. Parenting style mediates the relationship between maternal chronic illness/disability in early childhood, at age 2, for boys and girls, but not at age 5. At age 8, following commencement of formal education, we find that parenting style mediates the relationship between maternal chronic illness/disability for boys only.

4 Conclusion

We examined the relationship between maternal chronic illness or disability and the development of children's socio-emotional skills, using the Growing Up in New Zealand longitudinal study. Our study contributes to an international body of evidence that examines the association between parental long-term illness and children's socio-emotional outcomes (e.g., Grant et al., 2006; Rainville et al., 2012; Sieh et al., 2010). We add to the literature by studying whether and at what age maternal chronic illness or disability affects children's socio-emotional outcomes. Our findings revealed that differences in socio-emotional outcomes between children whose mother has a long-term illness or disability and other children are likely to emerge in early childhood. These differences remain small in the first few years of life but widen after the child starts school. This is a novel finding that highlights the need for

[22] At age 8, positive parenting is statistically related to less conduct problems, hyperactivity-inattention, emotional symptoms, peer problems, total SDQ, and higher prosociality for the full sample as well as boys and girls separately (*path b*).

[23] At ages 2, 5 and 8, for the full sample, and boys and girls separately, maternal chronic illness/disability is significantly associated with maternal depression (*path a*); and maternal depression is significantly linked to all dimensions of child SDQ (*path b*).

Table 9 Indirect effects (path a * path b) of maternal chronic illness/disability, mediated by maternal depression, on child SDQ scores for age 2, 5, and 8

Indirect effect	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)
Panel A: Full sample						
M illness/disability (age 2)	0.040***	0.028***	0.046***	0.024***	–0.017***	0.049***
	(0.007)	(0.006)	(0.008)	(0.005)	(0.005)	(0.008)
M illness/disability (age 5)	0.071***	0.054***	0.068***	0.030***	–0.021***	0.084***
	(0.010)	(0.008)	(0.010)	(0.006)	(0.005)	(0.011)
M illness/disability (age 8)	0.060***	0.034***	0.097***	0.057***	–0.022***	0.096***
	(0.010)	(0.008)	(0.015)	(0.010)	(0.007)	(0.014)
Panel B: Child is a boy						
M illness/disability (age 2)	0.044***	0.038***	0.054***	0.032***	–0.022**	0.060***
	(0.010)	(0.009)	(0.011)	(0.009)	(0.008)	(0.011)
M illness/disability (age 5)	0.066***	0.040***	0.072***	0.030***	–0.017**	0.078***
	(0.013)	(0.009)	(0.014)	(0.008)	(0.008)	(0.014)
M illness/disability (age 8)	0.055***	0.039**	0.087***	0.051***	–0.021**	0.089***
	(0.014)	(0.012)	(0.019)	(0.013)	(0.011)	(0.020)
Panel C: Child is a girl						
M illness/disability (age 2)	0.032***	0.018***	0.033***	0.016**	–0.012**	0.035***
	(0.010)	(0.007)	(0.011)	(0.006)	(0.005)	(0.011)
M illness/disability (age 5)	0.076***	0.072***	0.065***	0.031***	–0.024***	0.094***
	(0.015)	(0.014)	(0.013)	(0.009)	(0.008)	(0.017)
M illness/disability (age 8)	0.063***	0.027***	0.105***	0.062***	–0.022**	0.100***
	(0.015)	(0.010)	(0.022)	(0.015)	(0.010)	(0.021)

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

a life course approach to understand the association between parental illness and child development. Future research should investigate the reasons for the stronger relationship in mid-childhood than in early childhood. For instance, as children become older, they may begin to understand what it means for a parent to be ill and acquire caring responsibilities. Although our analysis does not account for caring responsibilities at eight years of age, our results nonetheless highlight the importance of understanding the experiences of children who may become young carers at mid-childhood. They may also be stigmatised by peers. Both factors could play a mediating role and should be explored in future research.

Aligned with past research, our mediation analysis revealed that parenting style might act as an important transmission channel of the influence of maternal chronic illness or disability on children's socio-emotional outcomes (e.g., Armistead et al., 1995; Masarik & Conger, 2017). Interestingly, we found that positive parenting mediates the relationship between maternal health and child socio-emotional outcomes in early childhood, at age 2, but not at age 5, and only for boys at age 8, after commencement of formal education. Our mediation results at age 5, in particular, need to be interpreted with caution because, at that age, we do not find a relationship between maternal chronic illness or disability and parenting style. Even when we do find a relationship between maternal chronic illness or disability and parenting style, this relationship may not be causal. Therefore, our results provide suggestive evidence that parenting style mediates the relationship between maternal chronic illness or disability and child socio-emotional outcomes at age 2, and at age 8 among boys. Future research should further explore these findings, in particular, with respect to the gender difference in the mediating role of parenting style at 8 years of age.

Our study also highlights the key role of maternal mental health for child socio-emotional outcomes. Importantly, we find that maternal depression affects child socio-emotional outcomes directly, and consistently mediates the relationship between maternal chronic illness or disability and child socio-emotional outcomes, from early to mid-childhood. This finding needs to be interpreted with caution given the self-reported nature of child outcomes. It is plausible that mothers suffering from depression are also more pessimistic about their children's socio-emotional outcomes. Future research should further explore the nature of the relationship between maternal depression and child outcomes.

Our study provides useful guidance for research and policy on the consequences of maternal long-term health conditions and child socio-emotional development, and the channels underlying this relationship. At the same time, we acknowledge that our analysis is primarily a descriptive exercise and has limitations. First, we are not accounting for all factors that could affect both maternal health and child socio-emotional outcomes. We controlled for observable factors, including maternal, household and child characteristics. By doing so, maternal chronic illness or disability and child socio-emotional development at age 8 remain associated, which suggests that factors beyond those listed underlie the relationship between maternal health and child outcomes. Second, due to data restrictions, we use a binary measure of maternal chronic illness and disability assessed at one point in time and we cannot establish whether the relationship with child socio-emotional outcomes varies given the nature and severity of the health condition. For instance, when managed well, some chronic illnesses do not lead to symptoms and would not be expected to affect child socio-emotional outcomes. Future research should

account for the nature, persistence and severity of long-term maternal health conditions when examining their relationships with child development. A third limitation is that child socio-emotional outcomes were reported by mothers only. Like in the case of mothers suffering from depression, it is possible that mothers with chronic illness or disability may judge their children more harshly (Del Bono et al., 2024). Future research that draws on reports of child development from multiple evaluators may be valuable. Finally, we can only report on child developmental outcomes until eight years of age. The emerging picture is that the gap in socio-emotional development between children whose mother has a chronic illness or disability and other children becomes large and consistent across measures at eight years of age. It is important to know how the gap evolves over time, such as when they age into adolescence. Future research drawing on additional waves of the GUiNZ study could address this question.

Data availability Access to the data used in the manuscript requires following the steps outlined here: https://www.growingup.co.nz/data-access-application.

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Data availabilityAccess to the data used in the manuscript requires following the steps outlined here: https://www.growingup.co.nz/data-access-application.

Compliance with ethical standards

Conflict of interest The authors declare no competing interests.

5 Appendix

Tables 10–23, Figs. 1–11

Table 10 Parenting variables and items included in the positive parenting index

Variable (wave)	Item
Interest with the baby (9 months)	I say nice things about my baby [babies]
	I take an active interest in my baby [babies
	I am interested in the things my baby does [babies do]
	I praise my baby when he/she deserves it [babies when they deserve it]
	I enjoy having my baby [babies] around me
	I tell my baby how proud I am of him/her when he/she is good [babies how proud I am of them when they are good]
	I make my baby [babies] feel proud when he/she does [they do] well
	I talk to my baby [babies] in a warm and affectionate way
	I make my baby [babies] feel what he/she does [they do] is important
	I pay a lot of attention to my baby [babies]
	I try to make my baby [babies] happy
	I like to spend time with my baby [babies]
Parenting confidence (age 2)	We would like to know how you feel about being a parent. Overall, do you feel that as a parent you are: (Not very good at being a parent; A person who has some trouble being a parent; An average parent; A better than average parent; A very good parent)
Parenting enjoyment (age 2)	On the whole, I enjoy being a parent
	Being a parent is very satisfying
	On the whole, my child is/children are easy to parent
	On the whole, it's good to be a parent
Authoritarian parenting (age 5)	There should be a clear line of authority within the family and no doubt about who decides?
	Children should obey their parents?
	Parents should teach their children to behave properly?
	Children should not talk back to their parents?
	It is a child's responsibility to look after the parents when they need help?
	Parents always know what is best?
Hostile parenting (age 5)	I guide {him/her} by punishment more than by reason
	I smack {him/her} when {he/she} is disobedient
	I grab {him/her} when {he/she} is being disobedient
	I use physical punishment as a way of disciplining {him/her}
	I argue with {him/her}
	I yell or shout when {he/she} misbehaves
	I explode with anger at {him/her}
	I disagree with {him/her}
Warm parenting (age 5)	I encourage {him/her} to talk about {his/her} troubles
	I give praise when {he/she} is good
	I show sympathy if {he/she} is hurt or frustrated
	I give comfort and understanding when {he/she} is upset
	I am responsive to {his/her} feelings and needs

Table 10 continued

Variable (wave)	Item
	I tell {him/her} that I appreciate what they try to accomplish express affection by hugging, kissing, and holding {him/her}
	How often do you express affection by hugging, kissing, holding {NAME}?
	I apologise to {him/her} when I make a mistake in parenting
Parenting efficacy (age 5)	I find it difficult to discipline {him/her}
	I am afraid that disciplining my child for misbehaviour will cause {him/her} to not like me
	I threaten {him/her} with punishment more often than actually giving it
	I set strict, well-established rules for {him/her}
	I am unsure of how to solve {his/her} misbehaviour
Hostile parenting (age 8)	I have raised my voice and have shouted at {NAME}
	I have been angry with {NAME}
	I have lost my temper with {NAME}
	When {NAME} cries, {HE/SHE} gets on my nerves
Parenting efficacy (age 8)	Does {NAME} behave in a manner different from the way you want {HIM/HER} to?
	Do you think that {NAME}'s behaviour is more than you can handle?
	Do you feel you are good at getting {NAME} to do what you want {HIM/HER} to do?
	Do you feel that you are in control and on top of things when you are caring for {NAME}?
Parenting consistency (age 8)	How often do you think the level of discipline you give {NAME} depends on your mood?
	If you tell {NAME} that {HE/SHE} will be disciplined if {HE/SHE} doesn't stop doing something, but {HE/SHE} keeps doing it, how often will you discipline {HIM/HER}?
	How often does {NAME} get away with things that you feel should have been disciplined?
	How often is {NAME} able to get out of discipline when {HE/SHE} really sets {HIS/HER} mind to it?
	When you discipline {NAME}, how often does {HE/SHE} ignore it?
	When you give {NAME} an instruction or make a request to do something, how often do you make sure that {HE/SHE} does it?
Warm parenting (age 8)	How often do you express affection by hugging, kissing, holding {NAME}?
	How often do you tell {NAME} how happy {HE/SHE} makes you?
	How often do you have warm, close times together with {NAME}?
	How often do you enjoy listening to {NAME} and doing things with {HIM/HER}?
	How often do you feel close to {NAME} both when {HE/SHE} is happy and upset?
	How often do you hug or hold {NAME} for no particular reason?

Table 11 Maternal chronic illness/disability and child SDQ scores at age 2

Age 2	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.016	0.068*	0.065*	0.001	–0.074*	0.055
	(0.039)	(0.041)	(0.039)	(0.039)	(0.041)	(0.038)
M age	–0.070***	–0.062**	–0.021	–0.075***	0.013	–0.083***
	(0.023)	(0.025)	(0.023)	(0.024)	(0.025)	(0.023)
M age squared	0.001*	0.001*	0.000	0.001***	–0.000	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BMI (Ref: Normal)						
Missing	0.210***	0.165***	0.274***	0.108**	0.021	0.270***
	(0.047)	(0.049)	(0.047)	(0.047)	(0.050)	(0.046)
Underweight	–0.026	–0.014	0.257***	0.021	0.109	0.072
	(0.077)	(0.080)	(0.076)	(0.077)	(0.081)	(0.074)
Overweight	0.083**	0.056	0.012	–0.009	–0.025	0.056*
	(0.035)	(0.037)	(0.035)	(0.035)	(0.037)	(0.034)
Obese	0.177***	0.090**	0.107***	–0.031	0.023	0.129***
	(0.040)	(0.042)	(0.040)	(0.040)	(0.042)	(0.039)
Rural	–0.062	–0.058	–0.208***	–0.072	–0.048	–0.137***
	(0.048)	(0.050)	(0.047)	(0.048)	(0.050)	(0.046)
Household income (Ref: $50–70,000)						
Missing	0.095	0.088	0.107*	0.107*	–0.071	0.141**
	(0.059)	(0.062)	(0.059)	(0.059)	(0.062)	(0.057)
< $20,000	0.109	0.122	0.337***	0.313***	–0.163*	0.299***
	(0.087)	(0.091)	(0.087)	(0.087)	(0.092)	(0.084)
$20–30,000	0.084	0.059	0.166**	0.232***	–0.035	0.183***
	(0.067)	(0.070)	(0.067)	(0.067)	(0.070)	(0.065)
$30–50,000	0.123***	0.083*	0.118**	0.124***	–0.078	0.159***
	(0.046)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
$70–100,000	0.003	–0.003	–0.052	–0.017	–0.017	–0.022
	(0.045)	(0.047)	(0.045)	(0.045)	(0.047)	(0.043)
$100–150,000	0.017	–0.044	–0.085*	–0.093**	–0.003	–0.068
	(0.047)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
>$150,000	0.024	–0.054	–0.111**	–0.115**	–0.011	–0.085*
	(0.052)	(0.054)	(0.051)	(0.052)	(0.054)	(0.050)
M Education (Ref: Secondary school)						

Table 11 continued

Age 2	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Below secondary school	0.326***	0.047	0.113*	0.223***	–0.071	0.251***
	(0.061)	(0.063)	(0.060)	(0.061)	(0.064)	(0.059)
Diploma/Trade	0.019	0.018	–0.052	0.036	0.047	0.010
	(0.037)	(0.038)	(0.037)	(0.037)	(0.039)	(0.036)
Bachelor	–0.137***	–0.070	–0.158***	–0.101**	–0.021	–0.164***
	(0.041)	(0.043)	(0.041)	(0.041)	(0.043)	(0.040)
Higher degree	–0.217***	–0.122**	–0.122***	–0.079*	0.001	–0.198***
	(0.047)	(0.049)	(0.046)	(0.047)	(0.049)	(0.045)
Child is a boy	0.002	0.196***	–0.032	0.102***	–0.228***	0.105***
	(0.026)	(0.028)	(0.026)	(0.026)	(0.028)	(0.025)
M is single	0.170***	0.041	0.058	0.015	0.056	0.105**
	(0.051)	(0.053)	(0.051)	(0.051)	(0.054)	(0.049)
NZ Deprivation index	0.023***	0.011**	0.026***	0.030***	–0.008	0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Number of coresidential siblings	0.068***	–0.016	0.051***	0.016	–0.026	0.041**
	(0.017)	(0.018)	(0.017)	(0.017)	(0.018)	(0.016)
Birth order	–0.005	–0.006	–0.014	0.025**	0.010	–0.001
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.012)
Constant	1.262***	1.103***	0.390	1.017***	0.068	1.391***
	(0.380)	(0.397)	(0.378)	(0.382)	(0.400)	(0.367)
N	5040	5040	5040	5040	5040	5040

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 12 Maternal chronic illness/disability and child SDQ scores at age 5

Age 5	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.080**	0.010	0.065*	–0.005	–0.017	0.054
	(0.041)	(0.040)	(0.040)	(0.039)	(0.041)	(0.038)
M age	–0.011	–0.062**	–0.056**	–0.095***	–0.017	–0.084***
	(0.026)	(0.026)	(0.026)	(0.025)	(0.027)	(0.025)
M age squared	0.000	0.001*	0.001	0.001***	0.000	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BMI (Ref: Normal)	0.152***	0.154***	0.269***	0.165***	0.050	0.278***
Missing	(0.050)	(0.049)	(0.049)	(0.048)	(0.051)	(0.047)
	–0.055	–0.105	–0.034	0.101	0.011	–0.055
Underweight	(0.081)	(0.079)	(0.078)	(0.076)	(0.081)	(0.075)
	0.013	0.078**	0.006	–0.026	0.080**	0.039
Overweight	(0.036)	(0.035)	(0.035)	(0.034)	(0.037)	(0.034)
	0.120***	0.193***	0.099**	0.070*	0.063	0.193***
Obese	(0.042)	(0.041)	(0.041)	(0.040)	(0.042)	(0.039)
	–0.031	0.007	–0.157***	–0.093**	0.024	–0.094**
Rural	(0.049)	(0.048)	(0.048)	(0.047)	(0.050)	(0.046)
	0.080**	0.010	0.065*	–0.005	–0.017	0.054
Household income (Ref: $50–70,000)						
Missing	–0.054	0.037	0.119**	0.160***	0.008	0.095*
	(0.055)	(0.053)	(0.053)	(0.052)	(0.055)	(0.051)
< $20,000	0.058	0.122	0.128	–0.062	–0.256*	0.113
	(0.139)	(0.136)	(0.135)	(0.132)	(0.141)	(0.130)
$20–30,000	0.087	0.028	0.146	0.122	0.039	0.133
	(0.093)	(0.091)	(0.090)	(0.088)	(0.094)	(0.087)
$30–50,000	0.103*	0.150***	0.088	0.103*	–0.075	0.171***
	(0.057)	(0.056)	(0.055)	(0.054)	(0.058)	(0.053)
$70–100,000	–0.047	0.011	–0.103**	–0.012	0.008	–0.052
	(0.049)	(0.048)	(0.048)	(0.047)	(0.050)	(0.046)
$100–150,000	–0.107**	–0.035	–0.091*	–0.034	0.092*	–0.096**
	(0.050)	(0.049)	(0.048)	(0.047)	(0.050)	(0.046)
>$150,000	–0.069	–0.035	–0.152***	–0.062	0.087	–0.116**
	(0.053)	(0.052)	(0.052)	(0.050)	(0.054)	(0.049)
M Education (Ref: Secondary school)						

Table 12 continued

Age 5	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Below secondary school	0.110*	0.134**	0.077	–0.007	0.031	0.129**
	(0.065)	(0.064)	(0.064)	(0.062)	(0.066)	(0.061)
Diploma/Trade	–0.007	–0.026	0.015	0.005	0.023	–0.008
	(0.039)	(0.038)	(0.038)	(0.037)	(0.039)	(0.036)
Bachelor	–0.161***	–0.228***	–0.077*	–0.183***	–0.098**	–0.247***
	(0.043)	(0.042)	(0.042)	(0.041)	(0.043)	(0.040)
Higher degree	–0.148***	–0.277***	0.029	–0.159***	–0.046	–0.218***
	(0.048)	(0.047)	(0.047)	(0.046)	(0.049)	(0.045)
Child is a boy	0.130***	0.247***	–0.068**	–0.012	–0.348***	0.134***
	(0.028)	(0.027)	(0.027)	(0.026)	(0.028)	(0.026)
M is single	0.154***	0.095*	0.127**	0.100**	0.011	0.174***
	(0.053)	(0.052)	(0.052)	(0.051)	(0.054)	(0.050)
Missing	0.048	0.034	–0.378	–0.456	–1.096**	–0.310
	(0.401)	(0.391)	(0.425)	(0.380)	(0.442)	(0.373)
NZ Deprivation index	0.010*	0.019***	0.024***	0.033***	–0.012**	0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Number of coresidential siblings	0.021	–0.030**	0.053***	0.000	–0.029*	0.012
	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)	(0.014)
Birth order	–0.002	–0.002	–0.000	0.007	–0.005	0.000
	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)
Constant	0.200	1.175***	1.112**	1.704***	0.650	1.576***
	(0.457)	(0.446)	(0.444)	(0.434)	(0.461)	(0.425)
N	5032	5032	5030	5032	5030	5032

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 13 Maternal chronic illness/disability and child SDQ scores at age 8

Age 8	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.209***	0.068	0.155***	0.124***	0.005	0.201***
	(0.047)	(0.047)	(0.047)	(0.045)	(0.047)	(0.046)
M age	–0.040	–0.002	0.006	–0.084**	–0.034	–0.043
	(0.040)	(0.040)	(0.040)	(0.038)	(0.040)	(0.039)
M age squared	0.000	–0.000	–0.000	0.001*	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)
BMI (Ref: Normal)						
Missing	0.166**	0.118*	0.161**	0.273***	–0.026	0.272***
	(0.066)	(0.065)	(0.065)	(0.062)	(0.065)	(0.064)
Underweight	–0.081	–0.038	–0.113	–0.128	0.113	–0.140
	(0.096)	(0.095)	(0.095)	(0.091)	(0.095)	(0.093)
Overweight	0.062	0.054	0.001	0.007	0.040	0.038
	(0.042)	(0.041)	(0.041)	(0.039)	(0.041)	(0.040)
Obese	0.136***	0.070	0.127***	0.325***	–0.042	0.253***
	(0.049)	(0.049)	(0.049)	(0.047)	(0.049)	(0.047)
Rural	0.038	–0.115**	–0.053	–0.027	0.072	–0.066
	(0.054)	(0.054)	(0.054)	(0.051)	(0.054)	(0.052)
Household income (Ref: $50–70,000)						
Missing	0.047	0.139**	0.068	0.125*	–0.225***	0.144**
	(0.069)	(0.069)	(0.069)	(0.066)	(0.069)	(0.067)
< $20,000	0.353***	0.359***	0.126	0.367***	–0.407***	0.427***
	(0.107)	(0.107)	(0.107)	(0.102)	(0.106)	(0.104)
$20–30,000	0.177	0.037	–0.061	0.212*	–0.121	0.119
	(0.117)	(0.116)	(0.116)	(0.111)	(0.116)	(0.113)
$30–50,000	0.015	–0.010	–0.039	0.075	–0.150*	0.013
	(0.078)	(0.078)	(0.078)	(0.074)	(0.078)	(0.076)
$70–100,000	–0.009	–0.002	–0.105	–0.089	–0.131**	–0.089
	(0.065)	(0.065)	(0.065)	(0.062)	(0.065)	(0.063)
$100–150,000	–0.010	–0.069	–0.142**	–0.150**	–0.002	–0.155**
	(0.063)	(0.063)	(0.063)	(0.060)	(0.063)	(0.061)
>$150,000	–0.052	–0.047	–0.171***	–0.192***	–0.060	–0.189***
	(0.064)	(0.063)	(0.063)	(0.061)	(0.063)	(0.062)
M Education (Ref: Secondary school)						

Table 13 continued

Age 8	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Below secondary school	–0.013	–0.115	–0.061	0.119	–0.070	–0.022
	(0.088)	(0.087)	(0.087)	(0.083)	(0.087)	(0.085)
Diploma/Trade	–0.069	–0.005	–0.081*	–0.001	0.063	–0.057
	(0.047)	(0.047)	(0.047)	(0.045)	(0.047)	(0.045)
Bachelor	–0.052	–0.086*	–0.093*	–0.078*	–0.023	–0.119**
	(0.050)	(0.049)	(0.049)	(0.047)	(0.049)	(0.048)
Higher degree	–0.047	–0.002	–0.060	–0.038	–0.020	–0.057
	(0.056)	(0.055)	(0.055)	(0.053)	(0.055)	(0.054)
Child is a boy	0.135***	0.150***	–0.079**	0.092***	–0.368***	0.089***
	(0.032)	(0.032)	(0.032)	(0.031)	(0.032)	(0.031)
M is single	0.060	–0.092	0.090	0.103*	–0.043	0.069
	(0.059)	(0.058)	(0.058)	(0.056)	(0.058)	(0.057)
Missing	0.219	0.110	0.032	0.131	–0.231	0.164
	(0.144)	(0.143)	(0.143)	(0.136)	(0.142)	(0.139)
NZ Deprivation index	–0.010	0.008	–0.002	0.021***	–0.014**	0.008
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Number of coresidential siblings	0.013	–0.003	–0.079***	–0.026	0.006	–0.045**
	(0.019)	(0.019)	(0.019)	(0.018)	(0.019)	(0.018)
Birth order	–0.005	–0.006	0.012	0.017	–0.040***	0.009
	(0.015)	(0.015)	(0.015)	(0.014)	(0.015)	(0.015)
Constant	0.873	0.054	0.424	1.742**	0.976	1.166
	(0.781)	(0.777)	(0.776)	(0.741)	(0.774)	(0.755)
N	3755	3755	3755	3755	3755	3755

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 14 Maternal chronic illness/disability and child SDQ scores at age 2, for boys

Age 2, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.048	0.153***	0.099*	0.009	–0.112*	0.116**
	(0.053)	(0.056)	(0.054)	(0.054)	(0.057)	(0.052)
M age	–0.037	–0.026	–0.051	–0.056*	–0.001	–0.059*
	(0.033)	(0.034)	(0.033)	(0.033)	(0.035)	(0.032)
M age squared	0.000	0.000	0.001	0.001	–0.000	0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
BMI (Ref: Normal)						
Missing	0.175***	0.153**	0.124*	0.105	–0.014	0.203***
	(0.065)	(0.068)	(0.065)	(0.066)	(0.070)	(0.063)
Underweight	–0.077	–0.126	0.221**	0.093	0.204*	0.018
	(0.104)	(0.110)	(0.105)	(0.107)	(0.113)	(0.102)
Overweight	0.029	0.048	–0.020	0.011	–0.048	0.028
	(0.050)	(0.052)	(0.050)	(0.051)	(0.054)	(0.048)
Obese	0.141**	0.046	0.119**	0.007	0.029	0.113**
	(0.055)	(0.057)	(0.055)	(0.056)	(0.059)	(0.053)
Rural	–0.030	–0.025	–0.219***	–0.085	–0.061	–0.119*
	(0.068)	(0.071)	(0.068)	(0.069)	(0.073)	(0.066)
Household income (Ref: $50–70,000)						
Missing	0.104	0.062	0.078	0.075	–0.169**	0.115
	(0.079)	(0.084)	(0.080)	(0.081)	(0.086)	(0.078)
< $20,000	0.205*	0.058	0.321***	0.189	–0.071	0.265**
	(0.116)	(0.122)	(0.117)	(0.119)	(0.125)	(0.113)
$20–30,000	0.231**	0.099	0.088	0.261***	–0.065	0.241***
	(0.094)	(0.099)	(0.095)	(0.096)	(0.102)	(0.092)
$30–50,000	0.112*	0.031	0.118*	0.127*	–0.074	0.134**
	(0.064)	(0.068)	(0.065)	(0.066)	(0.070)	(0.063)
$70–100,000	–0.014	–0.031	–0.070	0.042	–0.050	–0.027
	(0.061)	(0.065)	(0.062)	(0.063)	(0.066)	(0.060)
$100–150,000	0.000	–0.089	–0.204***	–0.125*	0.001	–0.141**
	(0.064)	(0.067)	(0.065)	(0.066)	(0.069)	(0.063)
>$150,000	–0.061	–0.091	–0.158**	–0.099	–0.090	–0.143**
	(0.071)	(0.075)	(0.072)	(0.073)	(0.077)	(0.069)
M Education (Ref: Secondary school)						
Below secondary school	0.268***	0.037	0.097	0.220**	–0.082	0.219***
	(0.084)	(0.088)	(0.085)	(0.086)	(0.091)	(0.082)

Table 14 continued

Age 2, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Diploma/Trade	0.049	0.045	–0.047	0.035	0.044	0.034
	(0.051)	(0.054)	(0.052)	(0.052)	(0.055)	(0.050)
Bachelor	–0.121**	–0.042	–0.169***	–0.096*	0.003	–0.148***
	(0.057)	(0.060)	(0.057)	(0.058)	(0.062)	(0.056)
Higher degree	–0.199***	–0.109	–0.114*	–0.122*	–0.025	–0.196***
	(0.064)	(0.068)	(0.065)	(0.066)	(0.069)	(0.063)
M is single	0.155**	0.109	0.073	0.031	0.030	0.137**
	(0.069)	(0.073)	(0.070)	(0.071)	(0.075)	(0.068)
NZ Deprivation index	0.029***	0.016**	0.035***	0.027***	–0.003	0.037***
	(0.007)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
Number of coresidential siblings	0.080***	0.016	0.030	0.012	–0.032	0.050**
	(0.023)	(0.024)	(0.023)	(0.023)	(0.025)	(0.022)
Birth order	–0.009	–0.024	0.005	0.061***	0.030	0.008
	(0.017)	(0.018)	(0.018)	(0.018)	(0.019)	(0.017)
Constant	0.704	0.745	0.742	0.790	0.028	1.067**
	(0.532)	(0.560)	(0.538)	(0.544)	(0.575)	(0.519)
N	2604	2604	2604	2604	2604	2604

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 15 Maternal chronic illness/disability and child SDQ scores at age 5, for boys

Age 5, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.038	0.056	0.080	–0.059	–0.124**	0.055
	(0.055)	(0.056)	(0.054)	(0.054)	(0.060)	(0.052)
M age	–0.060	–0.030	–0.098***	–0.122***	0.012	–0.107***
	(0.037)	(0.037)	(0.036)	(0.036)	(0.040)	(0.034)
M age squared	0.001	0.000	0.001**	0.001***	–0.000	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
BMI (Ref: Normal)						
Missing	0.133*	0.143**	0.193***	0.188***	0.114	0.243***
	(0.069)	(0.069)	(0.067)	(0.067)	(0.074)	(0.065)
Underweight	–0.074	–0.121	–0.076	0.051	0.014	–0.100
	(0.111)	(0.113)	(0.109)	(0.109)	(0.121)	(0.105)
Overweight	0.043	0.037	0.014	–0.026	0.090	0.031
	(0.051)	(0.051)	(0.050)	(0.050)	(0.055)	(0.048)
Obese	0.075	0.149***	0.038	0.127**	0.091	0.149***
	(0.057)	(0.057)	(0.055)	(0.055)	(0.061)	(0.053)
Rural	0.016	0.041	–0.118*	–0.158**	0.067	–0.065
	(0.069)	(0.070)	(0.068)	(0.067)	(0.075)	(0.065)
Household income (Ref: $50–70,000)						
Missing	–0.053	0.077	0.118*	0.082	0.002	0.094
	(0.073)	(0.074)	(0.071)	(0.071)	(0.079)	(0.069)
< $20,000	–0.327	0.176	–0.184	–0.504**	–0.015	–0.224
	(0.208)	(0.210)	(0.203)	(0.202)	(0.225)	(0.195)
$20–30,000	–0.152	0.027	–0.098	0.075	0.147	–0.050
	(0.127)	(0.128)	(0.123)	(0.123)	(0.137)	(0.119)
$30–50,000	–0.043	0.100	0.001	0.119	0.006	0.072
	(0.078)	(0.079)	(0.077)	(0.076)	(0.085)	(0.074)
$70–100,000	–0.144**	0.070	–0.132**	0.035	0.013	–0.050
	(0.067)	(0.068)	(0.066)	(0.066)	(0.073)	(0.063)
$100–150,000	–0.230***	–0.072	–0.136**	–0.004	0.117	–0.161**
	(0.068)	(0.069)	(0.067)	(0.067)	(0.074)	(0.064)
>$150,000	–0.232***	–0.050	–0.242***	–0.035	0.144*	–0.201***
	(0.072)	(0.073)	(0.070)	(0.070)	(0.078)	(0.068)
M Education (Ref: Secondary school)						

Table 15 continued

Age 5, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Below secondary school	–0.028	0.249***	0.066	0.048	0.038	0.156*
	(0.090)	(0.091)	(0.088)	(0.088)	(0.098)	(0.085)
Diploma/Trade	–0.026	–0.019	–0.015	0.001	0.013	–0.023
	(0.053)	(0.054)	(0.052)	(0.052)	(0.058)	(0.050)
Bachelor	–0.151**	–0.216***	–0.054	–0.136**	–0.132**	–0.215***
	(0.059)	(0.060)	(0.058)	(0.058)	(0.064)	(0.056)
Higher degree	–0.115*	–0.243***	0.042	–0.151**	–0.107	–0.184***
	(0.066)	(0.067)	(0.065)	(0.065)	(0.072)	(0.062)
M is single	0.148**	0.115	0.176**	0.111	0.014	0.204***
	(0.073)	(0.073)	(0.071)	(0.071)	(0.079)	(0.068)
Missing	–0.485	–0.327	–0.716	0.255	–0.800	–0.615
	(0.557)	(0.563)	(0.665)	(0.544)	(0.737)	(0.524)
NZ Deprivation index	0.011	0.019**	0.026***	0.034***	–0.013	0.033***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
Number of coresidential siblings	0.052**	–0.016	0.046**	0.009	–0.033	0.028
	(0.021)	(0.021)	(0.021)	(0.021)	(0.023)	(0.020)
Birth order	–0.024	–0.006	0.018	0.003	0.009	–0.002
	(0.017)	(0.018)	(0.017)	(0.017)	(0.019)	(0.016)
Constant	1.310**	0.875	1.792***	2.141***	–0.230	2.155***
	(0.636)	(0.643)	(0.621)	(0.621)	(0.689)	(0.599)
N	2597	2597	2595	2597	2595	2597

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 16 Maternal chronic illness/disability and child SDQ scores at age 8, for boys

Age 8, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.161**	0.058	0.117*	0.203***	–0.119*	0.201***
	(0.069)	(0.070)	(0.066)	(0.066)	(0.069)	(0.067)
M age	–0.008	–0.045	–0.012	–0.080	0.002	–0.057
	(0.060)	(0.060)	(0.057)	(0.057)	(0.060)	(0.058)
M age squared	0.000	0.001	–0.000	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BMI (Ref: Normal)						
Missing	0.289***	0.193**	0.209**	0.380***	0.053	0.397***
	(0.097)	(0.098)	(0.092)	(0.092)	(0.097)	(0.094)
Underweight	0.030	–0.014	–0.106	–0.180	0.145	–0.121
	(0.143)	(0.144)	(0.136)	(0.136)	(0.143)	(0.138)
Overweight	0.079	0.085	0.087	0.003	0.047	0.092
	(0.062)	(0.063)	(0.059)	(0.059)	(0.063)	(0.061)
Obese	0.221***	0.120*	0.222***	0.375***	0.005	0.358***
	(0.072)	(0.073)	(0.069)	(0.069)	(0.072)	(0.070)
Rural	0.044	–0.145*	–0.062	–0.017	0.080	–0.075
	(0.083)	(0.083)	(0.079)	(0.079)	(0.083)	(0.080)
Household income (Ref: $50–70,000)						
Missing	0.307*	0.476***	0.128	0.075	–0.236	0.335**
	(0.159)	(0.160)	(0.151)	(0.151)	(0.159)	(0.154)
< $20,000	0.371**	0.260	0.122	0.143	–0.260	0.302*
	(0.179)	(0.181)	(0.171)	(0.171)	(0.180)	(0.174)
$20–30,000	0.154	0.088	0.004	0.054	–0.163	0.094
	(0.118)	(0.119)	(0.113)	(0.112)	(0.118)	(0.115)
$30–50,000	0.161**	0.058	0.117*	0.203***	–0.119*	0.201***
	(0.069)	(0.070)	(0.066)	(0.066)	(0.069)	(0.067)
$70–100,000	0.161*	0.084	–0.018	–0.051	–0.270***	0.041
	(0.096)	(0.097)	(0.092)	(0.092)	(0.097)	(0.093)
$100–150,000	0.109	0.054	–0.094	–0.155*	–0.113	–0.061
	(0.095)	(0.096)	(0.091)	(0.091)	(0.096)	(0.093)
>$150,000	0.015	0.057	–0.091	–0.197**	–0.205**	–0.101
	(0.095)	(0.096)	(0.090)	(0.090)	(0.095)	(0.092)
M Education (Ref: Secondary school)						
Below secondary school	0.220*	–0.064	0.079	0.213*	–0.106	0.160
	(0.131)	(0.132)	(0.125)	(0.125)	(0.132)	(0.127)

Table 16 continued

Age 8, boys	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Diploma/Trade	–0.043	–0.005	–0.006	–0.029	0.089	–0.027
	(0.070)	(0.071)	(0.067)	(0.067)	(0.070)	(0.068)
Bachelor	–0.018	–0.183**	–0.027	–0.108	–0.050	–0.126*
	(0.074)	(0.074)	(0.070)	(0.070)	(0.074)	(0.072)
Higher degree	–0.001	–0.108	0.028	0.039	–0.088	–0.009
	(0.082)	(0.082)	(0.078)	(0.078)	(0.082)	(0.079)
M is single	–0.063	–0.207**	0.057	0.047	–0.009	–0.042
	(0.088)	(0.089)	(0.084)	(0.084)	(0.088)	(0.086)
Missing	0.345	0.301	0.111	0.422**	–0.287	0.421**
	(0.213)	(0.215)	(0.203)	(0.203)	(0.214)	(0.207)
NZ Deprivation index	–0.014	0.007	–0.006	0.031***	–0.013	0.009
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Number of coresidential siblings	0.023	–0.023	–0.063**	–0.050*	0.003	–0.052*
	(0.028)	(0.028)	(0.027)	(0.027)	(0.028)	(0.027)
Birth order	–0.010	0.006	–0.003	0.021	–0.049**	0.007
	(0.023)	(0.023)	(0.022)	(0.022)	(0.023)	(0.022)
Constant	0.097	0.944	0.528	1.656	–0.027	1.288
	(1.170)	(1.180)	(1.116)	(1.115)	(1.174)	(1.136)
N	1911	1911	1911	1911	1911	1911

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 17 Maternal chronic illness/disability and child SDQ scores at age 2, for girls

Age 2, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	–0.021	–0.030	0.018	–0.007	–0.038	–0.017
	(0.058)	(0.060)	(0.056)	(0.057)	(0.059)	(0.055)
M age	–0.097***	–0.094***	0.009	–0.093***	0.023	–0.104***
	(0.034)	(0.035)	(0.033)	(0.033)	(0.035)	(0.032)
M age squared	0.001**	0.001**	–0.000	0.001**	–0.000	0.001**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
BMI (Ref: Normal)						
Missing	0.245***	0.182**	0.431***	0.115*	0.048	0.343***
	(0.069)	(0.072)	(0.067)	(0.068)	(0.070)	(0.066)
Underweight	0.031	0.109	0.303***	–0.055	0.004	0.135
	(0.114)	(0.118)	(0.111)	(0.113)	(0.117)	(0.109)
Overweight	0.136***	0.068	0.049	–0.033	–0.004	0.085*
	(0.050)	(0.052)	(0.048)	(0.049)	(0.051)	(0.047)
Obese	0.214***	0.134**	0.090	–0.072	0.015	0.143**
	(0.059)	(0.061)	(0.057)	(0.058)	(0.060)	(0.056)
Rural	–0.083	–0.091	–0.189***	–0.065	–0.035	–0.150**
	(0.067)	(0.070)	(0.065)	(0.066)	(0.069)	(0.064)
Household income (Ref: $50–70,000)						
Missing	0.090	0.119	0.138	0.143	0.044	0.173**
	(0.089)	(0.092)	(0.086)	(0.087)	(0.090)	(0.085)
< $20,000	–0.015	0.206	0.329**	0.459***	–0.295**	0.331***
	(0.132)	(0.137)	(0.129)	(0.130)	(0.135)	(0.126)
$20–30,000	–0.047	0.033	0.237**	0.206**	–0.006	0.137
	(0.096)	(0.099)	(0.094)	(0.095)	(0.098)	(0.092)
$30–50,000	0.138**	0.136*	0.116*	0.122*	–0.079	0.185***
	(0.067)	(0.070)	(0.066)	(0.066)	(0.069)	(0.064)
$70–100,000	0.026	0.028	–0.036	–0.074	0.022	–0.014
	(0.066)	(0.068)	(0.064)	(0.065)	(0.067)	(0.063)
$100–150,000	0.033	–0.003	0.044	–0.063	–0.002	0.005
	(0.068)	(0.071)	(0.067)	(0.067)	(0.070)	(0.065)
>$150,000	0.111	–0.017	–0.061	–0.134*	0.069	–0.027
	(0.076)	(0.078)	(0.074)	(0.075)	(0.077)	(0.072)
M Education (Ref: Secondary school)						
Below secondary school	0.391***	0.061	0.136	0.225**	–0.054	0.290***
	(0.089)	(0.092)	(0.087)	(0.088)	(0.091)	(0.085)

Table 17 continued

Age 2, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Diploma/Trade	–0.013	–0.011	–0.053	0.047	0.056	–0.011
	(0.053)	(0.055)	(0.052)	(0.052)	(0.054)	(0.051)
Bachelor	–0.158***	–0.102	–0.156***	–0.103*	–0.045	–0.185***
	(0.060)	(0.062)	(0.059)	(0.059)	(0.061)	(0.057)
Higher degree	–0.242***	–0.138*	–0.133**	–0.023	0.031	–0.199***
	(0.068)	(0.071)	(0.067)	(0.067)	(0.070)	(0.065)
M is single	0.181**	–0.038	0.030	–0.009	0.086	0.060
	(0.075)	(0.078)	(0.073)	(0.074)	(0.077)	(0.072)
NZ Deprivation index	0.017**	0.005	0.017**	0.033***	–0.013	0.025***
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
Number of coresidential siblings	0.053**	–0.051*	0.077***	0.019	–0.021	0.029
	(0.026)	(0.027)	(0.025)	(0.025)	(0.026)	(0.024)
Birth order	–0.000	0.013	–0.034*	–0.008	–0.009	–0.008
	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)	(0.018)
Constant	1.730***	1.604***	0.024	1.336**	–0.064	1.766***
	(0.547)	(0.568)	(0.534)	(0.540)	(0.559)	(0.523)
N	2436	2436	2436	2436	2436	2436

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 18 Maternal chronic illness/disability and child SDQ scores at age 5, for girls

Age 5, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.139**	–0.036	0.056	0.062	0.099*	0.064
	(0.060)	(0.057)	(0.058)	(0.056)	(0.056)	(0.056)
M age	0.037	–0.091**	–0.017	–0.076**	–0.046	–0.063*
	(0.038)	(0.036)	(0.037)	(0.035)	(0.036)	(0.035)
M age squared	–0.001	0.001**	–0.000	0.001*	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BMI (Ref: Normal)						
Missing	0.153**	0.161**	0.341***	0.146**	–0.020	0.305***
	(0.073)	(0.069)	(0.071)	(0.068)	(0.069)	(0.068)
Underweight	–0.046	–0.087	0.013	0.155	0.013	–0.009
	(0.117)	(0.110)	(0.113)	(0.108)	(0.109)	(0.108)
Overweight	–0.023	0.110**	–0.003	–0.020	0.068	0.042
	(0.052)	(0.049)	(0.050)	(0.048)	(0.049)	(0.048)
Obese	0.154**	0.236***	0.162***	–0.001	0.036	0.231***
	(0.062)	(0.059)	(0.060)	(0.057)	(0.058)	(0.057)
Rural	–0.086	–0.030	–0.203***	–0.029	–0.008	–0.131**
	(0.070)	(0.066)	(0.068)	(0.065)	(0.066)	(0.065)
Household income (Ref: $50–70,000)						
Missing	–0.056	–0.011	0.118	0.255***	0.014	0.096
	(0.082)	(0.077)	(0.079)	(0.076)	(0.076)	(0.076)
< $20,000	0.373**	0.082	0.418**	0.275	–0.417**	0.399**
	(0.190)	(0.179)	(0.184)	(0.175)	(0.178)	(0.175)
$20–30,000	0.356***	0.017	0.415***	0.197	–0.072	0.337***
	(0.137)	(0.130)	(0.133)	(0.127)	(0.128)	(0.127)
$30–50,000	0.274***	0.199**	0.175**	0.098	–0.152*	0.281***
	(0.084)	(0.079)	(0.081)	(0.077)	(0.078)	(0.077)
$70–100,000	0.065	–0.050	–0.073	–0.056	–0.004	–0.050
	(0.072)	(0.069)	(0.070)	(0.067)	(0.068)	(0.067)
$100–150,000	0.035	–0.004	–0.038	–0.061	0.069	–0.024
	(0.073)	(0.069)	(0.070)	(0.067)	(0.068)	(0.067)
>$150,000	0.120	–0.027	–0.046	–0.081	0.025	–0.018
	(0.078)	(0.074)	(0.076)	(0.072)	(0.073)	(0.072)
M Education (Ref: Secondary school)						
Below secondary school	0.253***	0.013	0.095	–0.059	0.025	0.105
	(0.095)	(0.090)	(0.092)	(0.088)	(0.089)	(0.088)

Table 18 continued

Age 5, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Diploma/Trade	0.019	–0.029	0.055	0.015	0.031	0.017
	(0.057)	(0.054)	(0.055)	(0.052)	(0.053)	(0.052)
Bachelor	–0.171***	–0.240***	–0.101*	–0.233***	–0.061	–0.279***
	(0.063)	(0.059)	(0.061)	(0.058)	(0.059)	(0.058)
Higher degree	–0.186***	–0.316***	0.015	–0.164**	0.021	–0.257***
	(0.070)	(0.067)	(0.068)	(0.065)	(0.066)	(0.065)
M is single	0.152*	0.080	0.053	0.066	0.015	0.126*
	(0.079)	(0.075)	(0.077)	(0.073)	(0.074)	(0.073)
Missing	0.525	0.371	–0.140	–1.098**	–1.288**	–0.015
	(0.575)	(0.544)	(0.557)	(0.531)	(0.538)	(0.532)
NZ Deprivation index	0.012	0.018**	0.024***	0.029***	–0.011	0.030***
	(0.008)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Number of coresidential siblings	–0.008	–0.045**	0.061***	–0.009	–0.026	–0.003
	(0.022)	(0.021)	(0.021)	(0.020)	(0.021)	(0.020)
Birth order	0.015	0.002	–0.021	0.009	–0.020	–0.000
	(0.018)	(0.017)	(0.017)	(0.016)	(0.017)	(0.016)
Constant	–0.797	1.689***	0.414	1.396**	1.159*	1.165*
	(0.657)	(0.621)	(0.637)	(0.607)	(0.615)	(0.608)
N	2435	2435	2435	2435	2435	2435

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 19 Maternal chronic illness/disability and child SDQ scores at age 8, for girls

Age 8, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
M illness/disability	0.258***	0.065	0.187***	0.043	0.136**	0.193***
	(0.064)	(0.063)	(0.067)	(0.061)	(0.063)	(0.062)
M age	–0.057	0.051	0.026	–0.080	–0.077	–0.018
	(0.053)	(0.052)	(0.056)	(0.050)	(0.052)	(0.051)
M age squared	0.001	–0.001	–0.001	0.001	0.001	–0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
BMI (Ref: Normal)						
Missing	0.054	0.048	0.121	0.162*	–0.117	0.155*
	(0.089)	(0.087)	(0.093)	(0.084)	(0.087)	(0.086)
Underweight	–0.178	–0.040	–0.099	–0.084	0.083	–0.141
	(0.128)	(0.125)	(0.134)	(0.121)	(0.125)	(0.123)
Overweight	0.062	0.029	–0.071	0.022	0.020	0.003
	(0.055)	(0.054)	(0.058)	(0.052)	(0.054)	(0.053)
Obese	0.058	0.029	0.033	0.270***	–0.098	0.153**
	(0.067)	(0.065)	(0.070)	(0.063)	(0.065)	(0.064)
Rural	0.040	–0.077	–0.039	–0.042	0.085	–0.052
	(0.070)	(0.069)	(0.074)	(0.066)	(0.068)	(0.068)
Household income (Ref: $50–70,000)						
Missing	–0.098	–0.092	–0.036	0.119	–0.065	–0.025
	(0.092)	(0.090)	(0.097)	(0.087)	(0.090)	(0.089)
< $20,000	0.426***	0.231	0.124	0.679***	–0.576***	0.530***
	(0.145)	(0.141)	(0.152)	(0.137)	(0.141)	(0.139)
$20–30,000	0.028	–0.187	–0.215	0.271*	0.025	–0.045
	(0.151)	(0.147)	(0.158)	(0.143)	(0.147)	(0.146)
$30–50,000	–0.089	–0.095	–0.071	0.088	–0.131	–0.052
	(0.104)	(0.101)	(0.109)	(0.098)	(0.101)	(0.100)
$70–100,000	–0.158*	–0.068	–0.185**	–0.130	0.014	–0.204**
	(0.088)	(0.086)	(0.092)	(0.083)	(0.086)	(0.085)
$100–150,000	–0.112	–0.173**	–0.186**	–0.151*	0.113	–0.238***
	(0.084)	(0.082)	(0.088)	(0.079)	(0.082)	(0.081)
>$150,000	–0.096	–0.149*	–0.245***	–0.192**	0.093	–0.270***
	(0.086)	(0.084)	(0.090)	(0.081)	(0.083)	(0.082)
M Education (Ref: Secondary school)						
Below secondary school	–0.215*	–0.153	–0.186	0.034	–0.046	–0.180
	(0.116)	(0.113)	(0.121)	(0.109)	(0.113)	(0.111)

Table 19 continued

Age 8, girls	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ
	(1)	(2)	(3)	(4)	(5)	(6)
Diploma/Trade	–0.095	–0.005	–0.153**	0.015	0.047	–0.091
	(0.063)	(0.061)	(0.066)	(0.059)	(0.061)	(0.060)
Bachelor	–0.085	0.019	–0.149**	–0.057	0.006	–0.108*
	(0.067)	(0.065)	(0.070)	(0.063)	(0.065)	(0.064)
Higher degree	–0.103	0.118	–0.139*	–0.141**	0.069	–0.109
	(0.076)	(0.074)	(0.079)	(0.072)	(0.074)	(0.073)
M is single	0.161**	0.036	0.125	0.140*	–0.073	0.171**
	(0.078)	(0.076)	(0.082)	(0.074)	(0.076)	(0.075)
Missing	0.127	–0.035	–0.026	–0.148	–0.163	–0.053
	(0.193)	(0.189)	(0.203)	(0.183)	(0.188)	(0.186)
NZ Deprivation index	–0.008	0.008	0.001	0.010	–0.015*	0.006
	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)
Number of coresidential siblings	–0.005	0.015	–0.096***	–0.008	0.012	–0.044*
	(0.025)	(0.025)	(0.027)	(0.024)	(0.025)	(0.024)
Birth order	0.002	–0.013	0.026	0.015	–0.030	0.014
	(0.020)	(0.019)	(0.021)	(0.019)	(0.019)	(0.019)
Constant	1.475	–0.872	0.166	1.770*	1.768*	0.891
	(1.035)	(1.010)	(1.085)	(0.978)	(1.008)	(0.997)
N	1844	1844	1844	1844	1844	1844

Notes: Standard errors in brackets. Statistical significance of ***M*** *illness/disability* and ***M*** *depression* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 20 Regression coefficients of maternal chronic illness/disability on child SDQ scores (Path c), maternal illness/disability on positive parenting (Path a), and positive parenting on child SDQ (Path b), for age 2, 5, and 8

	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)	Positive parenting (7)
Full sample							
Age 2							
M illness/disability	–0.015	0.037	0.051	–0.017	–0.043	0.021	–0.150***
	(0.038)	(0.040)	(0.039)	(0.039)	(0.040)	(0.037)	(0.041)
Child is a boy	–0.005	0.189***	–0.035	0.099***	–0.222***	0.097***	–0.027
	(0.026)	(0.027)	(0.026)	(0.026)	(0.027)	(0.025)	(0.028)
Positive parenting	–0.200***	–0.195***	–0.069***	–0.109***	0.210***	–0.215***	–
	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)	(0.013)	–
Constant	1.140***	0.996**	0.347	0.952**	0.188	1.265***	–0.541
	(0.371)	(0.389)	(0.376)	(0.379)	(0.390)	(0.356)	(0.401)
N	5034	5034	5034	5034	5034	5034	5034
Age 5							
M illness/disability	0.084**	0.007	0.066*	–0.005	–0.017	0.054	0.004
	(0.037)	(0.038)	(0.039)	(0.039)	(0.040)	(0.035)	(0.041)
Child is a boy	0.106***	0.223***	–0.084***	–0.013	–0.333***	0.108***	–0.067**
	(0.025)	(0.026)	(0.026)	(0.026)	(0.027)	(0.024)	(0.028)
Positive parenting	–0.404***	–0.303***	–0.216***	–0.044***	0.243***	–0.375***	
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.012)	
Constant	0.122	1.154***	1.099**	1.834***	0.666	1.571***	–0.131
	(0.421)	(0.426)	(0.436)	(0.434)	(0.450)	(0.391)	(0.463)
N	4934	4934	4934	4934	4934	4934	4934

Table 20 continued

	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)	Positive parenting (7)
Age 8							
M illness/disability	0.186***	0.067	0.134***	0.086*	0.063	0.169***	–0.137***
	(0.046)	(0.048)	(0.046)	(0.044)	(0.044)	(0.044)	(0.049)
Child is a boy	0.086***	0.140***	–0.111***	0.055*	–0.329***	0.042	–0.092***
	(0.031)	(0.033)	(0.032)	(0.030)	(0.030)	(0.030)	(0.034)
Positive parenting	–0.299***	–0.109***	–0.253***	–0.236***	0.399***	–0.331***	
	(0.016)	(0.017)	(0.016)	(0.015)	(0.015)	(0.015)	
Constant	1.036	0.389	0.973	2.355***	0.845	1.834**	–0.016
	(0.764)	(0.800)	(0.772)	(0.733)	(0.732)	(0.724)	(0.814)
N	3446	3446	3446	3446	3446	3446	3446

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values
*$p < 0.1$, **$p < 0.05$, ***$p < 0.01$

Table 21 Regression coefficients of maternal chronic illness/disability on child SDQ scores (Path c), maternal illness/disability on positive parenting (Path a), and positive parenting on child SDQ (Path b), for age 2, 5, and 8, by child gender

	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)	Positive parenting (7)
Panel A: Child is a boy							
Age 2							
M illness/disability	0.020	0.123**	0.085	–0.009	–0.081	0.082	–0.151***
	(0.052)	(0.055)	(0.053)	(0.054)	(0.056)	(0.050)	(0.057)
Positive parenting	–0.181***	–0.194***	–0.059***	–0.113***	0.212***	–0.205***	–
	(0.018)	(0.019)	(0.018)	(0.018)	(0.019)	(0.017)	–
Constant	0.698	0.774	0.745	0.800	0.016	1.081**	0.130
	(0.519)	(0.546)	(0.533)	(0.538)	(0.560)	(0.503)	(0.573)
N	2599	2599	2599	2599	2599	2599	2599
Age 5							
M illness/disability	0.032	0.049	0.077	–0.062	–0.118**	0.048	–0.016
	(0.050)	(0.053)	(0.053)	(0.054)	(0.058)	(0.047)	(0.056)
Positive parenting	–0.398***	–0.295***	–0.217***	–0.046**	0.238***	–0.370***	–
	(0.018)	(0.019)	(0.018)	(0.019)	(0.020)	(0.017)	–
Constant	1.081*	0.753	1.716***	2.356***	–0.096	2.053***	–0.687
	(0.588)	(0.617)	(0.611)	(0.624)	(0.676)	(0.553)	(0.655)
N	2546	2546	2546	2546	2546	2546	2546
Age 8							
M illness/disability	0.092	0.026	0.086	0.147**	0.012	0.134**	–0.227***
	(0.066)	(0.071)	(0.065)	(0.065)	(0.064)	(0.063)	(0.069)
Positive parenting	–0.326***	–0.144***	–0.242***	–0.218***	0.453***	–0.337***	–
	(0.023)	(0.025)	(0.023)	(0.022)	(0.022)	(0.022)	–

Table 21 continued

	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)	Positive parenting (7)
Constant	0.003	1.483	1.087	2.377**	0.296	2.011*	–0.777
	(1.127)	(1.203)	(1.105)	(1.099)	(1.088)	(1.076)	(1.173)
N	1752	1752	1752	1752	1752	1752	1752
Panel B: Child is a girl							
Age 2							
M illness/disability	–0.055	–0.061	0.005	–0.023	–0.006	–0.052	–0.151**
	(0.056)	(0.058)	(0.056)	(0.056)	(0.057)	(0.053)	(0.059)
Positive parenting	–0.224***	–0.199***	–0.081***	–0.105***	0.212***	–0.228***	–
	(0.019)	(0.020)	(0.019)	(0.019)	(0.020)	(0.018)	–
Constant	1.422***	1.322**	–0.096	1.188**	0.224	1.445***	–1.363**
	(0.531)	(0.554)	(0.530)	(0.534)	(0.544)	(0.505)	(0.560)
N	2435	2435	2435	2435	2435	2435	2435
Age 5							
M illness/disability	0.143***	–0.038	0.055	0.064	0.096*	0.064	0.010
	(0.055)	(0.054)	(0.057)	(0.055)	(0.054)	(0.051)	(0.060)
Positive parenting	–0.408***	–0.313***	–0.211***	–0.045**	0.247***	–0.380***	–
	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)	(0.017)	–
Constant	–0.695	1.755***	0.477	1.429**	1.048*	1.264**	0.345
	(0.602)	(0.587)	(0.621)	(0.603)	(0.591)	(0.554)	(0.653)
N	2388	2388	2388	2388	2388	2388	2388

Table 21 continued

	Conduct problems (1)	Hyperactivity-inattention (2)	Emotional symptoms (3)	Peer problems (4)	Prosociality (5)	Total SDQ (6)	Positive parenting (7)
Age 8							
M illness/disability	0.284***	0.089	0.183***	0.026	0.129**	0.200***	–0.039
	(0.063)	(0.064)	(0.067)	(0.060)	(0.060)	(0.060)	(0.069)
Positive parenting	–0.265***	–0.068***	–0.265***	–0.255***	0.337***	–0.321***	–
	(0.022)	(0.022)	(0.023)	(0.021)	(0.021)	(0.021)	–
Constant	1.960*	–0.657	0.838	2.456**	1.186	1.689*	0.909
	(1.025)	(1.041)	(1.079)	(0.966)	(0.971)	(0.965)	(1.125)
N	1694	1694	1694	1694	1694	1694	1694

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 22 Regression coefficients of maternal chronic illness/disability on child SDQ scores (Path c), maternal illness/disability on maternal depression (Path a), and maternal depression on child SDQ (Path b), for age 2, 5, and 8

	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	Prosociality	Total SDQ	M depression
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Full sample							
Age 2							
M illness/ disability	–0.035	0.060	0.018	–0.028	–0.050	0.008	1.295***
	(0.040)	(0.041)	(0.039)	(0.040)	(0.042)	(0.038)	(0.187)
M depression	0.031***	0.021***	0.035***	0.019***	–0.013***	0.038***	–
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	–
Child is a boy	–0.007	0.183***	–0.033	0.104***	–0.221***	0.096***	0.250**
	(0.026)	(0.027)	(0.026)	(0.027)	(0.028)	(0.025)	(0.124)
Constant	0.904**	0.821**	0.087	0.772**	0.389	0.962***	7.631***
	(0.381)	(0.399)	(0.377)	(0.387)	(0.405)	(0.365)	(1.803)
N	5003	5003	5003	5003	5003	5003	5003
Age 5							
M illness/ disability	0.003	–0.059	–0.010	–0.027	0.033	–0.040	1.277***
	(0.041)	(0.040)	(0.040)	(0.039)	(0.042)	(0.038)	(0.156)
M depression	0.055***	0.042***	0.053***	0.023***	–0.016***	0.066***	–
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	–
Child is a boy	0.130***	0.244***	–0.066**	–0.009	–0.343***	0.134***	0.070
	(0.027)	(0.027)	(0.026)	(0.026)	(0.028)	(0.025)	(0.104)
Constant	–0.398	0.821*	0.583	1.404***	0.873*	0.918**	9.573***
	(0.452)	(0.445)	(0.438)	(0.436)	(0.465)	(0.414)	(1.726)
N	4964	4964	4963	4964	4963	4964	4964
Age 8							
M illness/ disability	0.174***	0.068	0.101	0.069	0.008	0.144***	1.397***
	(0.051)	(0.051)	(0.050)	(0.048)	(0.052)	(0.048)	(0.189)
M depression	0.043***	0.024***	0.069***	0.041***	–0.016***	0.069***	–
	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)	–
Child is a boy	0.140***	0.145***	–0.056*	0.086***	–0.359***	0.096***	–0.124
	(0.034)	(0.034)	(0.033)	(0.032)	(0.034)	(0.032)	(0.126)
Constant	1.020	0.835	0.779	1.389*	0.691	1.493*	11.366***
	(0.839)	(0.841)	(0.828)	(0.797)	(0.856)	(0.790)	(3.152)
N	3200	3200	3200	3200	3200	3200	3200

Notes: Standard errors in brackets. Statistical significance of ***M** illness/disability* and ***M** depression* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

Table 23 Regression coefficients of maternal chronic illness/disability on child SDQ scores (Path c), maternal illness/disability on maternal depression (Path a), and maternal depression on child SDQ (Path b), for age 2, 5, and 8, by child gender

	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	prosociality	Total SDQ	M depression
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Child is a boy							
Age 2							
M illness/ disability	0.021	0.140**	0.055	–0.011	–0.074	0.080	1.631***
	(0.054)	(0.057)	(0.054)	(0.056)	(0.059)	(0.052)	(0.260)
M depression	0.027***	0.023***	0.033***	0.020***	–0.014***	0.037***	–
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	–
Constant	0.132	0.110	0.303	0.518	0.544	0.358	11.726***
	(0.534)	(0.561)	(0.535)	(0.552)	(0.582)	(0.516)	(2.580)
N	2593	2593	2593	2593	2593	2593	
Age 5							
M illness/ disability	–0.028	0.005	0.003	–0.072	–0.067	–0.025	1.304***
	(0.056)	(0.057)	(0.054)	(0.055)	(0.061)	(0.052)	(0.219)
M depression	0.051***	0.031***	0.055***	0.023***	–0.013**	0.060***	10.692***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(2.484)
Constant	0.924	0.762	1.324**	1.875***	–0.073	1.718***	–
	(0.631)	(0.645)	(0.613)	(0.625)	(0.693)	(0.586)	–
N	2562	2562	2561	2562	2561	2562	2562
Age 8							
M illness/ disability	0.122*	0.048	0.070	0.157**	–0.116	0.146**	1.348***
	(0.074)	(0.075)	(0.071)	(0.071)	(0.077)	(0.071)	(0.259)
M depression	0.041***	0.029***	0.064***	0.038***	–0.016**	0.066***	8.453*
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(4.335)
Constant	0.368	1.731	1.420	1.552	–0.735	2.002*	–
	(1.227)	(1.252)	(1.182)	(1.184)	(1.277)	(1.181)	–
N	1635	1635	1635	1635	1635	1635	
Panel B: Child is a girl							
Age 2							
M illness/ disability	–0.102	–0.037	–0.033	–0.043	–0.028	–0.079	0.889***
	(0.058)	(0.060)	(0.057)	(0.058)	(0.060)	(0.055)	(0.267)
M depression	0.035***	0.021***	0.037***	0.018***	–0.014***	0.040***	–
	(0.004)	(0.005)	(0.004)	(0.004)	(0.005)	(0.004)	–
Constant	1.565***	1.640***	–0.133	1.129**	0.038	1.601***	4.022
	(0.544)	(0.568)	(0.532)	(0.545)	(0.565)	(0.517)	(2.513)

Table 23 continued

	Conduct problems	Hyperactivity-inattention	Emotional symptoms	Peer problems	prosociality	Total SDQ	M depression
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
N	2410	2410	2410	2410	2410	2410	2410
Age 5							
M illness/ disability	0.041	–0.127**	–0.018	0.026	0.141**	–0.052	1.290***
	(0.060)	(0.057)	(0.058)	(0.056)	(0.057)	(0.054)	(0.221)
M depression	0.059***	0.055***	0.050***	0.024***	–0.019***	0.073***	–
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	–
Constant	–1.559**	1.117*	–0.143	1.035*	1.442**	0.321	8.600***
	(0.645)	(0.612)	(0.627)	(0.606)	(0.618)	(0.584)	(2.392)
N	2402	2402	2402	2402	2402	2402	2402
Age 8							
M illness/ disability	0.228***	0.084	0.128	–0.016	0.136	0.140**	1.419***
	(0.069)	(0.067)	(0.070)	(0.064)	(0.068)	(0.063)	(0.276)
M depression	0.045***	0.019***	0.074***	0.044***	–0.016**	0.071***	–
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	–
Constant	1.672	0.015	0.005	1.325	1.868*	0.990	14.166***
	(1.135)	(1.101)	(1.156)	(1.056)	(1.125)	(1.035)	(4.574)
N	1565	1565	1565	1565	1565	1565	1565

Standard errors in brackets. Statistical significance of ***M** illness/disability* and ***M** depression* predicting child socio-emotional outcomes is based on family-wise error rate *p*-values

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$

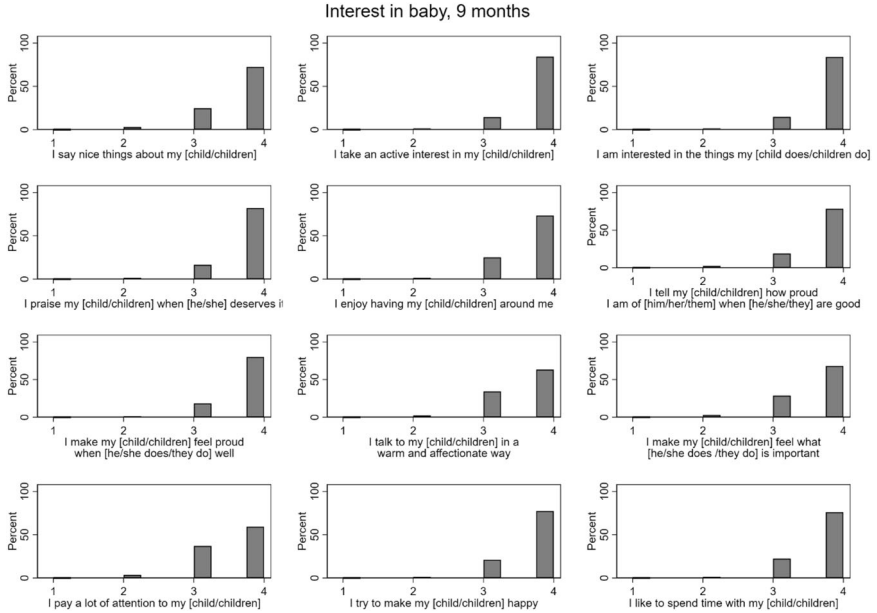

Fig. 1 Histograms for items in the interest in baby scale (9 months). Note: Higher values indicate more agreement with the item

Fig. 2 Histograms for the parenting confidence item (age 2 years). Note: Higher values indicate more agreement with the item

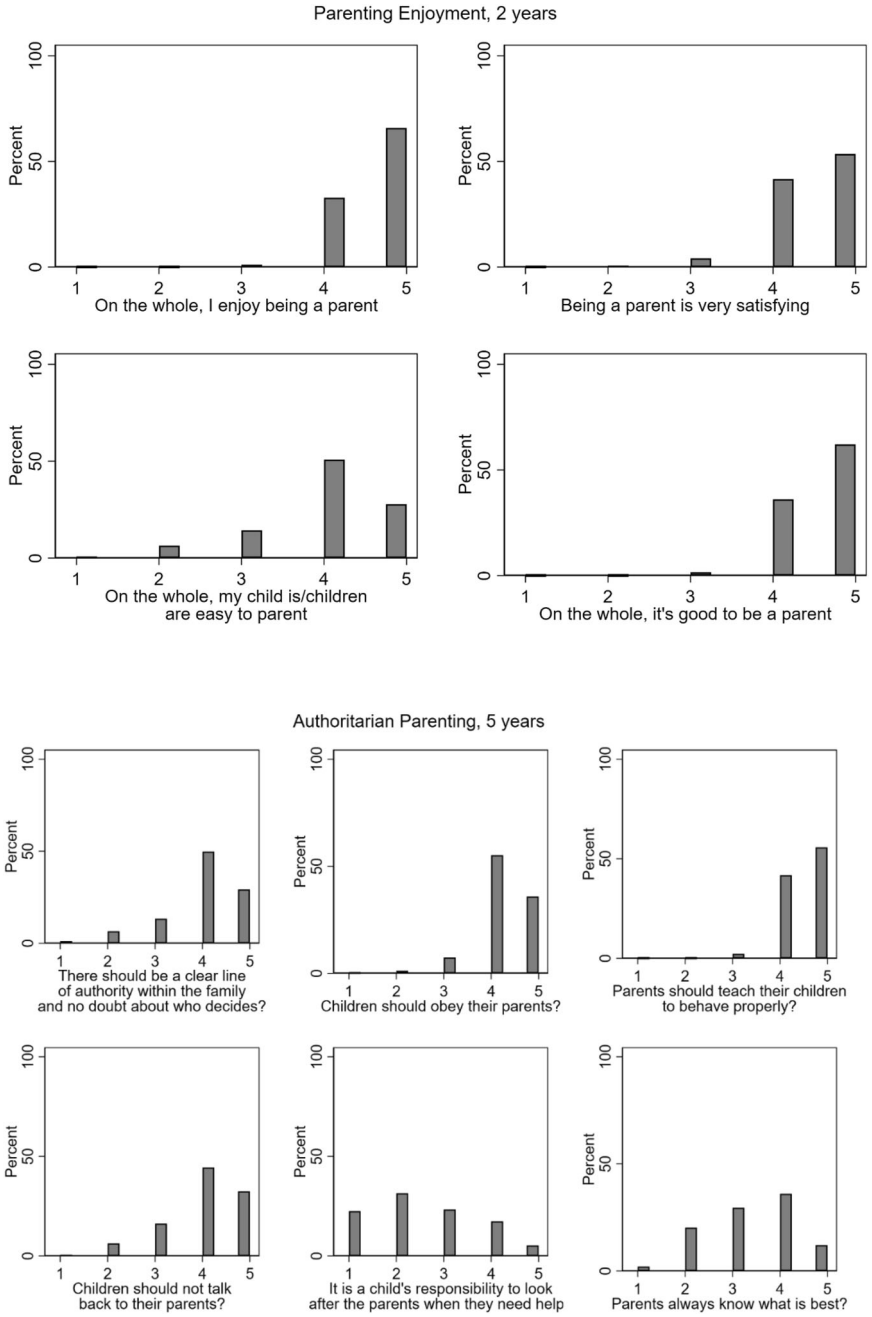

Fig. 3 Histograms for items in the parenting enjoyment scale (age 2 years). Note: Higher values indicate more agreement with the item. Histograms for items in the authoritarian parenting scale (age 5 years). Note: Higher values indicate more agreement with the item. Items were reverse-scored in the positive parenting index

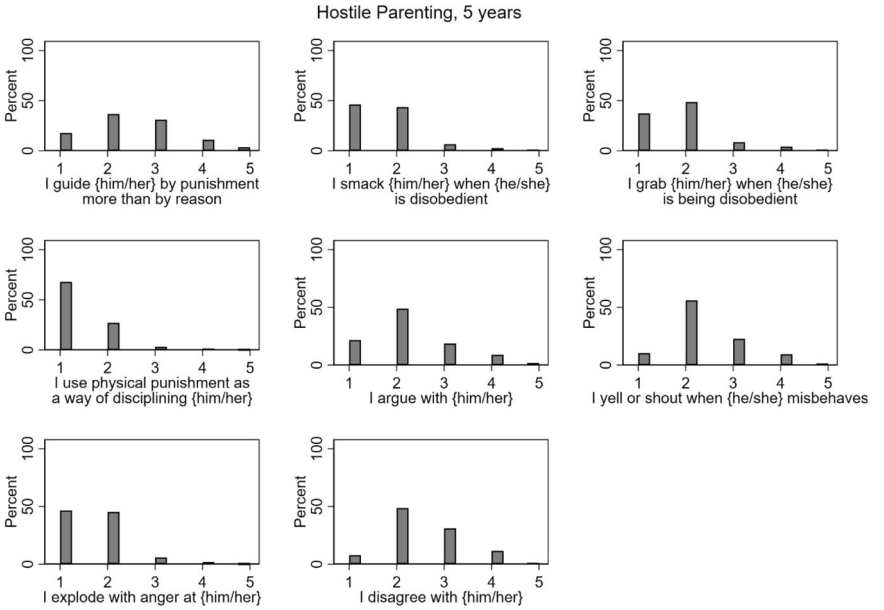

Fig. 4 Histograms for items in the hostile parenting scale (age 5 years). Note: Higher values indicate more agreement with the item. Items were reverse-scored in the positive parenting index

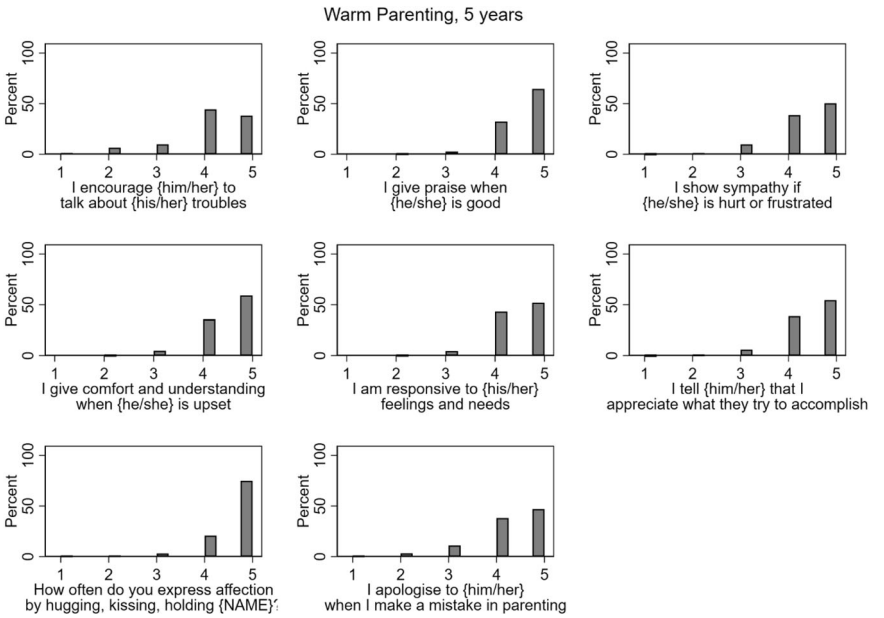

Fig. 5 Histograms for items in the warm parenting scale (age 5 years). Note: Higher values indicate more agreement with the item

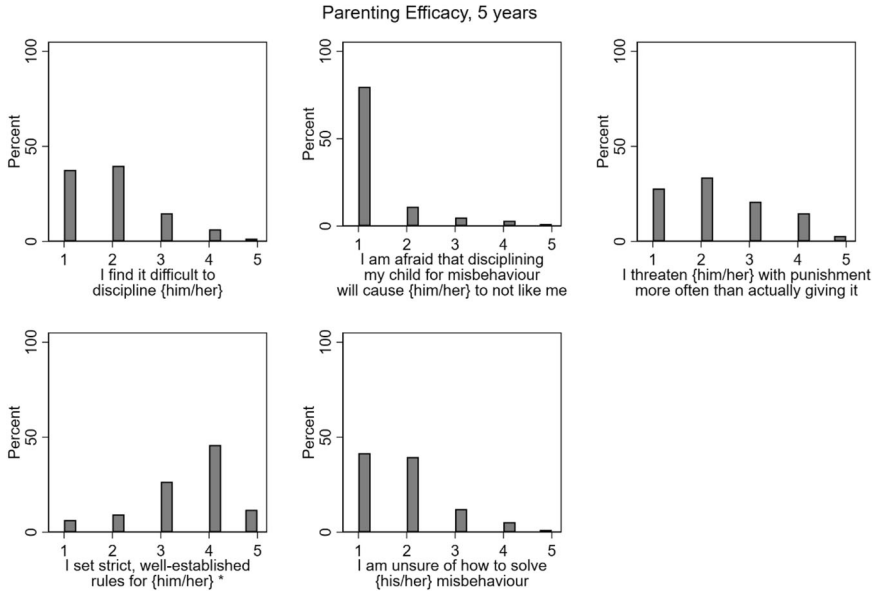

Fig. 6 Histograms for the items in the parenting efficacy scale (age 5 years). Note: Higher values indicate more agreement with the item

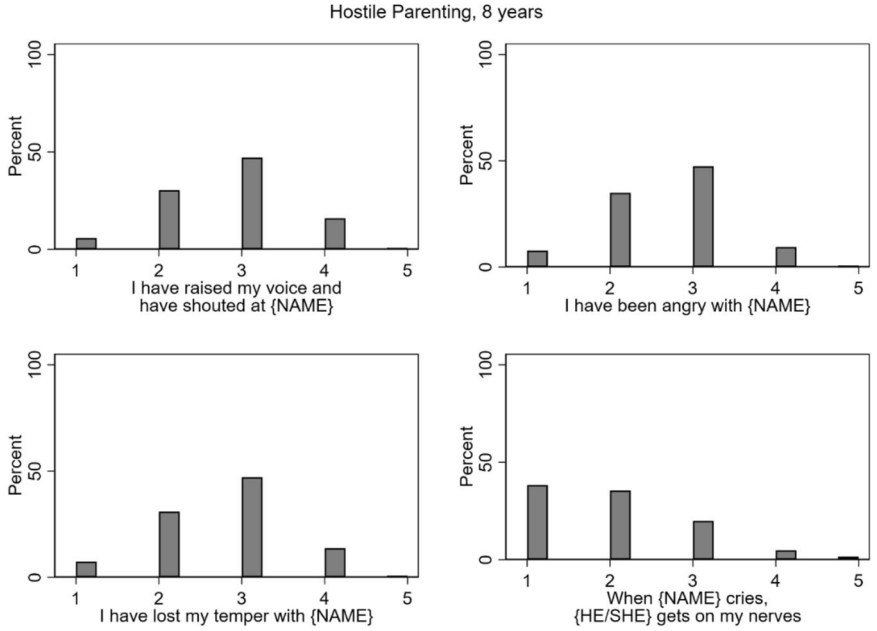

Fig. 7 Histograms for items in the hostile parenting scale (age 8 years). Note: Higher values indicate more agreement with the item. Items were reverse-scored in the positive parenting index

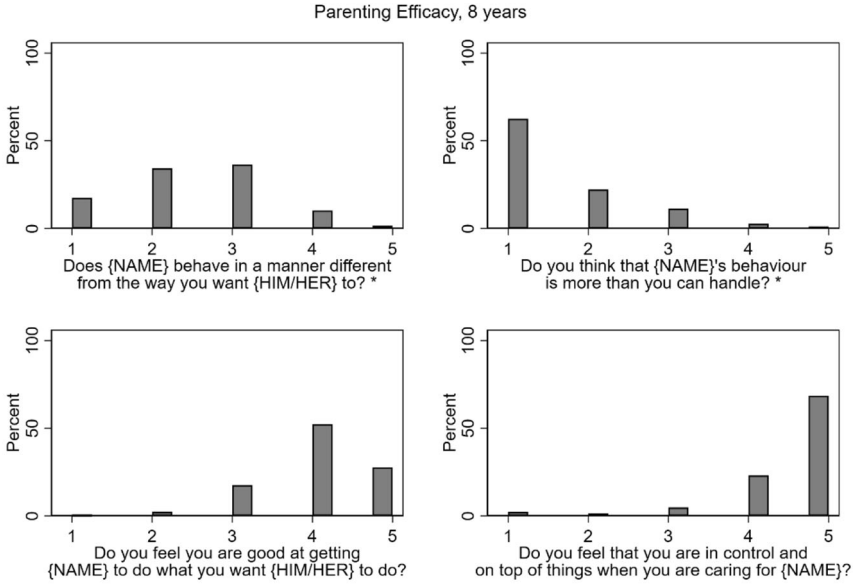

Fig. 8 Histograms for items in the parenting efficacy scale (age 8 years). Note: Higher values indicate more agreement with the item

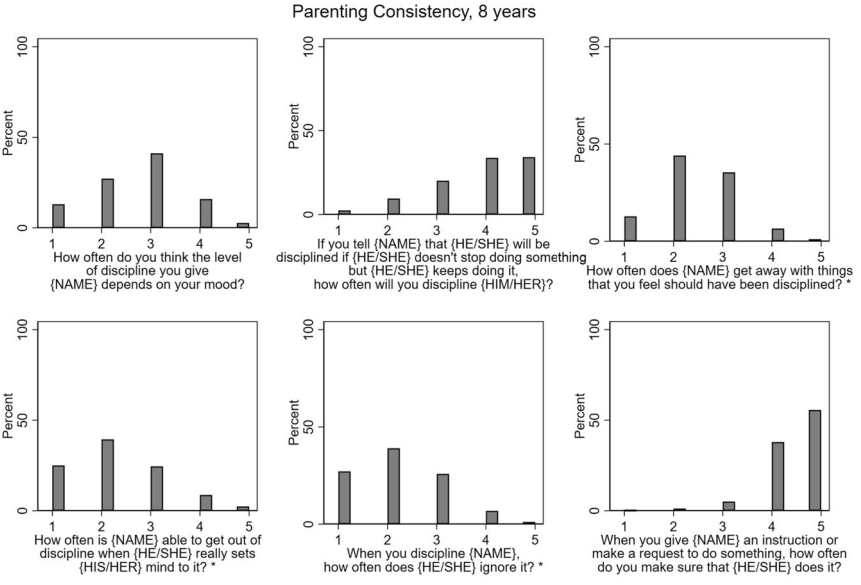

Fig. 9 Histograms for items in the parenting consistency scale (age 8 years). Note: Higher values indicate more agreement with the item

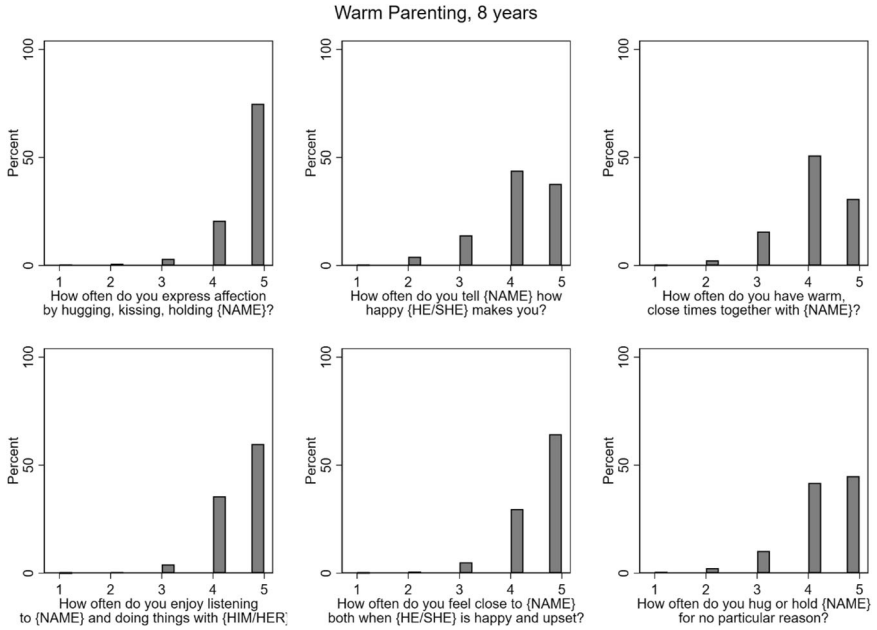

Fig. 10 Histograms for items in the warm parenting scale (age 8 years). Note: Higher values indicate more agreement with the item

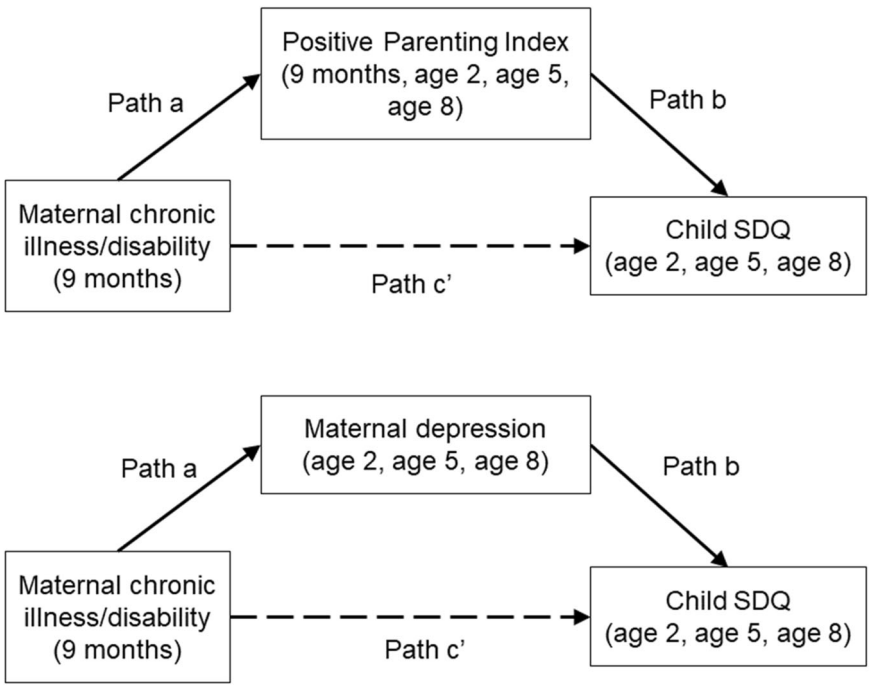

Fig. 11 Visual depiction of the mediation models. Note: Dashed line indicates a non-significant association

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