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Parental psychopathology before and after the child's diagnosis of a mental disorder: a population-based matched cohort study

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Background: More research is needed to understand psychopathology among parents of children with mental disorders in the years before and after the child is diagnosed. Here, we estimated the risk of mental disorders and psychotropic medication use in parents of children with versus without mental disorders and the temporal associations between child and parental psychopathology. **Methods:** We conducted a population-based matched cohort study using Danish register data. The study population included child–parent pairs of all children diagnosed with a mental disorder of interest (attention-deficit/hyperactivity disorder, autism spectrum disorder, intellectual disability, anxiety disorder, mood disorder, eating disorder, substance use disorder, and schizophrenia spectrum disorder) by 18 years of age during the period 1999–2014 and a matched reference population. Each child with a diagnosis was matched to 10 children of the same sex and birth year who had not been diagnosed with the mental disorder of interest. For all parents, we estimated the yearly incidence proportion of parental mental disorders and prescriptions for psychotropic medications 4 years before and after the child's diagnosis. **Results:** We observed a substantially increased risk of mental disorders and psychotropic medication use among parents of children with a mental disorder, compared to the reference population. On average, parents of children with a diagnosis had twice the odds of mood disorders, anxiety disorders, and prescriptions for anti-depressants and anti-psychotics. The incidence of mood and anxiety disorders peaked in the 1–2 years before and after the child's diagnosis. The incidence of parental prescriptions for psychotropic medications (particularly anti-psychotics) peaked in the year the child was diagnosed and in the 3 years *before* the child's diagnosis for anti-depressants and sleep medications. **Conclusions:** This study demonstrates clear temporal associations between child and parental psychopathology, with parental psychopathology peaking in the years immediately before and after the child's diagnosis. **Keywords:** Childhood mental disorders; parental psychopathology.

The incidence of mental disorders diagnosed in childhood is increasing and the median age at first diagnosis of mental disorders is decreasing (Dalsgaard et al., 2020; Kessler et al., 2007; McGrath et al., 2023; Plana-Ripoll et al., 2022). While these changes may represent increased reporting of mental disorders in children, they could also be influenced by administrative changes and reduced stigma over time. In the 1980s, the age at first diagnosis of a mental disorder peaked at age 50, whereas now, the age at first diagnosis peaks at age 18 (Plana-Ripoll et al., 2022). A meta-analysis of 192 studies shows that approximately 50% of individuals who develop a mental disorder are now diagnosed before 18 years of age (Solmi et al., 2022). Childhood mental disorders are associated with several adverse outcomes (decreased educational attainment, substance abuse, unemployment, criminality, premature mortality; Copeland, Wolke, Shanahan, & Costello, 2015; Dalsgaard et al., 2020; Yoshimasu et al., 2012), and the Global Burden of Disease studies indicate that mental disorders are now the leading cause of disability in children and adolescents (Baranne & Falissard, 2018; Erskine et al., 2015).

Mental disorders negatively impact the child's daily functioning as well as the functioning of parents and caregivers. In addition to caring for other children and fulfilling other responsibilities (e.g., paid work), parents of children with mental disorders typically assume responsibility for managing treatment, coordinating services, and advocating for the child. Parents often take on these additional responsibilities without adequate preparation, knowledge, and support (Souza et al., 2017). Consequently, parents of children with mental disorders report high levels of parental burnout and stress (Cheung & Theule, 2016; Hayes & Watson, 2013; Meltzer, Ford, Goodman, & Vostanis, 2011; Singer, 2006; Taylor-Richardson, Heflinger, & Brown, 2006; Theule, Wiener, Tannock, & Jenkins, 2013). Furthermore, parents of children with

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mental disorders have a significantly elevated risk of depression and anxiety compared with parents of children without mental disorders (Cheung & Theule, 2016; Hayes & Watson, 2013; Singer, 2006; Theule et al., 2013). A meta-analysis shows that parents of children with attention-deficit/hyperactivity disorder (ADHD) had 2.85 times the odds of being diagnosed with a mental disorder compared with parents of children without ADHD (Cheung & Theule, 2016).

Parenting children with mental disorders can be even more challenging when the parent experiences depression and anxiety themselves. Thus, it is essential that we understand the associations between childhood mental disorders and parental psychopathology. However, previous studies on these associations have some limitations. First, most studies have focused on parents of children with ADHD, autism spectrum disorder (ASD), and intellectual disability (ID). Even though some cross-sectional studies have investigated psychopathology in parents of children with other mental disorders, such as mood disorders (Jaycox et al., 2009; Logan & King, 2002) and anxiety disorders (Towe-Goodman, Franz, Copeland, Angold, & Egger, 2014; Wu et al., 2018), there is limited population-based longitudinal research on a broad range of childhood mental disorders. Further, research has focused on clinical samples comprising parents of children already diagnosed with mental disorders. Thus, we lack knowledge about parental psychopathology in the years preceding the child's diagnosis, a period that can be particularly stressful as parents likely do not have access to support services and may be limited in understanding, explaining, and managing the child's symptoms (Davey, Creswell, Percy, & Reardon, 2022; Mitchell & Holdt, 2014; Osborn, Roberts, & Kneebone, 2020; Smith-Young, Chafe, & Audas, 2020). Finally, most research has focused on parental depression and anxiety (Meltzer et al., 2011; Montes & Halterman, 2007; Totsika, Hastings, Emerson, Lancaster, & Berridge, 2011). Consequently, less is known about other key markers of parental psychopathology, such as prescriptions for psychotropic medications and late identification of neurodevelopmental disorders. To obtain a more complete picture, we included a broad range of mental disorders and also explored medication usage among parents. While our focus is on incident psychopathology among parents, we are likely to also capture effects stemming from the reverse association, attributable to undiagnosed mental disorders in the parents.

More research is needed to understand psychopathology among parents of children with mental disorders in the years before and after the child is diagnosed. Such research would lend insights into support needs among these parents, such as early intervention aimed at preventing parental psychopathology and enhancing parents' capacity to manage the challenges of parenting children with mental disorders. Thus, we conducted a population-based study to describe the incidence of parental psychopathology among parents of children with mental disorders compared to parents of children without mental disorders. We examined both diagnoses of mental disorders and prescriptions for psychotropic medications as markers of parental psychopathology. We aimed to investigate temporal relationships between the child's diagnosis and incident parental psychopathology, by examining parental psychopathology in the 4 years preceding the child's diagnosis up to 4 years after the child's diagnosis.

Methods

Data sources

This population-based study was conducted by linking data between the Danish national registers. At birth or upon migration to Denmark, individuals are allocated a unique registration number, which enables data linkage between the registers. Data on sex, place of birth, parent's identity, and dates of birth, death, and migration, were obtained from the Danish Civil Registration System (CRS) (Pedersen, 2011), which was established in 1968. Data on child and parental mental disorders were obtained from the Danish National Patient Register (NPR) (Lynge, Sandegaard, & Rebolj, 2011) and the Danish Psychiatric Central Research Register (PCRR) (Mors, Perto, & Mortensen, 2011). The NPR and PCRR contain all inpatient hospital contacts since 1977 and 1969, respectively, and all outpatient and emergency contacts since 1995. In the NPR and PCRR, diagnoses have been classified according to the International Classification of Diseases–Tenth Revision (ICD-10) (WHO, 2016) since January 1994 and the Eighth Revision (ICD-8) prior to January 1994. Data on prescriptions for psychotropic medications were obtained from the Danish National Prescription Registry (Pottegård et al., 2016), which contains dispensing dates and Anatomical Therapeutic Chemical (ATC) classification codes for all prescription drugs dispensed since 1995.

Study population

The study population included child–parent pairs of all children diagnosed with a mental disorder by 18 years of age during the period January 01, 1999 to December 31, 2014 (children with a mental disorder diagnosis) and a matched reference population. All children were singletons born in Denmark between January 01, 1981 and December 31, 2013 with at least one known parent. We identified the following mental disorders (using the NPR and PCRR): ADHD, ASD, ID, anxiety disorder, mood disorder, eating disorder, substance use disorder, and schizophrenia spectrum disorder (SSD) (see ICD-10 codes in Table 1). A child with multiple diagnoses was included in multiple analyses. The onset of a disorder was defined as the admission date of the first contact leading to a discharge diagnosis of the disorder. Each child with a mental disorder diagnosis was matched to 10 individuals with the same sex and birth year who had not been diagnosed with the mental disorder of interest at the time of matching. Finally, we linked all children to parents using the CRS.

Outcomes

We estimated the incidence of parental mental disorders and prescriptions for psychotropic medications. We identified

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Table 1 International Classification of Diseases (ICD) and Anatomical Therapeutic Chemical (ATC) codes used to classify parental psychopathology outcomes

Outcome	Codes
Childhood mental disorders	
ADHD	ICD-10 – F90 and F98.8
ASD	ICD-10 – F84 (excluding F84.2 and F84.3)
Intellectual disability	ICD-10 – F70-F79
Anxiety disorder	ICD-10 – F40-F48
Mood disorder	ICD-10 – F30-F39
Eating disorder	ICD-10 – F50
Substance use disorder	ICD-10 – F10-F19
Schizophrenia spectrum disorders	ICD-10 – F20-F29
Parental mental disorders	
Mood disorders	ICD-10 – F30-F39 ICD-8 – 296.x9, 298.09, 298.19, 300.49, 301.19
Anxiety disorders	ICD-10 – F40-F48 ICD-8 – 300.x9 (excluding 300.49), 305.x9, 305.68, 307.99
ADHD and ASD	ICD-10 – ADHD: F90 and F98.8; ASD: F84 (excluding F84.2 and F84.3) ICD-8 – ADHD: 308.01; ASD: 299.00–299.03
Schizophrenia spectrum disorders	ICD-10 – F20-F29 ICD-8 – 295.x9, 296.89, 297.x9, 298.29–298.99, 299.04, 299.05, 299.09, 301.83
Eating disorder	ICD-10 – F50 ICD-8 – 306.50, 306.58, 306.59
Substancce use disorder	ICD-10 – F10-F19 ICD-8 – 291.x9, 299.39, 303.x, 304.x
Parental prescriptions for psychotropic medication	
Anti-depressant medication	ATC – N06A (excluding N06AX12 and N06AX21)
Sleep medication/ sedatives	ATC – N05CD, N05BA, N03AE, N03AA, N05CF, N05CH, N05BB01, N07CA02, R06AA02, R06AA04, R06AD02, R06AE03, R06AE05
Stimulant medication	ATC – N06BA02, N06BA04, N06BA09, N06BA12, C02AC02
Anti-psychotic medication	ATC – N05A (excluding N05AN01)

ADHD, attention-deficit/hyperactivity disorder; ASD, autism spectrum disorder.

parental mental disorders in the NPR and PCRR using ICD-8 and -10 codes (see Table 1), using first-time occurrence of the disorders of interest, hence measuring the incidence of disorders. The parental mental disorders of interest were mood disorders, anxiety disorders, neurodevelopmental disorders (including ADHD and ASD), eating disorders and schizophrenia spectrum disorders (SSD). We identified parental prescriptions for psychotropic medications in the National Prescription Registry using ATC codes (see Table 1), using the first time the medication of interest was prescribed. The parental prescriptions of interest were anti-depressant medications, sleep medications and sedatives, stimulant and non-stimulant ADHD medications, and anti-psychotic medications. Parents were monitored from 4 years before the child was diagnosed with the mental disorder of interest until the date of parental outcome event (i.e., first diagnosis of mental disorder or first prescription of psychotropic medication), censoring (i.e., parent emigrated, disappeared, or died), or 4 years after the child's diagnosis, whichever date came first. The decision to analyze parental outcomes 4 years pre- and post-child's diagnoses was made to estimate the incidence of parental psychopathology in close (temporal) proximity to one's child being diagnosed with a mental disorder while striking a balance between comprehensiveness and achieving reasonable statistical power. The psychiatric case register only holds data on clinical diagnoses from *hospital* contacts, and most children and adolescents are treated by hospital departments. Only licensed child and adolescent specialists are allowed to prescribe psychotropic drugs for individuals under age 18, therefore adding prescription data would not improve our coverage for that age group. In contrast, most adults with psychiatric disorders are treated by doctors outside hospital departments who do report to the prescription database. Hence, to improve coverage for parents, we also included data on the use of psychotropic drugs in parents, but not in children.

Statistical analysis

We calculated the yearly incidence proportion of parental mental disorders and prescriptions for psychotropic medications. We examined each category of parental mental disorder and prescription separately, then we collapsed the categories to evaluate 'any parental mental disorder' and 'any parental prescription'. Logistic regression models were used to estimate odds ratios (ORs) for parental mental disorders and prescriptions each year in parents of children with a mental disorder diagnosis compared with the reference population. All ORs were adjusted for the child's sex, birth year, birth order, maternal education, and comorbid mental disorders (yes/no). Psychiatric comorbidity was treated as a time-dependent variable. All analyses were conducted separately for each childhood mental disorder of interest. Analyses were also stratified by parent sex based on previous studies indicating sex differences in outcomes among caregivers (Mortensen et al., 2017). To comply with Danish legislation related to personally identifiable information, parental outcome categories were excluded from analyses when there were <5 individuals across any time point. Data management and analysis were conducted in R Version 4.2.1.

Results

The baseline characteristics of the cohort are presented in Table 2. For each childhood mental disorder, the number of children diagnosed ranged from n = 3,258 (SUD) to n = 31,362 (anxiety disorder). Among children with ADHD, ASD, ID, and SUD, we observed a higher proportion of males (58%–77%) than females (23%–42%), whereas among children with other mental disorders, we observed a higher proportion of females (57%–89%) than males (11%–43%). Across the childhood mental disorders, mean ± SD age at diagnosis ranged from 9 ± 4 to 16 ± 1 years in the child, 38 ± 6 to 45 ± 5 years in the mothers, and 42 ± 7 to 48 ± 6 years in the fathers. Across the childhood mental disorders, we observed a higher proportion of first-born children (41%–51%) than second-born (34%–38%) and third-born (15%–23%) children. The proportion of children with a comorbid mental disorder diagnosed prior to the disorder of interest ranged from 29% (eating disorder) to 75% (ID), and those diagnosed

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Table 2 Baseline characteristics of the matched cohort by childhood mental disorder in children with and without mental disorder diagnoses

	ADHD		Autism spectrum disorder		Eating disorder		Anxiety disorder		Mood disorder		Intellectual disability		Substance use disorder		Schizophrenia spectrum disorder	
	Diagnosed N = 28,735[a]	Not diagnosed N = 287,350[a]	Diagnosed N = 20,175[a]	Not diagnosed N = 201,750[a]	Diagnosed N = 7,028[a]	Not diagnosed N = 70,280[a]	Diagnosed N = 31,362[a]	Not diagnosed N = 313,620[a]	Diagnosed N = 10,864[a]	Not diagnosed N = 108,640[a]	Diagnosed N = 8,400[a]	Not diagnosed N = 84,000[a]	Diagnosed N = 3,258[a]	Not diagnosed N = 32,580[a]	Diagnosed N = 4,090[a]	Not diagnosed N = 40,900[a]
Unique parents included in analysis																
Mothers	26,641 (93%)	247,836 (86%)	19,212 (95%)	182,496 (90%)	6,955 (99%)	67,877 (97%)	30,009 (96%)	267,891 (85%)	10,676 (98%)	102,389 (94%)	8,168 (97%)	80,731 (96%)	3,216 (99%)	32,010 (98%)	4,030 (99%)	40,042 (98%)
Fathers	26,479 (92%)	246,428 (86%)	19,037 (94%)	181,457 (90%)	6,916 (98%)	67,429 (96%)	29,790 (95%)	266,280 (85%)	10,592 (97%)	101,723 (94%)	8,071 (96%)	80,172 (95%)	3,172 (97%)	31,809 (98%)	3,977 (97%)	39,797 (97%)
Child's sex																
Female	7,697 (27%)	76,970 (27%)	4,687 (23%)	46,870 (23%)	6,260 (89%)	62,600 (89%)	19,807 (63%)	198,070 (63%)	7,594 (70%)	75,940 (70%)	2,685 (32%)	26,850 (32%)	1,358 (42%)	13,580 (42%)	2,312 (57%)	23,120 (57%)
Male	21,038 (73%)	210,380 (73%)	15,488 (77%)	154,880 (77%)	768 (11%)	7,680 (11%)	11,555 (37%)	115,550 (37%)	3,270 (30%)	32,700 (30%)	5,715 (68%)	57,150 (68%)	1,900 (58%)	19,000 (58%)	1,778 (43%)	17,780 (43%)
Child's age at diagnosed child's diagnosis																
Mean (*SD*)	10.2 (3.8)	10.2 (3.8)	9.3 (4.2)	9.3 (4.3)	14.24 (2.35)	14.25 (2.40)	13.79 (2.82)	13.80 (2.86)	15.05 (1.77)	15.07 (1.83)	9.7 (4.5)	9.7 (4.5)	15.94 (1.13)	15.99 (1.25)	15.06 (1.75)	15.07 (1.83)
<5 years	1,438 (5.0%)	14,609 (5.1%)	3,089 (15%)	30,792 (15%)	0 (0%)	45 (<0.1%)	0 (0%)	300 (<0.1%)	0 (0%)	0 (0%)	1,314 (16%)	13,192 (16%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
5–9 years	12,407 (43%)	123,202 (43%)	7,444 (37%)	74,408 (37%)	324 (4.6%)	3,255 (4.6%)	3,103 (9.9%)	30,782 (9.8%)	0 (0%)	334 (0.3%)	2,796 (33%)	27,949 (33%)	0 (0%)	0 (0%)	0 (0%)	134 (0.3%)
10–14 years	9,721 (34%)	97,811 (34%)	6,683 (33%)	66,882 (33%)	3,047 (43%)	30,665 (44%)	12,704 (41%)	127,503 (41%)	3,544 (33%)	35,614 (33%)	2,682 (32%)	26,736 (32%)	376 (12%)	4,074 (13%)	1,351 (33%)	13,649 (33%)
≥15 years	5,169 (18%)	51,728 (18%)	2,959 (15%)	29,668 (15%)	3,657 (52%)	36,315 (52%)	15,555 (50%)	155,035 (49%)	7,320 (67%)	72,692 (67%)	1,608 (19%)	16,123 (19%)	2,882 (88%)	28,506 (87%)	2,739 (67%)	27,117 (66%)
Mother's age at diagnosed child's diagnosis																
Mean (*SD*)	39 (6)	40 (6)	39 (6)	39 (6)	43.5 (5.2)	43.2 (5.2)	42.4 (5.6)	42.9 (5.3)	43.9 (5.2)	44.0 (5.0)	38 (6)	39 (6)	43.2 (5.3)	44.8 (4.9)	43.6 (5.4)	43.9 (5.0)
<40 years	16,197 (56%)	135,905 (47%)	10,823 (54%)	106,511 (53%)	1,536 (22%)	16,954 (24%)	9,932 (32%)	81,502 (26%)	2,228 (21%)	19,994 (18%)	4,875 (58%)	43,278 (52%)	860 (26%)	4,571 (14%)	988 (24%)	7,791 (19%)
40–49 years	11,309 (39%)	136,008 (47%)	8,290 (41%)	85,975 (43%)	4,657 (66%)	45,263 (64%)	18,000 (57%)	197,799 (63%)	7,083 (65%)	73,646 (68%)	3,142 (37%)	36,397 (43%)	1,982 (61%)	22,571 (69%)	2,520 (62%)	27,559 (67%)
≥50 years	1,229 (4.3%)	15,427 (5.4%)	1,062 (5.3%)	9,256 (4.6%)	835 (12%)	8,063 (11%)	3,430 (11%)	34,312 (11%)	1,553 (14%)	15,000 (14%)	383 (4.6%)	4,325 (5.1%)	416 (13%)	5,438 (17%)	582 (14%)	5,550 (14%)
(Missing)	[b]	10	0	8	0	[b]	[b]	7	[b]	[b]	0	[b]	0	0	0	0
Father's age at diagnosed child's diagnosis																
Mean (*SD*)	42 (7)	43 (7)	42 (7)	42 (7)	46 (6)	46 (6)	45 (7)	46 (6)	46.7 (6.1)	46.8 (6.0)	42 (7)	42 (7)	46.3 (6.4)	47.6 (5.9)	46.6 (6.7)	46.7 (6.0)
<40 years	11,487 (40%)	94,360 (33%)	7,724 (39%)	77,342 (38%)	821 (12%)	9,042 (13%)	5,811 (19%)	46,065 (15%)	1,124 (10%)	9,828 (9.1%)	3,335 (40%)	31,315 (37%)	425 (13%)	1,972 (6.1%)	538 (13%)	3,784 (9.3%)
40–49 years	13,549 (48%)	151,007 (53%)	9,513 (48%)	98,369 (49%)	4,352 (62%)	43,540 (62%)	17,988 (58%)	190,978 (61%)	6,508 (60%)	67,458 (62%)	3,807 (46%)	40,887 (49%)	1,933 (60%)	19,758 (61%)	2,291 (57%)	25,338 (62%)
≥50 years	3,434 (12%)	40,850 (14%)	2,749 (14%)	25,217 (13%)	1,823 (26%)	17,359 (25%)	7,317 (24%)	75,206 (24%)	3,152 (29%)	30,838 (29%)	1,169 (14%)	11,425 (14%)	858 (27%)	10,687 (33%)	1,213 (30%)	11,604 (28%)
(Missing)	265	1,133	189	822	32	339	246	1,371	80	516	89	373	42	163	48	174
Child's birth order																
1	13,153 (46%)	125,839 (44%)	10,190 (51%)	87,826 (44%)	3,348 (48%)	31,273 (45%)	14,235 (45%)	139,672 (45%)	4,872 (45%)	48,501 (45%)	3,638 (43%)	37,009 (44%)	1,351 (41%)	14,652 (45%)	1,896 (46%)	18,281 (45%)
2	10,349 (36%)	106,788 (37%)	6,825 (34%)	75,375 (37%)	2,605 (37%)	26,020 (37%)	11,377 (36%)	116,760 (37%)	4,094 (38%)	40,361 (37%)	2,840 (34%)	31,068 (37%)	1,200 (37%)	12,110 (37%)	1,409 (34%)	15,151 (37%)

(continues)

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Table 2 (continued)

	ADHD		Autism spectrum disorder		Eating disorder		Anxiety disorder		Mood disorder		Intellectual disability		Substance use disorder		Schizophrenia spectrum disorder	
	Diagnosed *N* = 28,735[a]	Not diagnosed *N* = 287,350[a]	Diagnosed *N* = 20,175[a]	Not diagnosed *N* = 201,750[a]	Diagnosed *N* = 7,028[a]	Not diagnosed *N* = 70,280[a]	Diagnosed *N* = 31,362[a]	Not diagnosed *N* = 313,620[a]	Diagnosed *N* = 10,864[a]	Not diagnosed *N* = 108,640[a]	Diagnosed *N* = 8,400[a]	Not diagnosed *N* = 84,000[a]	Diagnosed *N* = 3,258[a]	Not diagnosed *N* = 32,580[a]	Diagnosed *N* = 4,090[a]	Not diagnosed *N* = 40,900[a]
≥3	5,233 (18%)	54,656 (19%)	3,160 (16%)	38,493 (19%)	1,075 (15%)	12,981 (18%)	5,750 (18%)	57,149 (18%)	1,898 (17%)	19,773 (18%)	1,922 (23%)	15,906 (19%)	707 (22%)	5,812 (18%)	785 (19%)	7,468 (18%)
(Missing)	[b]	67	[b]	56	0	6	[b]	39	[b]	5	0	17	0	6	0	[b]
Mother's educational level at child's birth year																
Above elementary school	16,678 (59%)	213,445 (76%)	13,996 (71%)	148,936 (76%)	4,963 (72%)	47,359 (70%)	18,373 (60%)	218,099 (72%)	7,006 (66%)	73,633 (70%)	4,023 (50%)	61,093 (75%)	1,352 (43%)	21,555 (68%)	2,309 (59%)	27,477 (69%)
Elementary school	11,414 (41%)	65,623 (24%)	5,705 (29%)	47,035 (24%)	1,926 (28%)	20,705 (30%)	12,167 (40%)	85,637 (28%)	3,610 (34%)	31,584 (30%)	4,029 (50%)	20,505 (25%)	1,784 (57%)	9,938 (32%)	1,633 (41%)	12,080 (31%)
(Missing)	643	8,282	474	5,779	139	2,216	822	9,884	248	3,423	348	2,402	122	1,087	148	1,343
Comorbid mental disorder(s)																
Diagnosed before *disorder of interest*	13,401 (47%)	6,441 (2.2%)	10,030 (50%)	4,635 (2.3%)	2,043 (29%)	2,502 (3.6%)	11,440 (36%)	8,666 (2.8%)	5,795 (53%)	4,704 (4.3%)	6,284 (75%)	2,339 (2.8%)	2,371 (73%)	1,709 (5.2%)	2,783 (68%)	2,008 (4.9%)
Diagnosed before *end of study period*	16,816 (59%)	13,307 (4.6%)	12,694 (63%)	10,148 (5.0%)	3,554 (51%)	5,670 (8.1%)	17,582 (56%)	15,377 (4.9%)	8,425 (78%)	8,386 (7.7%)	6,702 (80%)	4,984 (5.9%)	2,718 (83%)	2,910 (8.9%)	3,580 (88%)	3,683 (9.0%)

[a]*n* (%); Mean (*SD*).
[b]Where missingness was equal to 1–4, these counts were included in the level above (e.g., parental age ≥50 years or birth order ≥3 categories) to maintain anonymity.

prior to the end of the study period ranged from 51% (eating disorder) to 87% (SSD).

Parental mental disorders

The yearly incidence proportions of parental mental disorders are presented in Figure 1 (by category) and stratified by sex of the children Figure S1 (any parental mental disorder). Estimated ORs for the incidence of mental disorders among parents of children with a mental disorder diagnosis compared with parents of children without a mental disorder diagnosis are presented in Figure 2 (by category) and stratified by sex of the children in Figure S2 (any parental mental disorder). Although the incidence proportions of parental mental disorders in each category were relatively low, they were markedly higher in parents of children with mental disorders compared with parents of children without a mental disorder. The most common parental diagnoses in all parents were anxiety disorders, followed by mood disorders. The yearly incidence of any parental mental disorder was highest in parents of children with SUDs (1.2%–2.1% maternal, 0.7%–1.3% paternal) or parents of children with anxiety disorders (1.0%–2.8% maternal, 0.7%–1.6% paternal) than parents of children with other mental disorders. Likewise, across the childhood mental disorders, the yearly incidence of mental disorders was higher in mothers than in fathers both in parents of children with and without a mental disorder diagnosis. The stratified analyses did not show differences in association according to sex of the children.

For most childhood mental disorders, we observed an increased risk of any parental mental disorder among parents with diagnosed children compared with parents of children without a mental disorder diagnosis both before and after the child's diagnosis (with ORs ranging to 5.5 in mothers and 4.3 in fathers). Across childhood mental disorders, parents were—on average—twice as likely to be diagnosed with mood disorders and anxiety disorders compared to parents of children without a mental disorder diagnose. For parental EDs, we observed ORs up to 6 in mothers of children with ASD, though the yearly incidence proportions of maternal EDs were relatively low in mothers of children with ASD. Likewise, we observed ORs up to 4 for paternal SSD diagnosis in fathers of children with anxiety disorder. Finally, the risk of parental ADHD/ASD was significantly elevated among parents of children with ADHD and also in parents of children with ASD, though lower increases in incidences.

Timing of parental mental disorders in relation to the child's diagnosis. While Figure S1 indicates that the incidence of any parental mental disorder among parents generally peaked in the same year the child was diagnosed, Figure 1 shows that peaks in incidence proportions vary by parental mental

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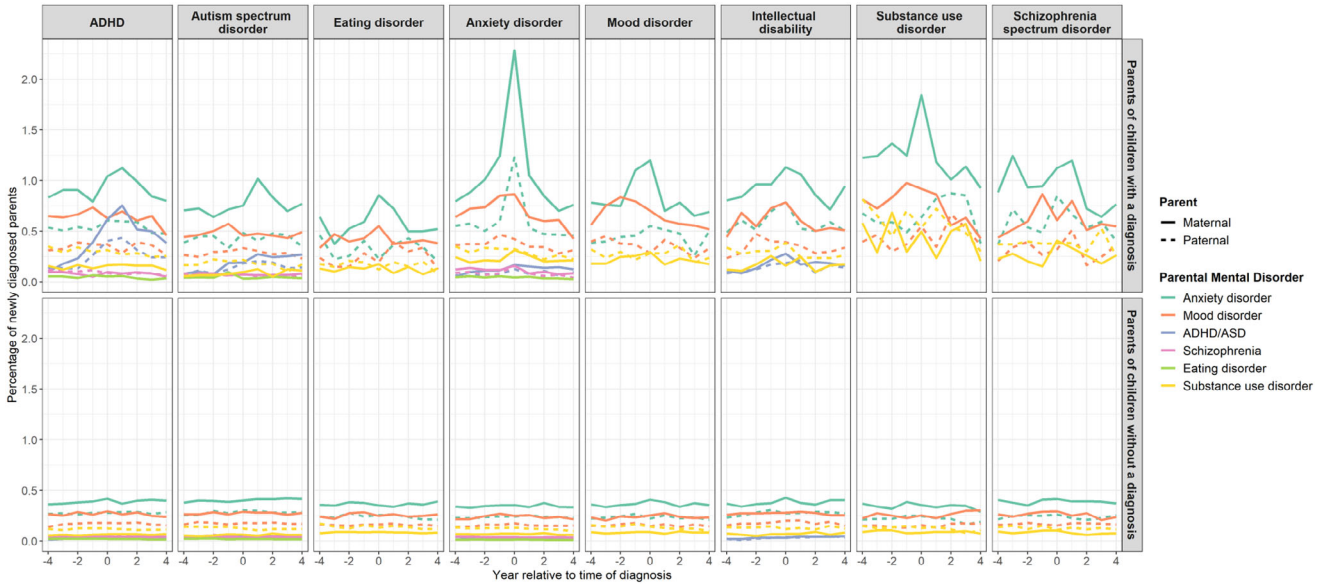


Figure 1 Incidence proportions (%) of parental mental disorders before and after the child's diagnosis. Time 0 is the time of diagnosis. Some parents may have been included in more than one analyses (e.g., where they had more than one child diagnosed with the disorder of interest; see number of unique parents included in analysis via Table 2). To comply with Danish legislation related to personally identifiable information, parental mental disorder categories were excluded from analyses when there were <5 individuals at any time point. ADHD, attention-deficit/hyperactivity disorder

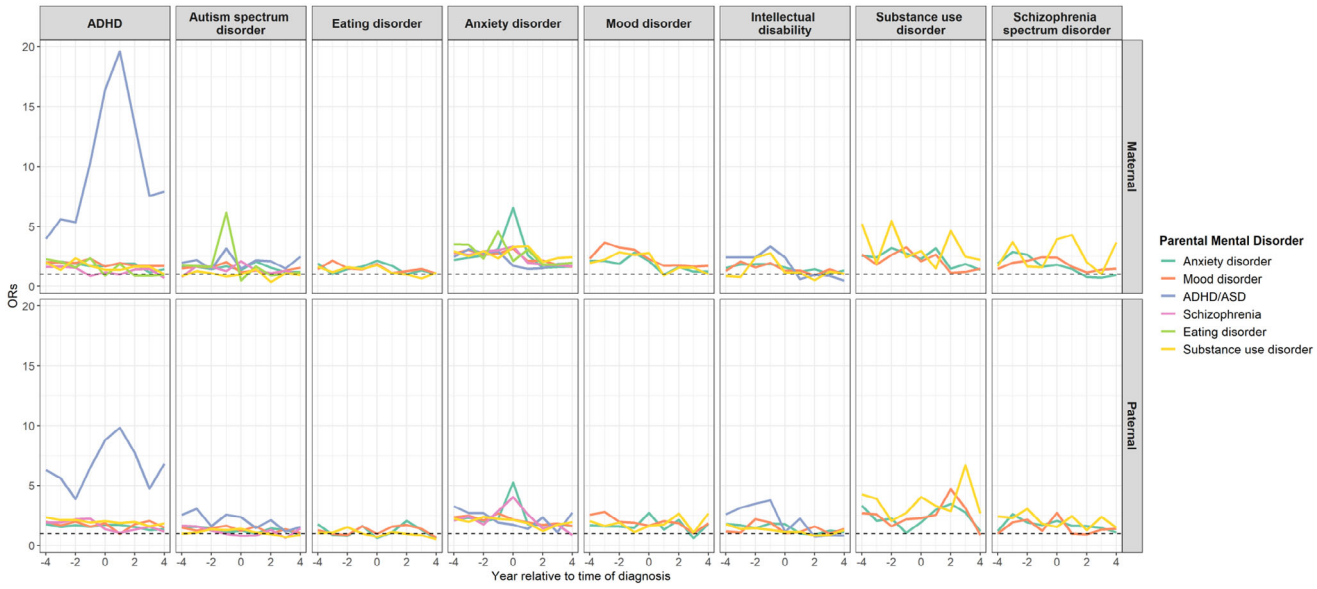


Figure 2 Estimated odds ratios (ORs) for the risk of parental mental disorders before and after the child's diagnosis. Time 0 is the time of diagnosis. Some parents may have been included in more than one analyses (e.g., where they had more than one child diagnosed with the disorder of interest; see number of unique parents included in analysis via Table 2). To comply with Danish legislation related to personally identifiable information, parental mental disorder categories were excluded from analyses when there were <5 individuals at any time point. ADHD, attention-deficit/hyperactivity disorder

disorder type. Across childhood mental disorders, we observed peaks in the incidence of parental mood disorders in the 1–2 years *before* the child's diagnosis and the 1–2 years *after* the child's diagnosis. For parental anxiety disorders, the incidence peaked 1 year after the child's diagnosis among parents of children with ADHD or ASD, while the incidence peaked in the same year the child was diagnosed among parents of children with other mental disorders.

Parental prescriptions

The yearly incidence proportions of parental prescriptions for psychotropic medications are presented in Figure 3 (by category) and stratified by sex of the children in Figure S3 (any parental prescription). Estimated ORs for incident prescriptions for psychotropic medications among parents of children with a mental disorder compared with parents of children without a mental disorder

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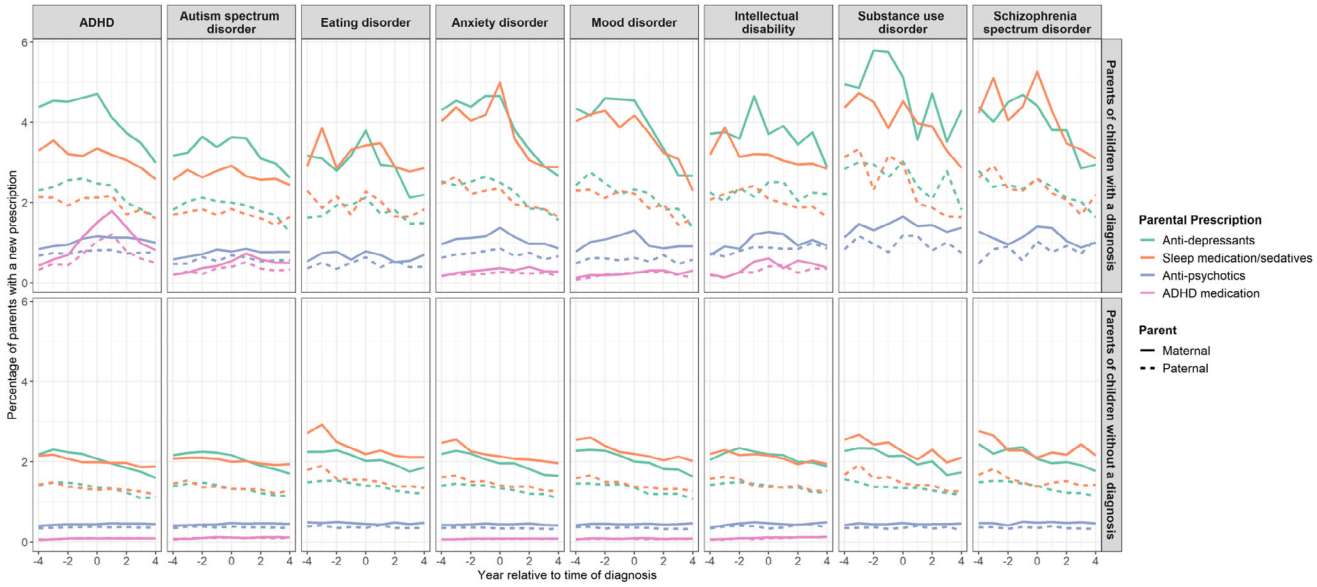


Figure 3 Incidence proportions (%) of parental psychotropic medication use before and after the child's diagnosis. Time 0 is the time of diagnosis. Some parents may have been included in more than one analyses (e.g., where they had more than one child diagnosed with the disorder of interest; see number of unique parents included in analysis via Table 2). To comply with Danish legislation related to personally identifiable information, parental mental disorder categories were excluded from analyses when there were <5 individuals at any time point. ADHD, attention-deficit/hyperactivity disorder

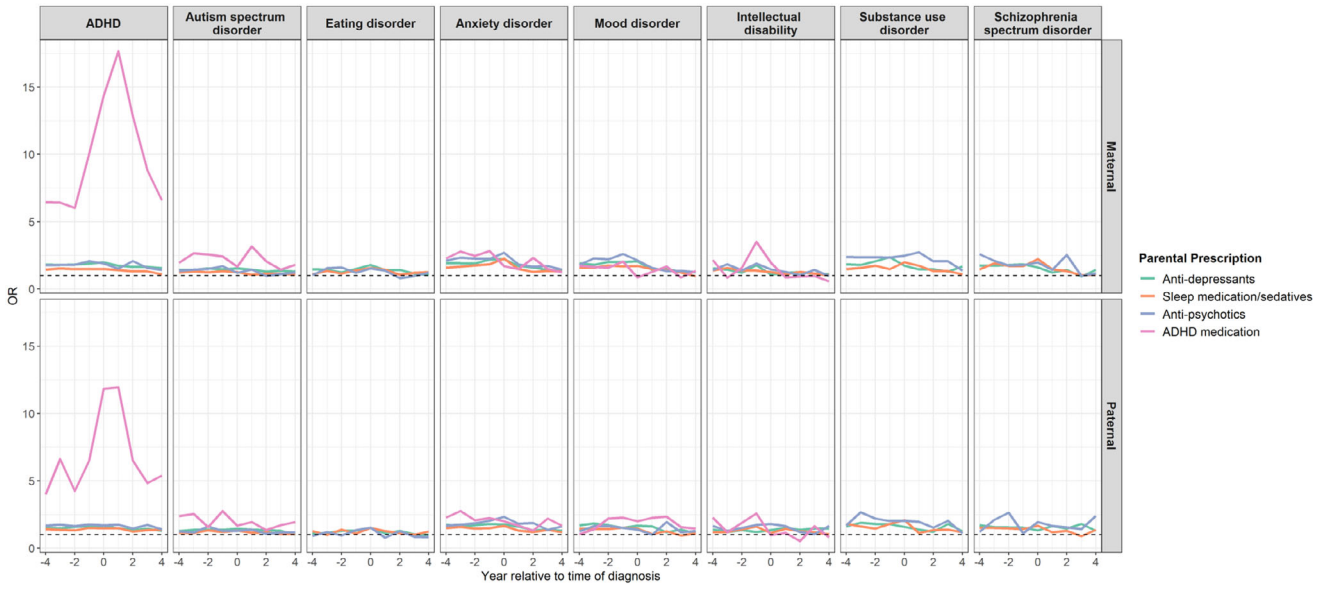


Figure 4 Estimated odds ratios (ORs) for the risk of parental psychotropic medication use before and after the child's diagnosis. Time 0 is the time of diagnosis. Some parents may have been included in more than one analyses (e.g., where they had more than one child diagnosed with the disorder of interest; see number of unique parents included in analysis via Table 2). To comply with Danish legislation related to personally identifiable information, parental mental disorder categories were excluded from analyses when there were <5 individuals at any time point. ADHD, attention-deficit/hyperactivity disorder

diagnose are presented in Figure 4 (by category) and stratified by sex of the children in Figure S4 (any parental prescription). Across childhood mental disorders, the incidence proportions of parental prescriptions were consistently higher in parents of children with mental disorders than parents of children without a mental disorder (with the highest proportions for parents of children with SUDs ranging up to 8.3% in mothers and 4.5% in fathers for receiving any prescription). At most time points, anti-depressant medications were the most common prescription among parents of children with a mental disorder diagnose, which peaks at 5.8% in mothers of children with SUDs, followed by sleep medication/sedatives, which peaks for mothers of children with SSDs at 5.3%. Across childhood mental disorders, the yearly incidence of parental prescription was higher in mothers than in fathers. The stratified analyses did not show differences in association according to sex of the children.

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Compared with parents of children without a mental disorder diagnosis, we observed an elevated risk of any parental prescription for psychotropic medication in most disorder groups both before and after the child's diagnosis in both mothers and fathers. On average, parents of children with mental disorders were twice as likely to be prescribed anti-psychotic medications and anti-depressant medications. Finally, the risk of parental prescriptions for ADHD medication was significantly elevated in most disorder groups especially in parents of children with ADHD (ORs up to 17.7 for mothers and 11.9 for fathers), though the yearly incidence proportions of parental ADHD medication were relatively low.

Timing of parental prescriptions in relation to the child's diagnosis. Whereas the yearly incidence of parental prescriptions steadily decreased over time among parents of children without a mental disorder diagnosis, we observed some steep increases in yearly incidence proportions among parents of children with a mental disorder diagnosis. The decline in yearly incidence among the parents of children without a mental disorder diagnosis indicates a decrease in new users after the age of 30 years. This trend aligns with the peak age of onset of mental disorders, which is typically around 30 years (Pedersen et al., 2014). Across childhood mental disorders, we observed peaks in the incidence of parental prescriptions for sleep medication/sedatives 3 years *before* the child's diagnosis and the same year the child was diagnosed. For parental anti-depressant medications, the incidence peaked 1–2 years *before* the child's diagnosis and the same year the child was diagnosed. Across childhood mental disorders, the incidence of parental prescriptions for anti-psychotic medications generally peaked in the same year the child was diagnosed. Finally, we observed peaks in the incidence of parental prescriptions for ADHD medication 1 year *after* the child's diagnosis among parents of children with ADHD or ASD.

Discussion

This population-based study represents, to our knowledge, the largest longitudinal investigation of psychopathology (including mental disorders and psychotropic medication use) among parents of children with mental disorders. The results provide new knowledge about parental psychopathology in relation to childhood mental disorders other than ADHD, ASD, and ID, which have been the primary focus of past research. In addition, this study examined parental psychopathology among mothers and fathers separately, which revealed novel insights regarding variation between mothers and fathers in the respective peaks in the incidence of mental disorders and prescriptions for certain psychotropic medications. Overall, the results indicate a substantially increased risk of mental disorders and prescriptions for psychotropic medications among parents of children with mental disorders, which is largely consistent with previous studies (Cheung & Theule, 2016; Hayes & Watson, 2013; Meltzer et al., 2011; Montes & Halterman, 2007; Singer, 2006; Theule et al., 2013; Totsika et al., 2011). More specifically, we found that parents of children with a mental disorder diagnosis were—on average—twice as likely to be diagnosed with mood disorders and anxiety disorders. Parents of children with mental disorders also had two times the odds of prescriptions for anti-psychotic and anti-depressant medications.

This study provided several novel insights into the temporal relationships between the child's diagnosis and parental psychopathology. First, the incidence of mood and anxiety disorders among parents of children with mental disorders peaked in the 1–2 years before and after the child's diagnosis. Secondly, we observed several peaks in the incidence of parental prescriptions (particularly for anti-psychotic medications) in the same year the child was diagnosed. In addition, the incidence of anti-depressants and sleep medication/sedatives peaked in the 3 years *before* the child's diagnosis. This pattern is consistent with the years preceding a child's diagnosis being particularly stressful and could indicate that the child's diagnosis provides some relief to the parents (perhaps by means of clarity, insight, labelling, and access to treatment options), consistent with qualitative studies (Craddock & Mynors-Wallis, 2014; Davey et al., 2022; Mitchell & Holdt, 2014; Osborn et al., 2020; Smith-Young et al., 2020). The nature of mental disorders is complex and multifactorial, including environmental, genetic and neurological aspects, hence the mechanisms behind our findings are likely complex.

The results indicate that the yearly incidence of parental psychopathology was often highest in parents of children with SUDs compared with parents of children with other mental disorders. This could be explained by the high psychiatric comorbidity in this group of children with SUDs (see Table 2) as well as the inherent complexity and broader socioeconomic challenges associated with SUDs (e.g., stigma, shame, safety concerns, and legal consequences). Nonetheless, this pattern is consistent with research showing that SUD during adolescence is associated with depression and anxiety in the parents (Lander, Howsare, & Byrne, 2013; Smith & Estefan, 2014). Finally, this study revealed that, across childhood mental disorders, the yearly incidence of parental psychopathology was higher in mothers than in fathers, however, the increase compared to parents of children without a mental disorder diagnosis was similar in mothers and fathers. This pattern highlights that future

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studies should distinguish between mothers and fathers when examining the possible impact of childhood mental disorders.

Strengths and limitations

To the authors' best knowledge, this study represents the first population-based investigation of temporal relationships between a child's diagnosis and incident parental psychopathology. Additional strengths include the matched cohort design to minimize confounding and the use of nationwide register data to reduce selection and reporting biases. Nonetheless, this descriptive study cannot be used to draw conclusions about causation. The study is not without limitations. While it was not within the scope of the current study to examine the role of genetics, we expect that genetics would partly explain the observed associations. The child's diagnosis might also increase parental awareness of symptoms of mental disorders, leading to parents identifying such symptoms in themselves. Parents of children with a mental disorder diagnosis may experience undiagnosed mental disorders to a greater extent than parents of children without a mental disorder diagnosis due to the heritability of mental disorders. Specifically for ASD and ADHD, diagnoses in adulthood do not indicate adulthood onset, as symptoms should have been present since childhood. Furthermore, these temporal associations are likely to be affected by diagnostic delays for childhood and parents mental disorders as well as parents of children with mental disorders being more likely to experience barriers to accessing services (Hansen, Telléus, Mohr-Jensen, & Lauritsen, 2021; Osborn et al., 2020; Reardon et al., 2017). The Danish registers only contain hospital-based diagnoses, which may not capture children and parents with less severe mental disorders, those diagnosed in private settings, and those who do not seek diagnosis. Accordingly, it is likely that the current study has underestimated the risk of psychopathology, especially for parental ADHD and ASD, which among adults in Denmark, are more often diagnosed in private settings. The high prevalence of comorbidity could potentially mask the temporal association. It is well-known that socioeconomic status (SES) can moderate associations between childhood mental disorders and stress-related outcomes in parents (Emerson, 2003; Lindsey & Barry, 2018; Zablotsky, Bradshaw, & Stuart, 2013), in the current study we adjusted for possible confounding from maternal education. Lastly, previous studies have shown that siblings of children with mental disorders and parents of multiple children with mental disorders report increased stress (Caliendo et al., 2020; Krzeczkowski et al., 2022), though it was not within the scope of this study to investigate sibling psychopathology.

Clinical implications

This study indicates that parents of children with mental disorders have an increased risk of psychopathology in the years preceding a child's diagnosis, which underscores the need to provide parents with early intervention and support. Clinical assessment of the child should involve assessment of the parent(s), which could help to identify parental psychopathology at an early stage. Once a child is diagnosed, intervention is often focused exclusively on the child, whereas some attention should be paid to parent capacity building. Clinicians working with parents of children with mental disorders should remain aware of psychopathology in these parents, as the parent's own psychological difficulties could affect their engagement in child-focused intervention and their capacity to implement recommended strategies at home.

Conclusion

Overall, parents of children with mental disorders had a significantly increased risk of psychopathology, including (on average) twice the odds of mood disorders, anxiety disorders, anti-depressant medications, and anti-psychotic medications, compared to parents of children without mental disorders. The incidence of parental mental disorders and prescriptions for psychotropic medications among parents of children with mental disorders peaked in the 3 years before the child was diagnosed. While a child's diagnosis may provide some relief to the parents, early intervention might mitigate parental psychopathology, and enhance parents' capacity to manage the challenges of parenting children with mental disorders.

Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article:

Appendix S1. Results stratified by sex of the children.

Figure S1. Incidence proportions (%) of *any* parental mental disorder before and after the child's diagnosis.

Figure S2. Estimated odds ratios (ORs) with 95% confidence intervals (95% CIs) for the risk of *any* parental mental disorder before and after the child's diagnosis among parents of children diagnosed compared with parents of children without a diagnosis.

Figure S3. Incidence proportions (%) of *any* parental prescription for psychotropic medication before and after the child's diagnosis.

Figure S4. Estimated odds ratios (ORs) with 95% confidence intervals (95% CIs) for the risk of *any* parental prescription for psychotropic medication before and after the child's diagnosis among parents of children with a diagnosis compared with parents of children without a diagnosis.

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The authors have declared that they have no competing or potential conflicts of interest.

Data availability statement

The author elects to not share data, data can be applied for from a Danish institution, and accessed at Denmarks Statistics.

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Key points

- It is essential that we understand the associations between childhood mental disorders and parental psychopathology.
- In this study, parents of children with mental disorders had—on average—twice the odds of mood disorders, anxiety disorders, and prescriptions for anti-depressants and anti-psychotics, than parents of children without the mental disorder of interest.
- The incidence of parental mental disorders and psychotropic medication use peaked in the 1–2 years before and after the child's diagnosis.
- These results indicate that early intervention might mitigate parental psychopathology, and enhance parents' capacity to manage the challenges of parenting children with mental disorders.

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