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Abstract

Results of previous research examining whether children's physical health conditions increase the risk of parental separation show considerable heterogeneity, potentially due to varying degrees of severity of health conditions, or to reverse causality or diagnostic delays for certain conditions. This study aims to extend the previous literature by categorizing eight common child health conditions into grades of severity, and estimating changes in parental separation risk before and after the first diagnosis. Using total population data from Finnish registers, we follow 363,830 couples whose first child was born between 1987 and 2000 until the child's 18th birthday. We identify parents whose child was diagnosed with a less severe (allergies, atopic dermatitis, chronic/repeated ear infections), severe (type 1 diabetes, epilepsy, inflammatory bowel disease, rheumatoid arthritis), or life-threatening (cancer) physical health condition, and use discrete-time event-history-models to examine changes in parental separation risk in each group compared to those in couples whose first child remained undiagnosed. Our results reveal that changes in separation risk differed by the severity of the child's health condition, with the risk temporarily declining following the diagnosis of a life-threatening condition, but increasing following the diagnosis of a severe condition. In contrast, separation risk was already elevated years before the first diagnosis of a less severe condition, and began to decline after the diagnosis. These findings suggest that while most parents avoided separation at the time of the diagnosis of a life-threatening illness, the stress and burden related to children's physical health conditions otherwise increased parental separation risk.

Introduction

When a child is diagnosed with a physical health condition, the likelihood of parental separation may increase (see Lyngstad and Jalovaara 2010), mainly due to elevated parental stress, financial distress, relationship conflicts, and psychological strain (Botha, Joronen, and Kaunonen 2019; Reichman, Corman, and Noonan 2004; Schermerhorn et al. 2012). While this association is supported by several studies (Corman and Kaestner 1992; Joesch and Smith 1997; Reichman et al. 2004), others find no evidence for an effect of child physical health conditions on parental separation risk (Fallesen and Breen 2016; Namkung et al. 2015; Syse, Loge, and Lyngstad 2010). These conflicting results may be attributed to previous studies focusing on specific health conditions in different societal contexts, or using different analytical approaches.

Specifically, previous studies on the effect of child physical health conditions on parental separation risk have focused either on single physical health conditions of children, such as cancer (Syse et al. 2010), or on several conditions pooled into a single combined indicator (Corman and Kaestner 1992; Reichman et al. 2004). The only study we are aware of that has investigated several conditions separately is by Joesch and Smith (1997), but they did not systematically classify the indicators according to severity. However, previous research has shown that parental stress responses to child health conditions differ by the conditions' severity (Pinquart 2018), which suggests that the severity could also affect the extent to which child health conditions influence parental relationship dynamics.

Two other potential issues that have not been addressed in previous research on the impact of child physical health on the likelihood of parental separation are reverse causality and diagnostic delay. In this context, reverse causality means that parental separation is not caused by the child health condition, but the health condition is caused by parental separation. Diagnostic delay refers to the period between symptom onset and the diagnosis of a health condition. Certain illnesses may affect the family climate before they are diagnosed, and, in some cases, receiving a diagnosis may even relieve parental stress. Both issues could be addressed by examining changes in parental separation risk in the years before the first diagnosis. However, while previous studies have examined the short- and long-term impact of child health conditions on parental separation risk (e.g., Loft 2011), we are not aware of any existing studies on the trajectories of separation risk both before and after the child's first diagnosis.

Another issue that only a few studies have dealt with is the potential moderating impact of parental education. Comparisons by parental education could reveal mechanisms through which child health conditions may affect parental separation risk. Parents with higher education have better health literacy (de Buhr and Tannen 2020), and might be more likely to turn to health professionals for advice (Rowe et al. 2016). This may reduce parental insecurity in dealing with certain health conditions, which could, in turn, lead to less partnership stress and less disagreement regarding parenting practices. Thus, there may be different or even opposing effects across educational groups, supporting the assumption of a compensatory advantage among highly educated families (Bernardi 2014).

In this study, we focus on three categories of health conditions, formed by classifying eight different physical health conditions based on their severity, to examine whether changes in parental separation risk before and after the child's first diagnosis differ by the severity of the health condition or by parental education. We base our analysis on Finnish total population register data, which allow us to follow 363,830 couples throughout the entire childhood of their firstborn child, and to identify the child's physical health conditions from data on specialized healthcare use and reimbursements of medication expenses.

Our study contributes to the existing literature on child health conditions and parental separation risk in four ways. First, by providing a comprehensive view of the trajectories of parental separation risk both before and after the first diagnosis of a child's health condition, our study sheds light on whether the diagnosis changed parental separation risk, or whether there were already substantial differences before the first diagnosis. Second, our study examines health conditions of varying severity, and thus improves our understanding of how the association between child health conditions and parental separation risk may vary by severity. Third, the study uses total population data and measurements based on administrative registers, which helps to overcome common problems in survey studies, such as selective samples, response bias, and attrition. Fourth, we test for moderation effects by parental education. This approach allows us to examine potential differences in the impact of child health conditions on families with different educational resources, and provides valuable insights into the social stratification of the association between child health and family dynamics.

Background

Parental separation risk following a child health condition diagnosis

Most theoretical approaches suggest that a child health condition diagnosis increases the risk of parental separation (see Becker 1973, 1974; Corman and Kaestner 1992; Reichman et al. 2004). One key theoretical mechanism is that the psychological impact of having a child with a health condition may lead to parental mental health problems, which might, in turn, increase their separation risk. The link between spouses' poor mental health and elevated separation risk is well-established (see Metsä-Simola, Martikainen, and Monden 2018; Mojtabai et al. 2017). If a child health condition is associated with worse parental mental health, this mechanism could explain the higher separation risk. There are different theoretical assumptions regarding the changes in parental mental health problems over time after a child health diagnosis. Corman and Kaestner (1992:389) discussed the concept of "chronic sorrow," which refers to the persistent psychological distress that parents may experience in dealing with their child's health condition, and that could increase over time.

Another theoretical assumption points to the first and often shocking experience of the child's diagnosis, positing that the largest increase in parental mental health problems occurs immediately after the child falls ill. Loft (2011) argued that this experience can trigger a profound emotional response in parents, placing an immediate and unusual strain on the parental relationship. This aligns with the assumptions of the set-point theory (Clark et al. 2008; Lucas 2007), which suggests that certain life events affect well-being immediately, rather than over the long term. In the literature on the impact of child health conditions on parental mental health, effects have been observed when children have life-threatening health conditions like cancer. In such cases, Metsä-Simola et al. (2022) found evidence of both an initial shock and persistent strain, particularly among mothers. Increased mental health problems among parents have also been observed when children are diagnosed with less immediately life-threatening but still severe conditions, such as diabetes (Helgeson et al. 2012), epilepsy (Carmassi et al. 2020; Reilly et al. 2018), and inflammatory bowel disease (Baudino et al. 2022).

A similar theoretical mechanism suggests that child health conditions might intensify parental stress, and subsequently increase parental separation risk. The main difference between this mechanism and the mechanism presented above is that there might be parents for whom increased stress does not lead to mental health problems, but still influences their separation risk, mainly due

to the impact of the child's diagnosis on the practicalities of parenting or time use. This theory, put forth by Corman and Kaestner (1992:390), argues that the stress induced by dealing with a child's health problems may strain marital relationships. Furthering this theoretical perspective, Schermerhorn et al. (2012) noted that the stress associated with a child's health condition may not only burden parents emotionally, but might also lead to disagreements over parenting strategies, thereby impairing marital functioning. Moreover, having a child with a chronic physical condition could alter the allocation of parental time and resources (Reichman, Corman, and Noonan 2008), which may, in turn, increase separation risk over time.

Previous studies have reported elevated stress among parents of children with severe conditions, such as diabetes (Van Gampelaere et al. 2020), epilepsy (Operto et al. 2021), inflammatory bowel disease (Diederen et al. 2018), rheumatoid arthritis (Cousino and Hazen 2013), and cancer (Rodriguez et al. 2012); but also among parents of children with less severe conditions, such as allergies (Jung et al. 2023), atopic dermatitis (Meltzer and Moore 2008), and chronic ear infections (Chen et al. 2019). A meta-analysis of various child health conditions and their associations with global parenting stress showed clear differences in the strength of the correlations (Pinquart 2018). While the more severe conditions, such as cancer and epilepsy, were strongly correlated with parental stress, the correlations were weaker for allergies, arthritis, and diabetes. Whether the effects on parental stress and mental health problems were mainly short or long term seemed to depend on the duration of the child's illness (Pinquart 2018).

Children with poor health often require more resources from their parents than children without health conditions. For instance, the parents of a child with cancer may find that their labor market participation decisions are influenced by their caregiving responsibilities. Limburg et al. (2008) and Lindahl Norberg et al. (2017) have shown that parents with such caregiving responsibilities often reduce their working hours. Previous research has found that mothers are more likely than fathers to reduce their hours, although the gender differences are smaller in countries with more generous family policies (Boeckmann, Misra, and Budig 2015). However, since our study focuses on the couple level of parental separation, the gender aspect is beyond the scope of this work.

In some countries, the financial impact of poor health can be particularly pronounced, as the out-of-pocket costs of medical care and other services for a child with a health condition can be substantial. While this pressure might increase parental stress, it could also force parents to stay together to save financial resources for the child. However, in welfare states such as Finland, where

more support for families is available (Lahelma and Lundberg 2009; Richter et al. 2012), families are more likely to be affected by employment changes than by out-of-pocket medical expenses (see Finnish Ministry of Social Affairs and Health 2024).[i] The extent to which child health conditions affect parental financial resources through employment changes is likely to depend on the level of parental care demanded by the specific illness and its duration.

Based on the potential mechanisms discussed above, we hypothesize that *child health conditions increase the risk of parental separation, and that the effect grows stronger the more severe the child's health condition is (Hypothesis 1).* In addition, we test whether *there is a short-term increase in parental separation risk immediately after the first diagnosis of a child physical health condition (Hypothesis 1a),* or whether *there is a long-term increase in parental separation risk following such a diagnosis (Hypothesis 1b)*.

Having explored various mechanisms that could explain the potential increase in the risk of parental separation following the diagnosis of a child health condition, the competing hypothesis that *child health conditions decrease the risk of parental separation (Hypothesis 2)* should be considered. For example, Tøssebro and Wendelborg (2017) found a slightly lower separation rate among families with children with physical disabilities below age 8 to 10. After that age, the annual occurrence of new relationship terminations was the same as that for all families.

There are several theoretical explanations for the lower separation rate. For example, parents may decide to stay together because they anticipate having an even larger financial burden if they dissolve their union (Amato 2010). Some scholars have argued that caring for a sick child may actually bring couples closer together. Reichman et al. (2008) suggested that the joint effort required to care for a child with a physical disability may strengthen family bonds. In a similar vein, Joesch and Smith (1997) argued that having a child with a health condition could strengthen a couple's commitment to caring for the child, thereby reducing the likelihood of separation. Furthermore, it has been observed that the experience of living with a child with a physical disability may have a positive impact on various aspects of family life. As Reichman et al. (2008) pointed out, such experiences can broaden family horizons, enhance family cohesion, and foster connections with community groups.

The shared experience of overcoming the challenges associated with a child's severe heath condition or extremely low birth weight, as discussed by Swaminathan et al. (2006), can also create a collective sense of accomplishment among parents and strengthen the partnership bond once the

initial difficult period has passed. This dynamic may be particularly strong in cases in which the child has a chance of fully recovering from a severe illness, such as cancer, but it might be weaker in cases in which the child has a chronic disease, such as diabetes or epilepsy. However, even when a child appears to have fully recovered from cancer, follow-up examinations will be required in subsequent years. Moreover, managing a child's treatments for a disease like epilepsy or diabetes could also bring the parents a sense of accomplishment as soon as the medication and lifestyle changes have been adopted and the family has adjusted to living with the disease.

In light of these theoretical explanations, we also test whether *the potential reduction in the risk of separation after a child's diagnosis with a physical health condition is short term (Hypothesis 2a),* or whether *it is persistent (Hypothesis 2b)*.

It should be noted, however, that it is not realistic to assume that only the risk-increasing or risk-reducing mechanisms play a role, as the experience of having a child with health problems has both relationship-strengthening and relationship-weakening effects for parents. This phenomenon of effects with opposite directions cancelling each other out could explain why some studies found no effect of parent-rated child physical health (Loft 2011) or cancer (Grant et al. 2012; Syse et al. 2010) on parental separation risk.

Parental separation risk preceding a child health condition diagnosis

In addition to studying changes in parental separation risk that occur after a child has been diagnosed with a health condition, we also examine parental separation risk in the years prior to the first diagnosis. In doing so, we assume that there are three potential reasons for an increased or a decreased risk of separation even before the diagnosis. First, reverse causality may occur, with parental separation leading to child physical health conditions. For example, changes in child health following parental separation have been observed by Kravdal and Wörn (2023). Second, the health condition could be endogenous and caused by factors that increase the risk of both separation and developing childhood health conditions (i.e., confounding variables), such as a lack of financial resources (Doyle, Harmon, and Walker 2005). Third, when there is a long diagnostic delay (see Chehade et al. 2021), we may observe the separation before the first diagnosis, even when the separation follows the onset of symptoms.

Regarding reverse causality, there is some evidence that poor physical health in children may result from family conflict, which could explain the increased parental separation risk even before the first diagnosis. Studies have shown that poor parental relationship quality has a detrimental effect

on children's overall physical health, as rated by mothers (James et al. 2022) and children themselves (Hair et al. 2009). While Repetti et al. (2002) also showed in a systematic literature review that family conflict often leads to poor physical health in children, they only used studies in which children's health was reported by the parents. Therefore, overall, previous research has shown an effect of parental relationship quality on children's physical health only when child health was measured by (parent) self-rated overall physical health. These self-reports may be severely biased, especially in situations of discord within the family. Furthermore, parental separation seems to be harmful primarily for diseases that we classify as less severe in this study, such as allergies and atopic dermatitis (Bockelbrink et al. 2006).

Two potential confounding variables of the relationship between child physical health and parental separation are parental financial resources and parental education. While financial resource strain could lead to both relationship stress and the development of child health conditions, so far links between financial resource strain and child health conditions have mainly been shown for childhood respiratory diseases (Doyle et al. 2005; Kuehnle 2014). However, children from families with lower education tend to have worse health (Poulain et al. 2019), and parents with higher education are less likely to separate (Hogendoorn, Kalmijn, and Leopold 2022).

Diagnostic delays could also explain the increased risk of parental separation even before the first diagnosis. Generally, the time from symptom onset to first diagnosis is longer the less severe the health condition is. For example, the diagnostic delay for certain allergic conditions was up to 32 months in the United States (Chehade et al. 2021), while the median diagnostic delay for cancer was less than two months in India (Verma and Bhattacharya 2020). Overall, however, there is considerable variation in diagnostic delays for cancer, with previous research generally pointing to shorter delays in high-income countries (Mullen, Barr, and Franco 2021). For epilepsy, six out of 10 children aged three years or younger had a diagnostic delay of less than one month (Berg, Loddenkemper, and Baca 2014). The median diagnostic delay was between two and four months for inflammatory bowel diseases among children in Austria and Germany (Leiz et al. 2022), was between one and six months for childhood rheumatoid arthritis in France (Aoust et al. 2017), and was less than one month following the most common symptoms of type 1 diabetes in the United Kingdom (Usher-Smith et al. 2015).

In sum, we hypothesize that *especially for less severe child health conditions, such as allergies, the risk of parental separation increases before diagnosis (Hypothesis 3)*.

The moderating impact of parental education

In addition to showing the confounding impact of education on the association between child health and parental separation risk, previous research suggests that education may also have a moderating effect. As noted above, difficulties in balancing caregiving needs with other responsibilities may adversely affect the employment and income of the parents of a child with a health condition, which could lead to financial strain that exacerbates their stress. Previous literature has found that parents' opportunities to combine family and work are likely to be shaped by their educational level (Pessin, Damaske, and Frech 2023), as education is related to both job demands and flexibility, which are known to affect work-family balance among parents of sick children (Brown and Clark 2017; Hjelmstedt et al. 2021; Kish, Haslam, and Newcombe 2020). Furthermore, the children of highly educated parents may have faster access to healthcare, as they are more likely to have private health insurance (Sointu, Lehtonen, and Häikiö 2021). There might also be differences in help-seeking behavior by parental education when a child is diagnosed. Compared to their less educated counterparts, highly educated parents have better health literacy (de Buhr and Tannen 2020), which is linked to care-seeking behavior, and may alleviate stress associated with uncertainty about the health condition. For example, a study by Mader et al. (2020) on the impact of childhood cancer on parental separation found that less educated parents in particular faced an increased risk of separation. However, another study found that among families with children with cancer, the divorce risk was elevated only for those families in which the mother had education beyond the high school level (Syse et al. 2010). Nevertheless, in line with the theoretical considerations on the moderating impact of parental education, we hypothesize *that more educated parents are less likely than their less educated counterparts to separate after their child is diagnosed with a health condition* (Hypothesis 4).

Analytical approach

Data

In our study, we use Finnish total population register data on 363,830 married and cohabiting couples who had their first common biological child in 1987-2001, and follow them until the first child's 18th birthday. We censor family observations after the death of the mother (N=3651), the father (N=3841), or the firstborn child (N=189); or after emigration (N=11). We have chosen to focus on the first child to enable comparability across families, and to avoid health-related

selection of families for whom the illness of their first child may have affected their likelihood of having more children. Our study design addresses this concern by eliminating systematic differences in this regard.

Information on first children's health conditions was derived from the administrative registers maintained by the Finnish Institute of Health and Welfare and the Social Insurance Institution, and data on various demographic and socioeconomic factors of parents and children were obtained from Statistics Finland. These data were linked by Statistics Finland using personal identification codes assigned to all permanent residents (Ethics Committee of Statistics Finland permission TK/23/07.03.00/2024, U0256_C_22; Findata permission THL/6303/14.06.00/2023).

Variables

Parental separation

Given the increasing prevalence of cohabitation (Hiekel, Liefbroer, and Poortman 2014) and the fact that from 40% to over 50% of firstborn children were born outside of marriage among our study cohorts (Official Statistics of Finland 2021), we include both married and cohabiting couples. Only couples who lived together for at least 90 days are defined as cohabiting in the data.

Children's health conditions and their categorization

We investigate whether the association between child physical health and parental separation varies according to the severity of the health condition. Therefore, we compare three groups of severity – less severe, severe, life-threatening – that include eight child health conditions known to affect family dynamics, especially parental stress (Chen et al. 2019; Cousino and Hazen 2013; Diederen et al. 2018; Jung et al. 2023; Meltzer and Moore 2008; Operto et al. 2021; Pinquart 2018; Rodriguez et al. 2012; Van Gampelaere et al. 2020). Indicators of these health conditions include data on visits to inpatient or specialized outpatient care, i.e., all hospital-level care in Finland, maintained by the Finnish Institute for Health and Welfare; and data on special reimbursement rights for long-term medications provided by the Finnish Social Insurance Institution. Conditions are identified based on ICD-10 (International Classification of Diseases, 10th revision) codes in the inpatient/outpatient data and on the Social Insurance Institution's classification of special reimbursement rights. While these operationalizations ensure the comparability of health conditions, the observations of all conditions, even those we categorize as less severe, are likely

restricted to those on the severe end of the respective diagnoses (for example, see Luukkonen et al. 2024 for children with atopic diseases measured by medication use).

The health conditions considered in our analyses, their prevalence in the data, and the allocation to condition groups are shown in Figure 1. In the lowest severity category we place allergies (ICD-10: L23, T78), atopic dermatitis (L20), and ear infections and inflammation that occur repeatedly or persist over a long period (H65). While considered less severe, these conditions are common in children and can be persistent, and might therefore present ongoing challenges for family life. The second category includes epilepsy (G40-G41), type I diabetes (E10), inflammatory bowel disease (Q20-Q28), and rheumatoid arthritis (M05-M06, M08). These conditions, while not immediately life-threatening, substantially affect child well-being by causing long-term health issues, and might therefore generate parental stress. In the highest severity category we place cancer (C00-C97) because of its potentially life-threatening nature and its profound emotional and psychological impact on families. We have not included other specific severe or life-threatening conditions due to their very low prevalence in childhood. The classification is designed to recognize that different levels of severity can have different impacts on family dynamics and parental stress levels. The assignment to a group is always based on the most severe health condition present. For instance, if a child was diagnosed with an allergy (in the less severe conditions category) and cancer (in the life-threatening conditions category) within their first 18 years, they are exclusively included in the life-threatening conditions category, and not in the less severe conditions category.

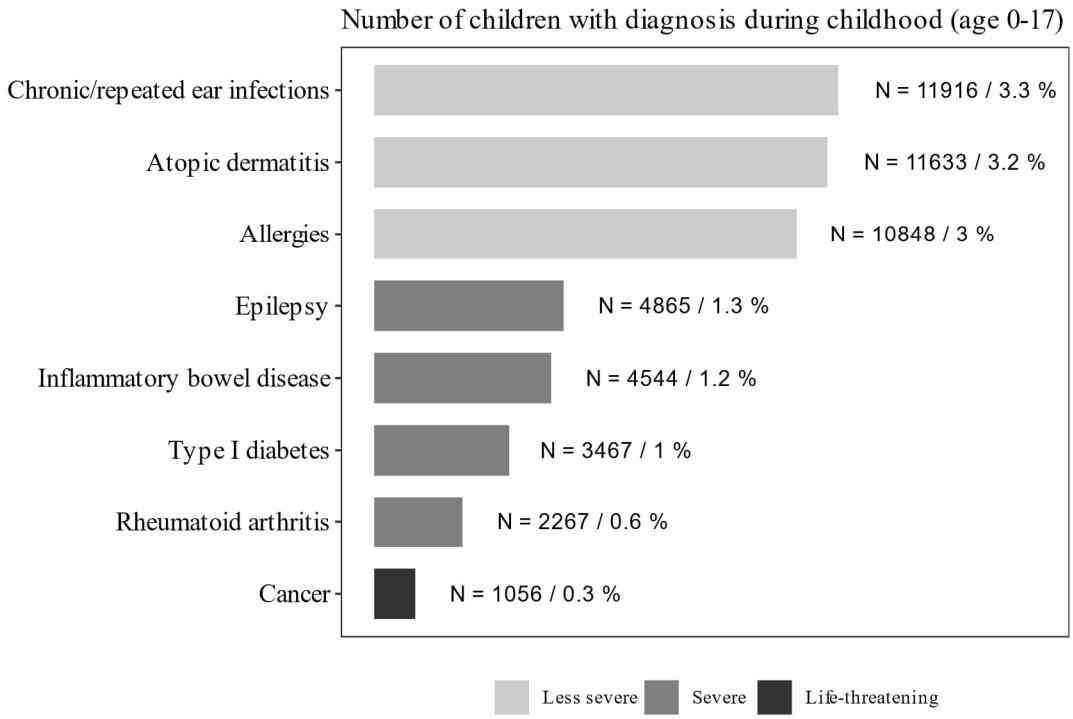

Figure 1: Prevalence (N and %) of child health conditions categorized as less severe, severe, or life-threatening conditions

Control variables

We control for congenital health conditions in the children (not including childhood disabilities), since certain congenital conditions could bias the association we examine by affecting both the (diagnosis of the) health condition and parental separation. A dummy variable indicates whether at least one congenital condition was diagnosed in the firstborn child. We present a detailed list of the included congenital conditions with the corresponding ICD-10 codes in the appendix (Table A1, pp. 1-2). We also control for any health condition presented in Figure 1 that was diagnosed in the mother or the father throughout the firstborn child's childhood. This variable is included as a time-varying dummy variable. Furthermore, we include single-year age dummies of the firstborn child and maternal age at childbirth as additional control variables.

Parental education as a moderator

Parental education is coded as time-varying, following the dominance principle (i.e., the highest observed maternal or paternal education). Parental education is categorized as compulsory, secondary (including vocational and general tracks), or tertiary education (bachelor's degree and

higher), shown in Table 1. However, we later combine primary and secondary education in the same category for ease of interpretation and to ensure a sufficient sample size.

Method

We employ discrete time survival models with logit link to examine the association between the diagnosis of a child health condition and the risk of parental separation. In our analytical sample, couples were at risk of separation until the year during which separation occurred, or, if separation did not occur, until their first joint child reached age 17.

The probability of separation is estimated at six time periods: -5/-3 years before the child's first diagnosis, -2/-1 years before diagnosis, the year of diagnosis, +1/+2 years after diagnosis, +3/+5 years after diagnosis, and +6/+10 years after diagnosis. The reference category for all coefficients consists of parents whose first child was not diagnosed with any of the included health conditions during childhood. All models are adjusted for the health of both parents, congenital conditions of the child, maternal age at childbirth, and age of the child. Standard errors are clustered at the individual level. In the figures presented in the results section, we show odds ratios of parental separation risk, which are presented in more detail in the online appendix (Tables A3 and A4, pp. 4-6).

Results

Table 1 provides an overview of the analytical sample. The total number of children in each group varies considerably, with the no-condition group being the largest, at 320,453 families; and the life-threatening condition group being the smallest, at 1,064 families. The proportion of children whose parents separated during their childhood ranges from 28% for children with life-threatening conditions to 32% for children with less severe conditions, indicating that children who were diagnosed with cancer (a life-threatening condition) experienced parental separation less often. Of the firstborn children who were not diagnosed with any of the health conditions during childhood, 30% experienced parental separation before age 18. Focusing on the families in which the firstborn child was diagnosed, 12% of parents separated before the first diagnosis of a less severe condition, 16% separated before the diagnosis of a severe condition, and 18% separated before the diagnosis of a life-threatening condition. The average age at which children experienced parental separation also varies slightly across groups, with the youngest average age among those diagnosed with less severe conditions being approximately seven years. For children with a health condition, the table

further details the mean age at first diagnosis, including the youngest mean age for less severe conditions (six years) and the oldest mean age for life-threatening conditions (10 years). Detailed descriptive information of the eight single health conditions are presented in the appendix (Table A2, p. 3).

Among the families in which the firstborn child was not diagnosed with one of the conditions we focus on, 8% of the children were diagnosed with a congenital condition. This share is substantially higher in the other groups, ranging from 13% (children with a less severe condition) to 19% (children with a life-threatening condition). The highest share of parents diagnosed with any of the health conditions is observed among families in which the child was diagnosed with a severe condition, for both mothers (14%) and fathers (17%). Nearly all parents in all groups had at least secondary education, whereas children diagnosed with less severe conditions were slightly more likely than all other groups to have tertiary educated parents.

Table 1: Descriptive statistics of the analytical sample stratified by child health condition group, firstborn children in Finnish birth cohorts 1987-2001

	No condition		Less severe conditions		Severe conditions		Life-threatening conditions	
Parental separation during childhood, %	30.2		32.0		30.7		28.4	
Parental separation before first diagnosis, %			12.1		15.8		18.1	
Child age at parental separation, mean (SD)	7.2	(5.0)	6.8	(5.0)	7.1	(5.0)	7.0	(4.9)
Child age at first diagnosis, mean (SD)			5.6	(5.2)	8.5	(5.5)	10.3	(5.7)
Diagnoses of congenital condition during childhood (%)	7.6		12.8		16.2		19.1	
Any health condition diagnosed in mother during childhood of firstborn child, %	11.6		15.4		16.9		12.0	
Any health	10.4		12.4		14.2		11.3	

condition diagnosed in father during childhood of firstborn child, %								
Parental education, %								
Primary education (0/1)	4.2		3.0		3.8		3.9	
Secondary education (0/1)	60.1		54.9		57.9		59.3	
Tertiary education (0/1)	35.6		42.1		38.3		36.8	
Mother's age at childbirth	28.6	(5.3)	28.1	(5.2)	28.4	(5.3)	28.8	(5.2)
N (children)	320,475		27,720		14,579		1,056	
N (person-years)	5,922,139		515,254		272,248		19,772	

Notes: The person-years include the years both before and after the diagnosis of the respective health condition. Families are followed both before and after a potential parental separation, which explains why the age of the firstborn child at the time of diagnosis can be either below or above the child's age at the time of the parental separation.

Figure 2 presents the trajectories of coefficients of parental separation risk before and after the child's first diagnosis by severity of the health condition. Detailed tables of the coefficients are presented in the appendix (Table A3, pp. 4-5) The parents of children with less severe health conditions had a significantly higher risk of separation five years before the first diagnosis than the parents of children who were not diagnosed with any of the conditions we investigate throughout childhood (OR 1.15, 95% CI 1.09-1.22). While the risk was still significantly increased in the year of diagnosis (1.11, 1.03-1.20) and in the two following years (1.05, 0.99-1.11), it decreased steadily thereafter. For the more severe but not life-threatening health conditions, no increased risk of separation can be identified five years before the diagnosis. However, the trajectory of the coefficients increased, such that the risk of separation was significantly higher in the year of diagnosis (1.15, 1.02-1.30). From six years after the first diagnosis onward, the risk of separation, relative to that of the parents of children without a health condition, had returned to the level observed five years before the diagnosis. For cancer as a life-threatening condition, the results are less certain due to the smaller case numbers, as was shown descriptively in Table 1. Nevertheless, it is clear that parental separation risk decreased significantly in the year of diagnosis (0.27, 0.10-0.71), but had already returned to pre-diagnosis levels in the following two years.

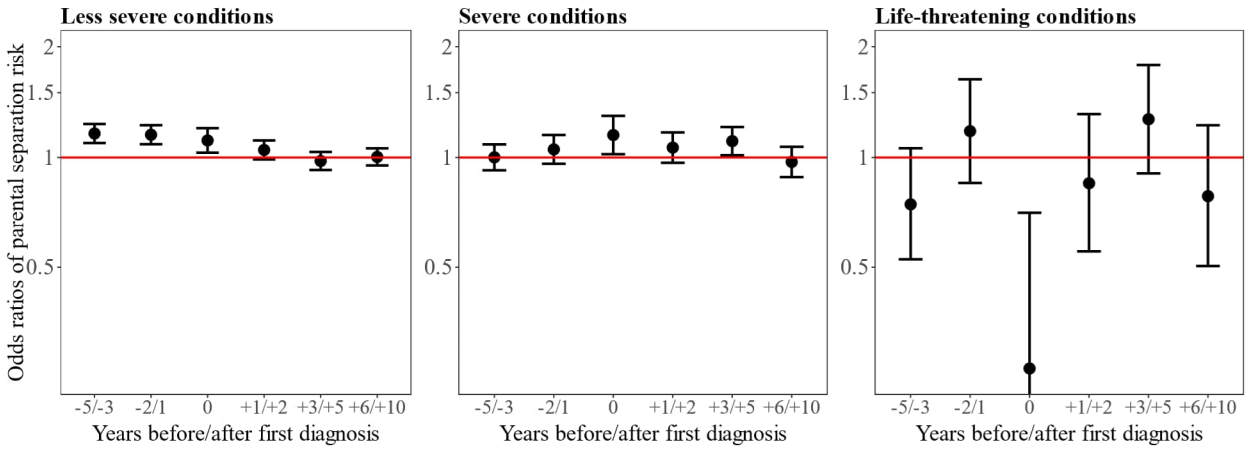

Figure 2: Trajectories of odds ratios of parental separation before and after the first diagnosis of less severe health conditions (allergies, atopic dermatitis, ear infections), severe conditions (epilepsy, type I diabetes, inflammatory bowel disease, rheumatoid arthritis), and life-threatening conditions (cancer); all models control for congenital conditions in the firstborn child, father's health, mother's health, child's age, and mother's age at childbirth; odds ratios are presented on log scales.

While the life-threatening category consists only of cancer, the less severe and severe categories include several conditions. For this reason, we have additionally estimated the models for each condition separately to assess whether the pattern of results in Figure 2 is driven by specific conditions. Figure A1 (presented in the appendix, p. 7) shows that the significantly higher probabilities of separation five years before the first diagnosis of less severe health conditions are mainly driven by atopic dermatitis and chronic/repeated ear infections, for which the patterns are very similar. Meanwhile, there is no significantly higher risk of separation for the parents of children with allergies than for the parents of children without any of the health conditions we consider at any of the time points. The pattern of the severe conditions is driven by epilepsy, inflammatory bowel disease, and rheumatoid arthritis, as these conditions also show a peak in the year of diagnosis. Type I diabetes is not associated with a significantly higher parental separation risk in the year of diagnosis.

Figure 3 presents changes in parental separation risk before and after the child's diagnosis by parental level of education. Although there is a rather high level of uncertainty in our estimates, it seems that parents with tertiary education experienced the highest separation risk at the time their child was diagnosed with a less severe condition (1.26, 1.13-1.41), whereas parents with low education experienced the highest separation risk five to three years before their child was first diagnosed with a less severe condition (1.24, 1.15-1.34). No differences in separation risk patterns depending on parental education are evident for parents of children with severe and life-threatening health conditions.

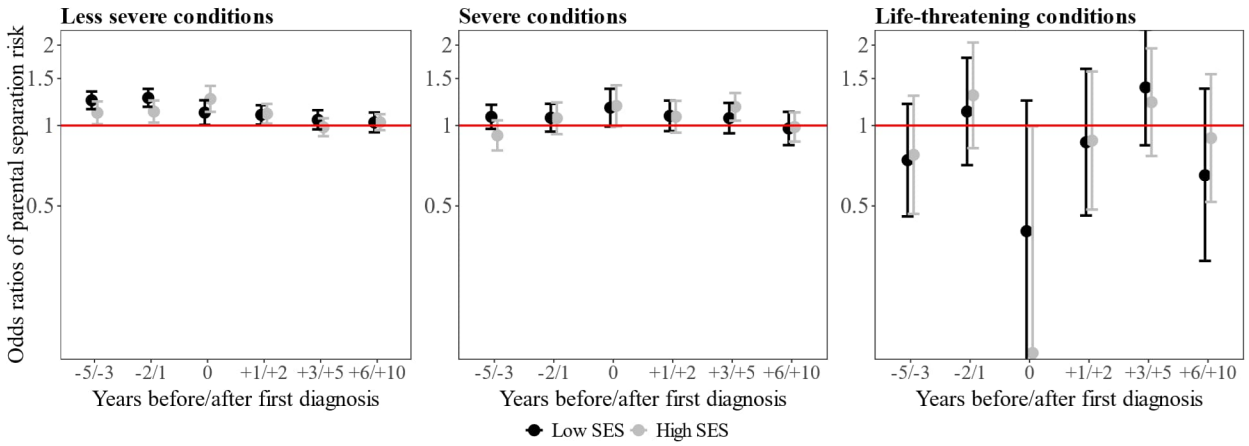

Figure 3: Trajectories of odds ratios of parental separation before and after the first diagnosis of less severe health conditions (allergies, atopic dermatitis, ear infections), severe conditions (epilepsy, type I diabetes, inflammatory bowel disease, rheumatoid arthritis), and life-threatening conditions (cancer) by parental level of education; all models control for congenital conditions in the firstborn child, father's health, mother's health, child's age, and mother's age at childbirth; odds ratios are presented on log scales.

Discussion

This study deepens our understanding of the role of child health in parental partnership stability. We used a sample of 363,830 family trios (both parents and the firstborn child) from Finnish total population registers, and followed each of these families throughout the childhood of the firstborn child (age 0 to 17). Based on these longitudinal data, we examined the risk of parental separation both before and after their child was first diagnosed with a health condition. By considering partnership stability in the years both before and after the first diagnosis of a child health condition, and by further differentiating between the levels of severity of the child's health condition, our work extends previous research on this topic and provides new insights for research on the interplay between family dynamics and health.

Our analyses generated three main findings. First, changes in the risk of parental separation at the time of the child's diagnosis depended on the severity of the child's health condition, as suggested by previous research (see Joesch and Smith 1997; Pinquart 2018). However, contrary to our first hypothesis, the separation risk did not increase with the increasing severity of the child's health condition. While the parental separation risk in the year when their child was diagnosed with a less severe or severe but not life-threatening childhood illness was significantly higher than that for parents whose child was not diagnosed with any of the health conditions we studied, the separation risk for parents whose child was diagnosed with cancer was significantly lower in the year of diagnosis. Beyond the differences in the directions, the magnitude of the changes in separation risk

also differed substantially by the severity of the child's health condition. The separation risk in the year of diagnosis was similar for children diagnosed with less severe conditions and severe but not life-threatening conditions, with the odds of parental separation increasing by 11% (less severe) and 15% (severe). These increases in separation risk are similar to those associated with substance use among adults (18-26% increase in separation risk) (Collins, Ellickson, and Klein 2007) and marrying at a young age (20% increase in separation risk) (Kalmijn, De Graaf, and Poortman 2004). In contrast, when a child was diagnosed with a life-threatening condition, the odds of separation decreased substantially, by 73%. Accordingly, our findings are in line with prior studies showing that child cancer does not increase separation risk (Syse et al. 2010), but we are the first to provide evidence that separation risk declines for a short period of time. A slightly lower parental separation risk immediately after a childhood cancer diagnosis was also found based on Danish data by Grant et al. (2012), but without reaching statistical significance.

Our finding that the separation risk was higher when children were diagnosed with severe conditions such as epilepsy, diabetes, and rheumatoid arthritis, but also with less severe conditions such as allergies, is consistent with previous research from Denmark (Loft 2011). However, the same study based on Danish data also found a higher parental separation risk among children who were diagnosed with cancer. Conversely, Syse et al. (2010) found some support for a decreased separation risk immediately after a child's cancer diagnosis in Norway. The reduced risk of separation when a child was diagnosed with cancer found in our analyses aligns with our second hypothesis, and is consistent with theoretical expectations in the literature that the shared challenge of coping with a child's serious illness strengthens a couple's relationship (see Joesch and Smith 1997; Reichman et al. 2008; Swaminathan et al. 2006). Furthermore, Grant et al. (2012) suggested that immediately after their child is diagnosed with cancer, parents focus on the treatment, which could be accompanied by normative pressure to stay together. By showing that the immediate impact of a child's diagnosis with a physical health condition on parental separation risk differed systematically by the severity of the health condition, we extend previous research that has also investigated some of the conditions we focused on, but that has not categorized them according to their severity.

Second, for both the group of severe conditions and cancer as a life-threatening disease, our results show short-term changes in separation risk in the year of diagnosis, but no significant differences between these families and families with children who were not diagnosed with any of the health

conditions in the years before and after diagnosis. If separation risk is assessed as being driven by parental stress, the increase in separation risk at the time of the child's diagnosis with a severe condition is consistent with the set-point theory, which highlights the short-term changes in subjective well-being around life events (Clark et al. 2008; Clark and Georgellis 2013; Lucas 2007; Soons, Liefbroer, and Kalmijn 2009; Zimmermann and Easterlin 2006). One potential explanation for our finding that separation risk at the time of cancer diagnosis changed in the opposite direction is that severe conditions such as epilepsy, bowel disease, rheumatoid arthritis, and diabetes are associated with the expectation of long-term stress, whereas cancer may be considered a temporary condition for which parents will do everything they can to ensure that their child survives, and is eventually cured.

In support of our third hypothesis, we found that parental separation risk was elevated up to five years before the child was diagnosed with a less severe condition. This may be partly related to diagnostic delays. Allergies, dermatitis, and chronic ear infections are among the conditions that are often diagnosed only after some time (see Chehade et al. 2021), while the child's symptoms may have already caused stress for the parents. An alternative explanation is that these conditions may be more endogenous than the severe and life-threatening conditions with respect to variables that are closely related to family conflict and stress, such as housing conditions and neighborhood characteristics (Ait Bamai et al. 2014; van Damme 2019; Wang, Abou El-Nour, and Bennett 2008). The examination of parental separation risk in the years before and after the first diagnosis of a child health condition is one of the main contributions of our study, as this has not been done in any previous study examining the impact of child health on parental separation. However, we have to speculate in order to interpret these results, as our data do not allow us to make conclusive statements about what drives heightened parental separation risk in the years preceding the first diagnosis of a child health condition.

Third, we found little variation in the associations between severe or life-threatening child health conditions and parental separation risk by parental education. It seems that highly educated parents of children with less severe conditions may delay separation more than their less educated counterparts, or that children with more educated parents may be diagnosed earlier. However, the level of uncertainty is high, since even though our analyses are based on register data, subgroups by education are small for some conditions. Furthermore, the measurement might be unclear, since, for example, the higher prevalence of less severe conditions among the tertiary educated parents

could reflect stronger treatment-seeking behavior. Overall, our results by parental education are in line with mixed findings from previous research on Nordic countries, especially for life-threatening conditions. Syse et al. (2010) found that in Norway, parental separation risk following a child's cancer diagnosis was higher if the mother had a higher education level. However, this association was not found by Grant et al. (2012) in Denmark, while in a more recent study for Denmark, Mader et al. (2020) found a higher separation risk if the mother had a lower education level. Therefore, especially for life-threatening conditions, our null findings provide another contribution to the literature showing only small or mixed differentials by parental education. These results may indicate that Finland's welfare country policies help to reduce socioeconomic differences in the social consequences of children's life-threating conditions.

Our study highlights promising avenues for better understanding the relationship between children's physical health and parental separation risk. Specifically, we found that a diagnosis of a life-threatening condition was associated with a short-term decrease in separation risk, while a diagnosis of a severe condition led to a short-term increase in separation risk. Conversely, separation risk was most pronounced some years before the first diagnosis of less severe conditions, highlighting the importance of further exploring reverse causality, potential confounding factors, and the significance of diagnostic delays. While we suggest that conflict and stress within the family and the parental relationship may be central factors, our study's reliance on register data limited our ability to test these subjective factors empirically. Therefore, subsequent studies could use survey data to capture subjective experiences of stress, relationship quality, and satisfaction with family life. Such data would provide deeper insights into internal family processes before and after a child's health diagnosis, and into how these processes may influence parental partnership stability.

Beyond the scope of our study, two limitations warrant further investigation. The first relates to the general issue of causality within our findings. Although we are fairly confident that the observed association between childhood cancer diagnoses and reduced parental separation risk was a consequence of the diagnosis rather than of pre-existing relationship stability leading up to the cancer diagnosis, our conclusions related to less severe conditions must be treated with some caution. Without a causally robust design, definitive conclusions remain elusive. Future research could benefit from employing genetically informed designs (Davey Smith and Hemani 2014; DiPrete, Burik, and Koellinger 2018), which would use genetic predispositions to child health

conditions as an instrument to more closely examine the causal impact of child health conditions on parental separation risk. The second limitation relates to our inability to determine when symptoms began, which complicates our understanding of diagnostic delays and the potential for family stress to occur with symptom onset. To address this gap, future studies could focus on collecting detailed timelines of symptom development and diagnosis to better assess the impact of diagnostic delays and early stress on family cohesion and stability.

In conclusion, our study has uncovered for the first time the complex variation in the association between children's physical health and parental separation risk. The findings highlight that the immediate effects following a diagnosis differed by the severity of the illness. For example, the diagnosis of cancer as a life-threatening condition significantly reduced separation risk, while the diagnosis of severe but not life-threatening conditions, such as epilepsy, inflammatory bowel disease, or rheumatoid arthritis, were associated with a higher separation risk in the year of diagnosis. Additionally, the findings uncovered both short- and long-term dynamic changes in separation risk in the years before and after the first diagnosis. More specifically, while the only substantial change in the separation risk of parents of children with life-threatening and severe conditions compared to that of parents of children not diagnosed with any of these conditions was in the year of diagnosis, the separation risk of parents with children diagnosed with less severe conditions was already significantly higher five years before the diagnosis. However, the coefficient sizes are rather small, with changes of less than one percentage point of predicted probabilities. These findings underscore the importance of using a nuanced approach when examining how a child's health status can affect family stability. The findings also have important policy implications. When a child's health condition places a substantial strain on the parental relationship, the parents may separate, resulting in further disadvantages for the child. Recognizing this risk, targeted support aimed at reducing stress and enhancing family resilience is critical for all families coping with a child's health condition.

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Data availability

The study uses data that are collected by register authorities (Statistics Finland, the Finnish Institute for Health and Welfare, and the Social Insurance Institution) and made available to researchers for specific research purposes stated in the research plan. All data used or produced by combining original data are confidential and the researchers cannot share them with third parties. Those interested can apply for a license to use the data for scientific research from the register authorities (Statistics Finland and Findata Health and Social Data Permit Authority).

[i] The general regulation in Finland for care leave among parents is that if a child gets ill, the parental temporary care leave can last a maximum of four working days, based on the Employment Contracts Act (Social Insurance Institution of Finland 2021). If a child needs hospital treatment, the parents can be granted a special care allowance that can be paid for up to 60 working days in relation to the same illness and in connection with care provided at an outpatient clinic, in a hospital, or in the form of rehabilitation. During home care, the special care allowance can be paid for up to 60 working days as well (Social Insurance Institution of Finland 2024).

Parental separation risk before and after the diagnosis of a child physical health condition

Appendix

List of congenital conditions

Below, we list all congenital health conditions with the ICD-10 Codes that we identified in the firstborn children and controlled for in all models.

Table A 1: List of congenital health condition of children that are controlled for in all models

Congenital health condition	**ICD-10 Code**
Congenital syphilis	A50
Benign neoplasm of ovary	D27
Sickle cell disease	D57
Haemophilia	D66
Congenital adrenal hyperplasia	E25
Werner syndrome	E34
Albinism	E70
Disorder of lipoprotein metabolism	E78
Neuronal ceroid lipofuscinosis	E75
Congenital Disorder of Glycosylation	E77
Hemochromatosis	E83
Cystic fibrosis	E84
Rett syndrome	F84
Huntington disease	G10
Myasthenic syndrome	G73
Strabismus	H50
Nystagmus	H81
Wolff-Parkinson syndrome	I45
Umbilical hernia	K42
Senear-Usher syndrome	L10
Hypertrichosis	L68
Kyphosis ad lordosis	M40

Scoliosis	M41
Constriction ring syndrome	P02
Neonatal jaundice	P59
Anencephaly	Q00
Encephalocele	Q01
Microcephaly	Q02
Holoprosencephaly	Q04
Spina bifida	Q05
Arnold-Chiari malformation	Q07
Heterochromia	Q13
Microtia	Q17
Atresia of nasopharynx	Q34
Hypoglossia	Q38
Imperforate anus	Q42
Hirschprung disease	Q43
Imperforate hymen	Q52
Hypospadias	Q54
Diphallus	Q55
Extrophy of urinary bladder	Q64
Clubfoot	Q66
Pectus excavatum	Q67
Congenital deformity of hand	Q68
Polydactyly	Q69
Syndactyly	Q70
Lobster-Claw hand	Q71
Amelia	Q73
Cleidocranial dysotosis	Q74
Macrocephaly	Q75
Gastroschisis	Q79
Harlequin fetus	Q80
Incontinentia pigmenti	Q82
Neurofibromatosis	Q85
Fetal alcohol syndrome	Q86
Congenital malformation syndromes predominantly involving limbs	Q87
Situs inversus	Q89
Down syndrome	Q90
Edwards syndrome and Patau syndrome	Q91
Other trisomies and partial trisomies of the autosomes	Q92
Cri-du-cha syndrome	Q93
Turner syndrome	Q96
Triple-X syndrome	Q97
Klinefelter syndrome	Q98

Descriptives

In Table A2, we present the eight health conditions that are categorized to the less severe (allergies, atopic dermatitis, chronic/repeated ear infections), severe (epilepsy, diabetes, inflammatory bowel disease, rheumatoid arthritis), and life-threatening (cancer) conditions. We present both the child's age at first diagnosis as well as the share of separated parents during childhood and the share of parents who separated before the first diagnosis.

Table A 2: Descriptive statistics of the individual eight child health conditions

		Age at diagnosis		Share parents separated	Parental separation before diagnosis
	N	Mean	SD	%	%
Cancer	1056	10.285	5.669	28.3	65.1
Epilepsy	4865	8.463	5.328	32.0	55.2
Diabetes	3467	9.248	4.662	29.2	55.6
Inflammatory Bowel disease	4544	7.549	6.277	30.4	42.6
Rheumatoid arthritis	2267	10.140	5.189	30.9	62.2
Allergies	10848	2.786	4.871	30.9	16.6
Atopic dermatitis	11633	7.905	5.716	31.7	50.1
Chronic/repeated ear infection	11916	5.407	3.567	33.2	41.0

Results

In tables A3 and A4, we present the odds ratios derived from logistic event history models based on survival data that are presented visually in Figures 2 and 3 in the main manuscript.

Table A 3: Odds ratios from logistic event history models based on survival data

	(1) Less severe b/se	(2) Severe b/se	(3) Life-threatening b/se
Time to/from diagnosis (Ref.: no diagnosis of child health condition)			
-3/-5 years	1.16***	1.00	0.75
	(0.04)	(0.04)	(0.13)
-1/-2 years	1.15***	1.05	1.18
	(0.04)	(0.05)	(0.20)
0 (year of diagnosis)	1.11**	1.15*	0.27**
	(0.04)	(0.07)	(0.13)
+1/+2 years	1.05	1.06	0.85
	(0.03)	(0.05)	(0.19)
+3/+5 years	0.98	1.11*	1.27
	(0.03)	(0.05)	(0.22)
+6/+10 years	1.00	0.97	0.79
	(0.03)	(0.05)	(0.18)
Child congenital condition	1.00	0.99	0.99
	(0.01)	(0.01)	(0.01)
Mother age at childbirth	0.90***	0.90***	0.90***
	(0.00)	(0.00)	(0.00)
Father: less severe condition (Ref.: no condition)	1.09	1.10	1.05
	(0.10)	(0.11)	(0.11)
Father: severe condition (Ref.: no condition)	1.11***	1.10***	1.11***
	(0.02)	(0.02)	(0.02)
Father: life threatening condition (Ref.: no condition)	1.10	1.11	1.10
	(0.07)	(0.07)	(0.07)
Mother: less severe condition (Ref.: no condition)	1.04	1.07	1.07
	(0.07)	(0.08)	(0.08)
Mother: severe condition (Ref.: no condition)	1.06**	1.05*	1.04
	(0.02)	(0.02)	(0.02)
Mother: life threatening condition (Ref.: no condition)	0.97	0.99	0.98
	(0.05)	(0.05)	(0.05)
Constant	0.46***	0.46***	0.46***

	(0.01)	(0.01)	(0.01)		
Child age FE	Yes	Yes	Yes		
N	5041971	4878510	4695902		

* p<0.05; ** p<0.01; *** p<0.001

Table A 4: Odds ratios from logistic event history models based on survival data stratified by parental education

	(1)	(2)	(3)	(4)	(5)	(6)
	Low	High	Low	High	Low	High
	Less severe		Severe		Life-threatening	
	b/se	b/se	b/se	b/se	b/se	b/se
Time to/from diagnosis (Ref.: no diagnosis of child health condition)						
-3/-5 years	1.24***	1.12*	1.08	0.92	0.74	0.78
	(0.05)	(0.06)	(0.06)	(0.06)	(0.18)	(0.20)
-1/-2 years	1.27***	1.13*	1.07	1.06	1.13	1.30
	(0.05)	(0.05)	(0.07)	(0.07)	(0.27)	(0.30)
0 (year of diagnosis)	1.12*	1.26***	1.17	1.18	0.40	0.14*
	(0.06)	(0.07)	(0.10)	(0.11)	(0.23)	(0.14)
+1/+2 years	1.10*	1.11*	1.09	1.08	0.87	0.88
	(0.05)	(0.05)	(0.07)	(0.08)	(0.28)	(0.27)
+3/+5 years	1.05	0.99	1.07	1.18**	1.39	1.22
	(0.04)	(0.04)	(0.07)	(0.07)	(0.35)	(0.29)
+6/+10 years	1.03	1.03	0.98	0.99	0.65	0.90
	(0.04)	(0.04)	(0.07)	(0.06)	(0.25)	(0.25)
Child congenital condition	1.01	1.00	1.00	1.00	1.00	1.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Mother age at childbirth	0.91***	0.92***	0.91***	0.92***	0.91***	0.92***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Father: less severe condition (Ref.: no condition)	1.05	1.15	1.07	1.17	1.00	1.13
	(0.14)	(0.15)	(0.15)	(0.16)	(0.15)	(0.16)
Father: severe condition (Ref.: no condition)	1.09***	1.11***	1.10***	1.10***	1.10***	1.12***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Father: life threatening condition (Ref.: no condition)	1.27**	0.95	1.26**	0.98	1.24*	0.98
	(0.11)	(0.08)	(0.11)	(0.09)	(0.11)	(0.09)
Mother: less severe condition (Ref.: no condition)	1.19	0.94	1.25*	0.94	1.24*	0.95
	(0.11)	(0.10)	(0.12)	(0.10)	(0.12)	(0.11)

Mother: severe condition (Ref.: no condition)	1.01	1.09**	1.01	1.08**	1.00	1.07*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Mother: life threatening condition (Ref.: no condition)	0.93	0.98	0.95	1.01	0.94	1.00
	(0.08)	(0.07)	(0.08)	(0.07)	(0.08)	(0.07)
Constant	0.52***	0.15***	0.52***	0.15***	0.52***	0.15***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Child age FE	Yes	Yes	Yes	Yes	Yes	Yes
N	2147522	2894449	2090589	2787921	2015252	2680650

* p<0.05; ** p<0.01; *** p<0.001

Individual conditions

In Figure A1 below, we present the trajectories of odds ratios of parental separation risk before and after the diagnosis if each single health condition presented in Table A2 and discussed in the results section of the main manuscript.

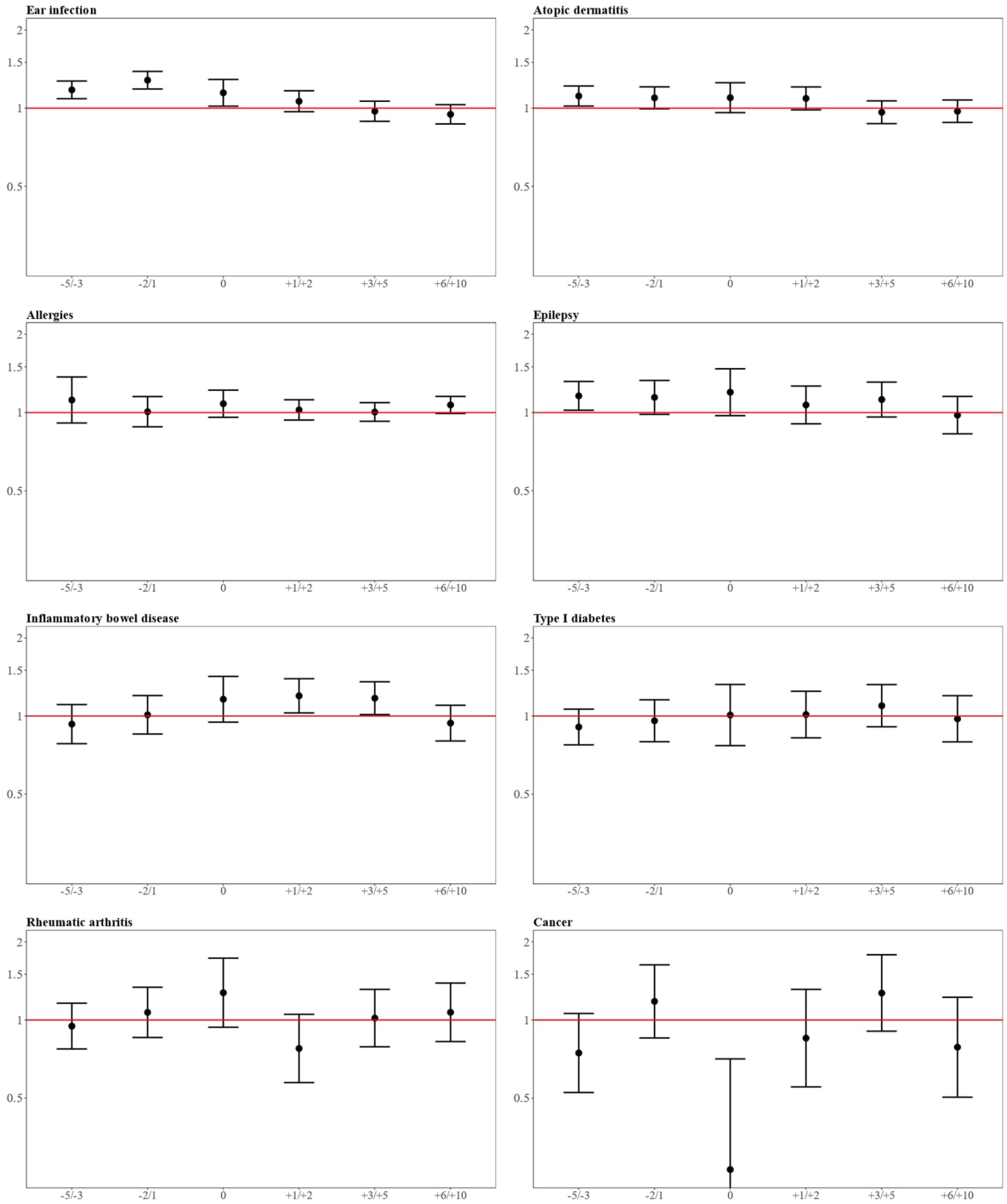

Figure A 1: Trajectories of parental separation probability before and after first diagnosis of individual conditions