It is illegal to post this copyrighted PDF on any website. Mother's and Father's Serious Mental Illness and Risk of Child Injury in a Taiwanese Birth Cohort

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ABSTRACT

Objective: Parental serious mental illness (SMI) is associated with childhood injury. This study investigated whether child injury risk differs according to which parent is affected, SMI diagnosis, or timing of SMI onset.

Methods: This cohort study included 1,999,322 singletons born in 2004–2014 identified from the national Taiwanese registries. General estimating equation Poisson models were used to estimate incidence rate ratios (IRRs) of injury events and hospitalizations before the age of 5 years among children according to which parent was affected, SMI diagnosis (schizophrenia [*ICD-9-CM* codes: 295, 297, 298.3, 298.4, 298.9], bipolar disorder [296.00–296.16, 296.40–296.81, 296.89–296.99, 298.1, 648.4], or major depressive disorder [MDD; 296.20–296.36, 296.82, 298.0]), and timing of diagnosis (before or after childbirth, as a proxy of timing of onset). Data analysis was performed on data obtained from April 20, 2017, to May 6, 2020.

Results: Relative to unexposed children, the IRRs of injury hospitalizations for children with two SMI-affected parents, maternal SMI only, and paternal SMI only were 1.85 (95% CI, 1.38–2.48), 1.58 (95% CI, 1.48–1.68), and 1.34 (95% CI, 1.23–1.46), respectively. The IRRs of injury hospitalizations for maternal schizophrenia, bipolar disorder, and MDD were 2.09 (95% CI, 1.82–2.40), 1.77 (95% CI, 1.56–2.00), and 1.38 (95% CI, 1.26–1.50), respectively. The IRRs for paternal schizophrenia, bipolar disorder, and MDD were 1.39 (95% CI, 1.20–1.60), 1.61 (95% CI, 1.39–1.87), and 1.19 (95% CI, 1.05–1.36), respectively. The magnitude of excess risk was similar for children whose parent(s) experienced SMI diagnosed before and after childbirth.

Conclusions: We found children with two SMI-affected parents or at least one parent with schizophrenia or bipolar disorder to be at greatest risk of severe injury requiring hospitalization. These parents may benefit from extra parenting support and injury prevention coaching.

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ental illness is prevalent among adults of childrearing age. Current data show that about 5% of young children have at least one parent with serious mental illness (SMI), including schizophrenia, bipolar disorder, and major depressive disorder (MDD).^{1,2} Research suggests that children of parents with mental illness have increased risk of physical illnesses.³ Biological, behavioral, and environmental factors have been proposed as plausible mechanisms to explain the association between parental mental illness and their children's health.⁴ Carrying out parental roles requires extensive knowledge and skills, including understanding of developmental milestones, child behavior management, problem-solving skills, and effective emergency response.⁵ Parenting is particularly challenging for parents with SMI, who may be compromised by SMI-related symptoms and experience functional impairment. Many parents with SMI have weak social networks and are more likely to be underresourced and experience challenges finding help in times of crisis.⁶

Injury is a leading cause of childhood disability worldwide.⁷ Prior research has shown that parental SMI is associated with early childhood injury.¹ However, few studies have examined whether this risk varies according to which parent is ill, SMI diagnosis, or timing of SMI onset,³ though current literature suggests that parenting competence⁸ and child psychiatric disorders⁹ may differ by these tertiary factors. A Swedish study¹⁰ showed that maternal mental illness was associated with slightly higher child injury risk than paternal mental illness. Since parents often develop distress and guilt following their child's injury¹¹ and family functioning likely also undergoes additional stresses,¹² it is important to understand whether child injury rates are greatest for specific subgroups of parents with SMI.¹³ This knowledge will enable clinicians to target families who require extra parenting support and injury prevention coaching.

The aim of this study was to investigate whether the associations between parental SMI and child injury vary according to which parent had an SMI, specific SMI diagnosis, and timing of SMI onset to better understand the patterns of risk and inform targeted interventions. We evaluated these associations for all injury events that required medical care (inpatient and outpatient) and, separately, for the more severe injuries that required hospitalization. It is illegal to post this copyrighted PDF on any website.

Clinical Points

- Parental serious mental illness (SMI) is associated with childhood injury, but little is known about whether child injury risk varies according to different subgroups of parents with SMI.
- Children with two SMI-affected parents or at least one parent with schizophrenia or bipolar disorder are at greatest risk of severe injury. These parents may benefit from extra parenting support and injury prevention coaching.

METHOD

Data Sources and Study Cohort

Data sources and the development of the cohort have been described in detail previously.¹ Briefly, we identified singleton children born in Taiwan during 2004-2014 using the Maternal and Child Health Database (linkages of parents and children) and the national birth certificate database. We linked these children to parent and child data in several Taiwanese national health databases, including the 1998-2014 National Health Insurance Research Database (NHIRD; sociodemographic data and inpatient/outpatient records from all medical facilities contracted with the Taiwan's National Health Insurance) and the 1998-2014 death certificate database. We excluded children if (1) their ID was unlinkable to the birth certificate or the registry of beneficiaries of the NHIRD or (2) one of their parents' IDs was missing or unlinkable to the registry of beneficiaries (flowchart can be found in our previous study¹). Children were followed from birth to their fifth birthday; December 31, 2014; or date of child death or parent death, whichever came first. To protect confidentiality, identification numbers across databases were encrypted with the same encryption algorithm. This study was approved by the Cathay General Hospital Institutional Review Board and the Taiwan Health and Welfare Data Science Center. Informed consent was waived.

Parental SMI Exposure

We retrieved International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnostic codes for schizophrenia, bipolar disorder, and MDD from parents' outpatient/inpatient records for the 6 years prior to childbirth to 5 years following childbirth (Table 1). An SMI disorder was defined by a diagnosis of these disorders made at least once by a psychiatrist or twice by a nonpsychiatric physician. In the case of multiple SMI diagnoses or diagnoses from multiple sources, the final assignment of SMI diagnosis followed a hierarchy based on source of diagnosis (psychiatrist > non-psychiatric physician) and conventional diagnostic hierarchy (schizophrenia>bipolar disorder > MDD). For example, a person with health care encounters showing bipolar disorder assigned by a nonpsychiatric physician and MDD diagnosis made by a psychiatrist would be classified as having a diagnosis of MDD. The onset of SMI (MDD in this example) would be

psychiatric physician's diagnosis of bipolar disorder).

We used the date of diagnosis as the proxy for the date of onset, which was defined as the date of the first visit with the SMI codes. Once exposed, children continued to be considered exposed until end of follow-up. We derived the following 3 time-dependent exposure variables: (1) number and identity of parent(s) with SMI: neither, mother only, father only or both parents; (2) SMI diagnosis: none, schizophrenia, bipolar disorder or MDD; and (3) timing of SMI diagnosis: none, before childbirth, and after childbirth. The latter two exposure variables were defined separately for mothers and fathers.

Outcomes

The method of assigning outcomes has been described previously.¹ Two injury outcomes were examined (Table 1). The first outcome, "injury events," was derived from all outpatient and inpatient records with ICD-9-CM injury codes. To avoid double-counting of follow-up visits for the same injury as new injury events, all successive visits of the same injury type¹⁴ (Table 1) occurring within 90 days were considered the same event (to account for the likelihood that several medical visits may have resulted from one injury event) as were injury visits of a different injury type recorded within 7 days of an initial injury (to account for single injury events that resulted in multiple injury types).¹⁴ The second outcome, "injury hospitalizations," was defined similarly but limited to injury events that resulted in hospitalization (Table 1).

Covariates

Covariates (Supplementary Table 1) included birth year (3 categories), child sex, child age (5 categories), low birthweight (LBW; <2500 g), preterm birth (<37 weeks), birth order (3 categories), urbanicity of residence (7 categories),¹⁵ parental ages (continuous), mother's marital status (binary), foreign-born mother, monthly family income (5 categories), maternal and paternal occupations (5 categories), spouse's (mother's/father's) SMI, and physical illness (3 categories, defined by Elixhauser comorbidity index that excluded psychiatric disorders).¹ Most of these covariates were measured at the time of the child's birth (for details, see Supplementary Table 1)

Statistical Analysis

We calculated the number of injury events or hospitalizations and person-time at risk for each exposure category. Generalized estimating equation Poisson models with independent correlation structure were employed to estimate adjusted incidence rate ratios (aIRRs) of injury outcomes for children within different exposure categories compared with unexposed children. Models accounted for clustering at the family and child level.¹⁶ Wald-based confidence intervals (CIs) were calculated using robust standard errors.¹⁷ A subset of our covariates (unmarried mother, family income, parental occupation, parental

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Table 1. Definitions of E	xposure variables and Outcomes of Interest
Variable	Details
Parental Serious Mental Illnes	is (SMI)
ICD-9-CM codes	Schizophrenia: 295, 297, 298.3, 298.4, 298.9 Bipolar disorder: 296.00–296.16, 296.40–296.81, 296.89–296.99, 298.1, 648.4 Major depressive disorder (MDD): 296.20–296.36, 296.82, 298.0
lnjury events	We retrieved <i>ICD-9-CM</i> diagnostic codes for schizophrenia, bipolar disorder, and MDD from parents' outpatient/inpatient records for the 6 years prior to childbirth to 5 years following childbirth. An SMI disorder was defined by a diagnosis of these disorders made at least once by a psychiatrist or twice by a non-psychiatric physician. Once exposed, children continued to be considered exposed until end of follow-up
Parent(s) with SMI	Four mutually exclusive categories: none, maternal, paternal, and both If only one parent had SMI, the value was "maternal" or "paternal" after the date of diagnosis for maternal or paternal SMI, respectively. If both parents had SMI, the value was changed to "both" after the date when both parents had SMI
Type of diagnosis for maternal/paternal SMI	Four mutually exclusive categories: none, schizophrenia, bipolar disorder, and MDD This variable was created separately for maternal and paternal SMI. The value was assigned with a diagnosis made at least once by a psychiatrist or twice by a non-psychiatric physician after the date of first visit with the SMI codes. In case of multiple SMI diagnoses or diagnoses from multiple sources, the assignment of SMI diagnosis followed sources of diagnosis and conventional diagnostic hierarchy
Time of diagnosis of maternal/paternal SMI	Three mutually exclusive categories: none, before childbirth, and after childbirth This variable was created separately for maternal and paternal SMI. We used the date of diagnosis as the proxy for the date of onset. If the date of diagnosis occurred prior to childbirth, the value was "before childbirth"; otherwise, the value was "after childbirth" from the date of onset
Child Injury	
ICD-9-CM codes	Injury: 800–999, excluding 905–909.9 (late effects), 958–958.8 (traumatic complications), and 995–999.9 (complications of medical care)
Injury events	We retrieved all outpatient and inpatient records with <i>ICD-9-CM</i> injury codes. Since a child may seek several medical visits for one injury event, all successive visits of the same injury type ¹² occurring within 90 days were considered the same event, as were injury visits of a different injury type recorded within 7 days of an initial injury ¹²
Injury types ¹¹	Fracture skull vault/base: 800–801.9 Fracture skull (apart from vault/base): 802–804.9 Intracranial injury: 850–854.1 Nerve and spinal cord: 950–957.9 Burns: 940–949.9 Fracture neck and trunk: 805–809.9 Fracture upper limb: 810–818.9 Fracture lower limb: 820–827.9, 829–829.9 Multiple fractures of limbs: 819–819.1, 828–828.1 Internal trauma: 860–869.1 Vascular injury: 900–904.9 Crush injury: 925–929.9 Open wounds: 870–897.9 Superficial injuries and contusion: 910–924.9 Dislocations, strains, and sprains: 830–848.9 Foreign body: 930–939.9 Poisoning: 960–989.9
Injury hospitalizations	Injury events resulting in hospitalization

physical illness, child's LBW, and preterm birth) could potentially also serve as mediators of the parental SMI-child injury association. Controlling for these variables could yield overadjusted risk estimates. We therefore provide two sets of bracketed risk estimates. We first adjusted for non-mediating covariates and then adjusted for all of the covariates. In the analysis of our previous study,¹ complex chronic conditions did not result in meaningful confounding of the injury risk estimates; therefore, we did not consider them a confounder in the current analyses. Complete-case analyses were conducted given only 1.6% of children had missing data on the covariates. Pairwise comparison analysis was used to evaluate differences between exposure categories. All analyses were carried out using SAS 9.4 software.¹⁸ Data analysis was performed on data obtained from April 20, 2017, to May 6, 2020.

RESULTS

The study cohort included 1,999,322 Taiwanese singleton children born in 2004–2014 with complete data for themselves and both parents (91% of all singletons).¹ The cohort also included 1,396,277 mothers and 1,401,863 fathers. Children with injury were more likely to be male and less likely to be born prematurely or with LBW, and their parents were more likely to be unmarried or of younger age or have an occupation type of "union members, farmers, and fishermen" or "dependents" (Supplementary Table 2). There were 33,408 children (1.7%) with paternal SMI only, 54,528 children (2.7%) with maternal SMI only, and 2,981 children (0.1%) with two SMI-affected parents (Table 2). Of 36,389 children with paternal SMI, 23,721 (65.2%) had SMI diagnosed before the birth. Of 57,509 children with maternal

For reprints or permissions, contact permissions@psychiatrist.com. ♦ © 2022 Copyright Physicians Postgraduate Press, Inc. J Clin Psychiatry 83:6, November/December 2022 PSYCHIATRIST.COM ■ e3 Table 2. Number of Children in the Study Population With Parental Serious Mental Illness (SMI) by Diagnosis^a

		Paternal Diag	nosis		Subtotal, M Diagno	aternal sis
Variable	Schizophrenia	Bipolar Disorder	MDD	No SMI	n	%
Maternal diagnosis						
Schizophrenia	239	95	137	8,090	8,561	0.43
Bipolar disorder	143	403	309	12,386	13,241	0.66
Major depressive disorder	269	410	976	34,052	35,707	1.79
No SMI	9,140	8,350	15,918	1,908,405	1,941,813	97.12
Subtotal, Paternal Diagnosis						
n	9,791	9,258	17,340	1,962,933		
%	0.49	0.46	0.87	98.18		
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^aTime frame of parent SMI diagnosis was from 6 years prior to childbirth to 5 years following childbirth. Abbreviation: MDD = major depressive disorder.

Table 3. The Associations Between Parental Serious Mental Illness (SMI) and Child Injury, by Number and Identity of SMI-Affected Parent(s)

			Adjusted Incidence Rate Ratio (95% CI)	
Variable	Events	PY	Model 1 ^a	Model 2 ^b
Injury Events				
Both Maternal SMI only Paternal SMI only Unexposed	2,625 52,705 31,821 1,900,226	8,153 175,972 111,543 7,421,280	1.25 (1.19–1.31) 1.15 (1.14–1.17) 1.12 (1.10–1.13) Reference	1.23 (1.17–1.29) 1.15 (1.14–1.16) 1.11 (1.09–1.12) Reference
Injury Hospitalizatio	ns			
Both Maternal SMI only Paternal SMI only Unexposed	55 1,010 584 277,43	8,153 175,972 111,543 7,421,280	1.85 (1.38–2.48) 1.58 (1.48–1.68) 1.34 (1.23–1.46) Reference	1.61 (1.20–2.16) 1.47 (1.38–1.57) 1.28 (1.18–1.39) Reference

^aModel 1 was adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence (non-mediating covariates).

^bModel 2 was adjusted for the variables noted for Model 1 as well as for unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, child's low birthweight, and preterm birth (non-mediating covariates and potential mediators).

Abbreviation: PY = person-years.

SMI, 34,522 (60.0%) had SMI diagnosed before the birth. Children whose parent(s) had SMI were more likely to be born prematurely, have LBW, or have parental characteristics that reflected disadvantage: unmarried; lower family income; occupation type of "union members, farmers, and fishermen" or "unemployed and low-income household"; or physical illness (Supplementary Tables 3–5). Children with two SMI-affected parents and children of parents with schizophrenia were most likely to be disadvantaged (Supplementary Tables 3–4).

Injury Risk by Number and Identity of SMI-Affected Parent(s)

Table 3 summarizes injury risk based on number and identity of SMI-affected parents, and Supplementary Table 6 shows results of the pairwise comparisons of these exposure groups.

Injury events. Relative to unexposed children, children with two SMI-affected parents (aIRR = 1.25; 95% CI, 1.19–1.31), children with maternal SMI only (aIRR = 1.15; 95% CI, 1.14–1.17), and children with paternal SMI only (aIRR = 1.12; 95% CI, 1.10–1.13) had increased rates of injury events after adjusting for non-mediating covariates (Model 1). Adjustment for the remaining

potentially mediating covariates had minimal effects on the results (Model 2). In pairwise comparisons, after adjusting for the non-mediating covariates (Model 1), children with two SMI-affected parents had a greater rates of injury events than those with maternal SMI only (aIRR=1.08; 95% CI, 1.03–1.14) and those with paternal SMI only (aIRR=1.12; 95% CI, 1.06–1.18). Children with maternal SMI only had a greater rate than those with paternal SMI only (aIRR=1.04; 95% CI, 1.02–1.05).

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Injury hospitalizations. The adjusted IRR of injury hospitalization was greatest for children with two SMI-affected parents (aIRR = 1.85; 95% CI, 1.38–2.48), followed by those with maternal SMI only (aIRR = 1.58; 95% CI, 1.48–1.68) and those with paternal SMI only (aIRR = 1.34; 95% CI, 1.23–1.46; Model 1). In pairwise comparisons, children with two SMI-affected parents had an increased but nonsignificant rate of injury hospitalization compared to those with maternal SMI only (aIRR = 1.17; 95% CI, 0.87–1.58) and a significantly higher rate compared to those with paternal SMI only (aIRR = 1.38; 95% CI, 1.02–1.87; Model 1). Children with maternal SMI only (aIRR = 1.18; 95% CI, 1.06–1.31).

Injury Risk by Parental SMI Diagnosis

Table 4 shows injury risk according to parental SMI diagnosis, and Supplementary Table 7 provides the results of pairwise comparisons.

Injury events. Children of mothers with schizophrenia (aIRR = 1.19; 95% CI, 1.16–1.22), bipolar disorder (aIRR = 1.17; 95% CI, 1.14–1.19), or MDD (aIRR = 1.14; 95% CI, 1.13–1.16; Model 1) had greater rates of injury events compared to children of mothers without SMI. In pairwise comparisons, the only significant difference was found between children of mothers with schizophrenia relative to children of mothers with MDD (aIRR = 1.04; 95% CI, 1.01–1.07). Children of fathers with schizophrenia (aIRR = 1.14; 95% CI, 1.11–1.17), bipolar disorder (aIRR = 1.14; 95% CI, 1.11–1.17), or MDD (aIRR = 1.10; 95% CI, 1.11–1.12), or MDD (aIRR = 1.10; 95% CI,

Table 4. The Associations Between Parental Serious Mental Illness (SMI) and Child Injury, by SMI Diagnosis

			Adjusted Incidence Rate Ratio (95% CI)	
Variable	Events	PY	Model 1 ^a	Model 2 ^b
Injury Events				
Maternal Schizophrenia Bipolar disorder Major depression	8,925 12,421 33,984	28,936 41,000 114,155	1.19 (1.16–1.22) 1.17 (1.14–1.19) 1.14 (1.13–1.16)	1.17 (1.14–1.21) 1.16 (1.13–1.18) 1.14 (1.12–1.15)
Unexposed Paternal Schizophrenia Bipolar disorder Major depression Unexposed	1,932,047 10,237 8,545 15,664 1 952 931	7,532,857 35,437 29,136 55,114 7 597 262	Reference 1.14 (1.11–1.17) 1.14 (1.11–1.17) 1.10 (1.08–1.12) Reference	Reference 1.13 (1.10–1.16) 1.12 (1.09–1.15) 1.09 (1.07–1.11) Reference
Injury Hospitalizations	s	.,		
Maternal Schizophrenia Bipolar disorder Major depression Unexposed	232 262 571 28.327	28,936 41,000 114,155 7.532.857	2.09 (1.82–2.40) 1.77 (1.56–2.00) 1.38 (1.26–1.50) Reference	1.87 (1.63–2.16) 1.63 (1.44–1.85) 1.28 (1.18–1.40) Reference
Paternal	20,527	7,552,657	herefellee	herefeltet
Schizophrenia Bipolar disorder Major depression Unexposed	211 182 246 28,753	35,437 29,136 55,114 7,597,262	1.39 (1.20–1.60) 1.61 (1.39–1.87) 1.19 (1.05–1.36) Reference	1.28 (1.11–1.48) 1.48 (1.28–1.72) 1.14 (1.01–1.30) Reference

^aModel 1 was adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence (non-mediating covariates).

^bModel 2 was adjusted for the variables noted for Model 1 as well as for unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, spouse's (mother's/father's) serious mental illness, child's low birthweight, and preterm birth (non-mediating covariates and potential mediators).

Abbreviation: PY = person-years.

Table 5. The Associations Between Parental Serious Mental Illness (SMI) and Child Injury, by Timing of Diagnosis of SMI

			Adjusted Incidence Rate Ratio (95% CI)	
Variable	Events	PY	Model 1 ^a	Model 2 ^b
Injury Events				
Maternal				
Before childbirth	39,318	131,444	1.16 (1.14–1.17)	1.15 (1.13–1.16)
After childbirth	16,012	52,647	1.16 (1.14–1.18)	1.15 (1.13–1.17)
Unexposed	1,932,047	7,532,857	Reference	Reference
Paternal				
Before childbirth	26,427	92,503	1.12 (1.10–1.14)	1.11 (1.09–1.12)
After childbirth	8,019	27,184	1.13 (1.10–1.16)	1.12 (1.09–1.15)
Unexposed	1,952,931	7,597,262	Reference	Reference
Injury Hospitalization	IS			
Maternal				
Before childbirth	748	131,444	1.58 (1.46–1.70)	1.46 (1.35–1.58)
After childbirth	317	52,647	1.58 (1.41–1.77)	1.46 (1.30–1.64)
Unexposed	28,327	7,532,857	Reference	Reference
Paternal				
Before childbirth	485	92,503	1.32 (1.20–1.45)	1.23 (1.12–1.35)
After childbirth	154	27,184	1.48 (1.25–1.74)	1.41 (1.20–1.66)
Unexposed	28,753	7,597,262	Reference	Reference

^aModel 1 was adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence (non-mediating covariates).

^bModel 2 was adjusted for the variables noted for Model 1 as well as for unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, spouse's (mother's/father's) serious mental illness, child's low birthweight, and preterm birth (non-mediating covariates and potential mediators).

Abbreviation: PY = person-years.

ted PDF on any website 1.08–1.12) had greater rates of injury events compared to children of fathers without SMI. In pairwise comparisons, children of fathers with schizophrenia (aIRR = 1.04; 95% CI, 1.01-1.07) and children of fathers with bipolar disorder (aIRR = 1.03; 95% CI, 1.00-1.07) both had slightly greater rates compared to children of fathers with MDD.

Injury hospitalizations. Children of mothers with schizophrenia (aIRR = 2.09; 95% CI, 1.82–2.40), bipolar disorder (aIRR = 1.77; 95% CI, 1.56–2.00), or MDD (aIRR = 1.38; 95% CI, 1.26–1.50; Model 1) were at greater risk of injury hospitalizations compared to children of mothers without SMI. In pairwise comparisons, children of mothers with schizophrenia had a marginally significantly increased rate relative to children of mothers with bipolar disorder (aIRR = 1.18; 95% CI, 0.98–1.42) and a greater rate relative to children of mothers with MDD (aIRR = 1.52; 95% CI, 1.29–1.79). Children of mothers with bipolar disorder (aIRR = 1.28; 95% CI, 1.11–1.49) were at greater risk than children of mothers with MDD.

Similarly, children of fathers with schizophrenia (aIRR = 1.39; 95% CI, 1.20–1.60), bipolar disorder (aIRR = 1.61; 95% CI, 1.39–1.87), or MDD (aIRR = 1.19; 95% CI, 1.05–1.36) were at greater risk compared to children of fathers without SMI. In pairwise comparisons, children of fathers with schizophrenia had a lower but nonsignificant rate relative to those of fathers with bipolar disorder (aIRR = 0.86; 95% CI, 0.71–1.04) and a marginally significantly increased rate relative to those of fathers with MDD (aIRR = 1.16; 95% CI, 0.96–1.41). Children of fathers with bipolar disorder risk than those of fathers with MDD (aIRR = 1.35; 95% CI, 1.11–1.64).

Injury Risk by Timing of Diagnosis of Parental SMI

Table 5 shows injury risk according to timing of diagnosis. Relative to children with unaffected mothers, the aIRR of injury events for when mothers' SMI was diagnosed before childbirth was 1.16 (95% CI, 1.14–1.17). The risk estimate was of similar magnitude compared to when mothers' SMI was diagnosed after childbirth (aIRR = 1.16; 95% CI, 1.14–1.18). For paternal SMI, the risks of injury events were also similar for diagnoses made before and after childbirth. The aIRRs of injury hospitalizations were also comparable between illness diagnosed before and after childbirth for both maternal SMI and paternal SMI (Supplementary Table 8).

DISCUSSION

Key Findings

Our prior work demonstrated that young children of parents with SMI have increased injury risk.¹

For reprints or permissions, contact permissions@psychiatrist.com. ♦ © 2022 Copyright Physicians Postgraduate Press, Inc. J Clin Psychiatry 83:6, November/December 2022 PSYCHIATRIST.COM ■ e5 **It is illegal to post this copy** This study, building upon our previous work, showed that child injury risk, especially of severe injury requiring hospitalization, differed by which parent was affected and parental SMI diagnosis, but did not differ by timing of parental SMI diagnosis made relative to childbirth.

We found increased rates of child injury events and hospitalizations regardless of which parent was affected by SMI. Coping with mental illness and young children in the household can overwhelm either parent's abilities and the functioning and health of the family. Children were more likely to sustain injuries when the mother had SMI compared to when the father had SMI. Prior studies have found that maternal SMI had stronger associations with adverse child outcomes than paternal SMI, including a study of disruptive caregiving for children in Denmark¹⁹ and a study of early childhood mortality in Taiwan.²⁰ A Swedish study¹⁰ also suggested that child injury risk associated with maternal mental illness was greater than with paternal illness. The greater risk of adverse outcomes observed for children of mothers with SMI may reflect that mothers shoulder more childcare responsibilities. While mothers may be able to provide support to children when fathers have SMI, fathers may have relatively fewer skills to compensate when mothers are ill. We found that injury risk was greater among children with two SMI-affected parents relative to children with one affected parent. Ensuring the health and safety of the children will be especially difficult if both parents suffer from SMI. A similar pattern was found in a study of postneonatal death among children with SMI-affected parents.²¹

As for SMI diagnoses, our findings suggest that the excess risk of child injury hospitalizations for maternal schizophrenia was greater than for maternal bipolar disorder, which in turn was greater than for maternal MDD. Previous studies also reported specific SMI diagnoses to have different impacts on family functioning.^{19,22} For example, Danish children of parents with schizophrenia had the greatest risk of being placed in out-of-home care¹⁹ and of experiencing family dissolution²² compared to children of parents with bipolar disorder or MDD. Our study did not find that child injury risk in fathers with schizophrenia was greater than in fathers with bipolar disorder. It is possible that fathers with schizophrenia were less likely to be involved in childcare than fathers with bipolar disorder. Nevriana et al¹⁰ found that parental schizophrenia was not associated with a greater child injury risk relative to parental bipolar disorder or MDD. The results from that earlier Swedish report may differ from ours due to differences in SMI or injury assessment or regional factors.

In this study, we considered the date of SMI diagnosis as the date of onset of SMI. Contrary to our expectations, child injury risk did not differ based on whether parental SMI diagnosis was made prior to or following childbirth. Research suggests that people typically do not seek care and receive a diagnosis until months or even years after the onset of symptoms.^{23–25} Additionally, using date of diagnosis in the health data to define onset timing could have generated non-differential misclassification of SMI onset, thereby **attenuating true effects.** An alternative explanation is that treatment had minimal effects on functional impairment^{26,27} or patients had treatment noncompliance, such that the adverse impact on parenting ability endured during and after treatment.

Our results demonstrated that both maternal SMI and paternal SMI influenced the injury risk of children. We observed the strongest child injury risk was among children for whom both parents had SMI, particularly for the more severe outcome of injury hospitalizations. The type of SMI diagnosis also modified injury risk, as children of parents with schizophrenia or bipolar disorder were at greater risk than children with of parents with MDD. These findings highlight the importance of recognizing the injury risk, especially of severe injury requiring hospitalization, associated with parental SMI and the need to provide parenting support and injury-prevention education for parents with SMI. Provision of home-visit programs^{28,29} or wraparound services³⁰ that include developing crisis plans, mapping social resources, and parenting skill training may serve to reduce child injury risk in this population.

Our study has several strengths that made it opportune for addressing the study questions. The NHIRD had universal coverage of the Taiwan population across types of treatment settings. Missing data were minimal, and linkage of records across national databases enabled us to adjust for key covariates. Registration and data quality are regularly examined by the audit committees of Taiwan NHI, thereby ensuring validity and consistency of the claims data. However, there were also limitations. We excluded multiplebirth children and children without complete data (12.0% of the children [n = 273,461] were excluded).¹ Approximately half of the excluded children were born to unmarried mothers, who were more likely than married mothers to have SMI.¹ Since single mothers with SMI encounter more parenting challenges,³¹ our study likely underestimates the strength of the associations between SMI and child injury. Our results may not be generalizable to children of multiple births, or populations outside of Taiwan, although they likely reflect the experiences of parents with SMI in other countries.

SMI diagnoses could have been misclassified given that they were assigned by different practitioners that included psychiatrists and non-psychiatric physicians. To improve diagnostic accuracy, we prioritized diagnoses made by psychiatrists, from whom 94% of parental SMIs were determined. Nevertheless, because mental illnesses are underdiagnosed in general, even a system with almost complete capture of a population's health care, like the NHIRD, would be expected to underestimate the occurrence of parent SMI in the population.^{32,33} Child injury could also be subject to misclassification. These factors might have resulted in underreporting of injury events. Some children with injuries might not have received medical care. Also, to avoid overcounting events, we used a 90-day clear zone, a maximum period for a return visit for medical treatment to define a single injury event. This approach could yield

It is illegal to post this cor an undercount of events that occur in quick successi However, for the outcome of injury hospitalizations, it is highly likely that a child who had serious injury would have been admitted to a hospital, reducing any misclassification for that outcome. If the underdiagnosis of parental SMI and imperfect ascertainment of child injury were non-differential (unrelated), this would be expected to bias the parental SMI-child injury association toward the null.^{34,35} The study findings may be biased insofar as parents who are treatment seekers differ from parents who do not seek treatment. Our prior work found that Taiwanese children of parents with and without SMI had similar patterns in their use of preventive health care,¹ suggesting that differential misclassification due to parents' differences in service utilization may be minimal.

Finally, we were not able to assess and consider symptom severity, functional impairment, and course of mental illness based on the NHIRD data. Since we could not account for these factors, we did not evaluate whether parent medication treatment decreased child injury risk due to concern over possible confounding by indication. We also did not capture all of the important factors that contribute to child injury risk, for example, social support,^{36,37} parent education,³⁸ psychiatric comorbidity, substance abuse, and domestic violence.39

Our findings suggest young children whose parents had SMI, particularly those with two SMI-affected parents or parents with schizophrenia or bipolar disorder, were at greatest injury risk, especially of more severe injury requiring hospitalization. Clinicians working with young children of SMI-affected parents or adults of childbearing age with SMI should be mindful of the increased risks identified. Supportive programs that are designed for parents with SMI and include home visitation, injury reduction education, and multisystemic wraparound support involving both child and adult service systems may reduce some of the burdens on parents with SMI and reduce child injury risk. Future research is needed to elucidate caregiving challenges and needs of parents with SMI; to evaluate whether comorbid psychiatric diagnoses, treatment, or side effects of psychotropic medications also influence child injury risk; and to shed light on the mechanisms of risk to best develop effective, evidencebased interventions. Observational or experimental studies may elucidate how injury prevention education or specific treatment regimens affect parenting practices and child outcomes among parents with SMI.

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Supplementary Material

THE OFFICIAL JOURNAL OF THE AMERICAN SOCIETY OF CLINICAL PSYCHOPHARMAC

- Article Title: Mother's and Father's Serious Mental Illness and Risk of Child Injury in a Taiwanese Birth Cohort
- Author(s): Shiow-Wen Yang, MD, PhD; Mary A. Kernic, PhD, MPH; Beth A. Mueller, MPH, DrPH; Gregory E. Simon, MD, MPH; Kwun-Chuen Gary Chan, PhD; and Ann Vander Stoep, PhD
- DOI Number: https://doi.org/10.4088/JCP.21m14214

List of Supplementary Material for the article

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- 2. <u>Table 2</u> Characteristics of children with and without injury, 2004-2014
- 3. <u>Table 3</u> Characteristics of children stratified by which parent(s) had serious mental illness
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- 6. <u>Table 6</u> Pairwise comparisons of injury risk for number and identity of parent(s) with serious mental illness
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Supplementary Table 1 Definitions of Covariates

Туре	Classification of variable
cs	
Categorical	Three categories: 2004-2007, 2008-2010, and 2011-2014 Child's birthdate in the registry of beneficiaries of the National Health Insurance Research Database (NHIRD)
Binary	Female or male Child's sex in the registry of beneficiaries
Binary	Yes (<2,500 g), no Birthweight variable in the birth certificate
Binary	Yes (<37 weeks), no Gestational age variable in the birth certificate
Categorical	Three categories: 1, 2, 3+ Sequence of live births in the child-mother pairs in the MCHD and/or the registry of beneficiaries of 2000-2014
Categorical Continuous	Descriptive analyses: categorical Maternal age<20, 20–24, 25–29, 30–34, 35-39 and 40+ years Paternal age<25, 25–29, 30–34, 35-39, 40-44 and 45+ years Multivariable regression: continuous variables centered at the means: 33 and 30 years for father and mother, respectively. Calculated from parent's and child's birthdates retrieved from the registry of beneficiaries
Binary	Yes, no Missing or unknown father's household location in the birth certificate
Binary	Taiwan, foreign-born Defined by using mother's original and current nationality in the birth certificate or whether a mother had a foreign ID in the registry of beneficiaries
Binary	Yes, no Whether the spouse had serious mental illness (schizophrenia, bipolar disorder, and major depressive disorder) prior to childbirth; measured from outpatient and inpatient records of the NHIRD in the period from 6 years prior to childbirth to childbirth
Categorical	Seven categories: cluster 1 highest urbanicity and cluster 7 least urbanicity. Mother's current residence recorded in the birth certificate Urbanicity clusters were derived by cluster analysis using five variables measured in 2005^{1} : population density, proportion of people with \geq educational levels of college (16-years education), proportion of people > 65, proportion of agricultural workers, and number of physicians per 100,000 people
Categorical	Five categories Divided monthly family income into five income groupings according to the quintiles of the year that a child was born. Data were retrieved from the year of the child's birth of the registry of beneficiaries. If there were no data in that year, data were retrieved from the following year.
Categorical	Five categories: (1) civil servants, teachers; (2) Employees, employers, and professionals; (3) union members ^a , farmers or fishermen; (4) the unemployed or low-income households; and (5) dependents ^b Data were retrieved from the year of the child's birth of the registry of beneficiaries. If there were no data in that year, data were retrieved from the following year.
5	
Categorical	Three categories: 0, 1, >1 Measured from outpatient and inpatient records of the NHIRD in the 12 months preceding the child's birthdate
	Type Categorical Binary Binary Categorical Categorical Binary Binary Binary Categorical Categorical Categorical Categorical

^a "Union members" refers to workers of the same occupation in the same city or county who organized and participated in an occupational union. Occupational unions are initially developed as insurance agents for (1) self-employed workers or workers who have no definite employer, (2) employees working in small businesses where there are fewer than 10 employees, and (3) small business owners. The occupation types for occupational unions vary a lot, from farming, fishing, mining, transportation, tourism and catering industry, construction and engineering, news advertising industry, and culture and recreational industry, etc.

^b Unemployed married persons joined the national health insurance Program as dependents of their spouses.

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	Without injury (n=917,258) %With injury (n=1,082,064) %			
Male	49.2	54.6		
Birthweight <2500 grams	6.2	5.6		
Gestational age <37 weeks	7.0	6.9		
Father's age at birth (years) ^a				
<25	4.4	5.7		
25–29	19.7	23.8		
30–34	38.4	38.2		
35-39	25.6	22.6		
≥ 40	11.9	9.8		
Mother's age at birth (years)				
<20	1.5	2.0		
20–24	11.4	14.6		
25–29	31.3	35.6		
30–34	38.5	34.7		
≥35-39	17.3	13.1		
Unmarried mother	3.0	3.4		
Foreign-born mother	10.0	9.6		
Urbanicity of residence ^a				
1 (highest urbanicity)	21.6	19.1		
2	32.6	32.0		
3	23.6	23.6		
4	13.7	14.9		
5	1.4	1.9		
6	3.1	3.7		
7	3.9	4.8		
Family income ^a				
High	20.8	19.6		
Upper-middle	20.1	20.1		
Middle	20.6	22.1		
Lower-middle	19.7	20.8		
Low	18.8	17.5		
Father's occupation ^a				
Civil servants and teachers	5.6	5.8		
Employees, employers, and professionals	76.4	74.6		
Union members, farmers, and fishermen ^b	4.8	6.2		
The unemployed and low-income household	10.1	10.0		
Dependents ^c	3.1	3.4		
Mother's occupation ^a				
Civil servants and teachers	5.5	5.4		
Employees, employers, and professionals	64.6	61.6		
Union members, farmers, and fishermen	3.0	3.9		
The unemployed and low-income household	7.0	6.6		
Dependents ^c	20.0	22.4		
Father's EI (≥ 1)	6.3	6.4		
Mother's EI (>1)	4.6	4 3		

Supplementary Table 2 Characteristics of children with and without injury, 2004-2014

^a Missing data: Father's age (n=1 without injury, 0 with injury); Urbanicity of residence (n=9 without, 4 with); Family income (n=1,392 without, 2,645 with); Father's occupation (n= 11,830 without, 16,171 with); Mother's occupation (n= 3,564 without, 4,959 with)

^b "Union members" refers to workers who organized and participated in an occupational union. Occupational unions are initially developed as insurance agents for (1) self-employed workers or workers who have no definite employer, (2) employees working in small businesses where there are fewer than 10 employees, and (3) small business owners. The occupation types for occupational unions vary a lot, from farming, fishing, mining, transportation, tourism and catering industry, construction and engineering, news advertising industry, and culture and recreational industry, etc.

^c Unemployed married persons joined the national health insurance program as dependents of their spouses.

Abbreviation: EI: Elixhauser index

	Neither parent with	Both parents with	Mothers with SMI Fathers with SMI		
	SMI (%)	SMI (%)	(%)	(%)	
	(n=1,908,405)	(n=2,981)	(n=54,528)	(n=33,408)	
Male	52.1	51.8	3 52.2	52.2	
Birthweight <2500 grams	5.8	8.6	5 7.7	6.5	
Gestational age <37 weeks	6.9	10.4	9.6	7.5	
Father's age at birth (years) ^a					
<25	5.0	9.4	4 6.6	10.2	
25–29	21.9	22.7	7 23.8	21.7	
30–34	38.5	29.8	35.6	31.4	
35-39	24.0	22.9	9 22.6	22.9	
≥40	10.7	15.2	2 11.4	13.9	
Mother's age at birth (years)					
<20	1.7	3.1	2.3	4.0	
20–24	12.9	18.8	3 15.4	20.9	
25–29	33.6	32.3	3 33.5	31.9	
30–34	36.7	29.0) 33.5	29.0	
>35	15	16.9) 15.3	14.2	
Unmarried mother	3.0	10.6	5 7.1	6.0	
Foreign-born mother	9.7	7.7	7 4.4	19.0	
Urbanicity of residence ^a					
1 (highest urbanicity)	20.3	21	196	197	
2	32.2	35.6	5 34 7	33.2	
3	23.7	21.2	7 22.2	21.9	
<u>з</u> 4	14 4	12.5	R 14.3	15.0	
	17.4	12.0	$\frac{14.5}{16}$	13.0	
5	3.5	1.0	7 36	2.1	
7	5.5	3.4	5 40	5.0 1 1	
Family income ^a	7.7	5	Э	т.т	
High	20.4	0 /	1 147	13 3	
Upper middle	20.4) 13 (14.7	13.3	
Middle	20.3	13.0	1 21.2	14.3	
Lower middle	21.5	10	$\frac{1}{21.2}$	19.2	
Lower-Inidule	20.2	25.2	2 22.1	24.3	
LOW Eather's accuration ^a	17.7	55.5	23.1	29.0	
Civil company and teachers	57	1 -	7 55	1 9	
Environments and teachers	3.7	4.	5.5	4.8	
Employees, employers, and	75.8	58.6	5 70.4	64.2	
professionals					
Gishowsow	5.5	7.6	6.0	7.6	
The second secon					
I ne unemployed and low-income	9.8	23.5	5 14.4	18.3	
household	2.2	<i>-</i>	2.0	5.1	
Dependents	3.2	5.0	5.8	5.1	
Mother's occupation ^a					
Civil servants and teachers	5.5	2.6	4.3	4.5	
Employees, employers, and	63.4	45.7	7 53.1	53.5	
professionals					
Union members, farmers, and	35	4 1	4 2	32	
fishermen	5.5			5.2	
The unemployed and low-income	6.5	22 () 14.1	10.7	
household	0.5	22.0	, 17.1	10.7	
Dependents	21.1	25.7	7 24.2	28.1	
Father's EI (≥ 1)	6.3	14.9	9 6.7	13.3	
Mother's EI (≥ 1)	4.4	7.7	7 7.1	4.4	

Supplementary Table 3 Characteristics of children stratified by which parent(s) had serious mental illness

^a Missing data: Father's age (n=1 paternal SMI); Urbanicity of residence (n=13 neither parent with SMI); Family income (n=3,761 neither parent with SMI, 12 both parents with SMI, 181 maternal SMI, 83 paternal SMI); Father's occupation (n=26,656 neither parent with SMI, 45 both parents with SMI, 893 maternal SMI, 407 paternal SMI); Mother's occupation (n=8,006 neither parent with SMI, 17 both parents with SMI, 304 maternal SMI, 196 paternal SMI) Abbreviation: EI: Elixhauser index; SMI: serious mental illness

	Without SMI	Bipolar disorder	Major depression	Schizophrenia
	(%)	(%)	(%)	([•] ⁄%)
Paternal SMI	n= 1,962,933	n= 9,258	n= 17,340	n= 9,791
Male	52.1	53.1	52.0	51.8
Birthweight <2500 grams	5.9	7.0	6.3	6.9
Gestational age <37 weeks	6.9	7.9	7.6	8.0
Father's age at birth (years) ^b				
<25	5.0	8.7	10.9	10.0
25–29	21.9	22.3	21.3	22.2
30–34	38.4	32.7	31.5	29.6
35-39	24.0	22.6	23.2	22.6
≥ 40	10.7	13.8	13.2	15.6
Mother's age at birth (years)				
<20	1.7	3.4	3.8	4.7
20–24	13.0	18.5	17.6	28.4
25–29	33.6	32.6	31.6	32.1
30–34	36.6	30.5	31.2	23.7
>35	15	15	15.9	11.2
Unmarried mother	3.1	6.9	6.1	6.3
Foreign-born mother	9.6	15.2	11.2	33.1
Urbanicity of residence ^a				
1 (highest urbanicity)	20.3	21.0	20.5	17.5
2	32.3	33.2	35.7	29.4
3	23.6	21.7	21.6	22.4
<u>л</u>	25.6 14 4	14.8	13.4	17.2
5	17	14.0	13.7	32
6	3.5	3.8	3.2	5.0
7	5.5	3.0	5.2 / 1	. 5.0 5.3
Family income ^a	4.4	5.7	4.1	5.5
High	20.3	12.5	17.2	5 9
Unper middle	20.3	12.5	17.2	2 0.9
Middle	20.2	20.1	10.0	18.0
Lower middle	21.3	20.1	19.2	20.7
Lower-Indule	20.2	23.4	21.0	25.1
Eow Fother's occupation ^a	17.9	50.1	20.2	. 50.0
Civil servents and teachers	57	4.4	6 1	2.0
Employees employees and professionals	J.1 75 7	4.4	0.1	2.9
Linion members, formers, and fisherman	13.1	05.7	07.9	y 30.3 11.7
The uncomplement and low income household	5.5	/.3	5.4 15 c	- 11./
The unemployed and low-income nousehold	9.9	19.3	15.0	23.7
Dependents Mathem?	5.5	5.2	5.0	5.2
Civil execution	5 5	4 5	E 4	2.2
Civil servants and teachers	5.5	4.5	5.4	- 2.3
Employees, employers, and professionals	63.1	54.1	57.4	43.5
Union members, farmers, and fishermen	3.5	3.3	3.1	3./
The unemployed and low-income household	6.7	12.4	10.7	12.7
Dependents	21.2	25.8	23.5	37.7
Father's EI (≥ 1)	6.3	14.3	12.6	14
Mother's El (≥ 1)	4.4	5.1	4.6	4.4
Maternal SMI	n= 1,941,813	n= 13,241	n= 35,707	n= 8,561
Male	52.1	51.2	52.7	51.6
Birthweight <2500 grams	5.8	8.5	7.1	9.4
Gestational age <37 weeks	6.9	9.9	9.1	11.2
Father's age at birth (years) ^b				
<25	5.0	6.8	6.9	5.9
25–29	21.9	23.5	24.7	20.3
30–34	38.4	34.9	36.0	32.8
35-39	24.0	22.8	22.2	24.1

Supplementary Table 4 Characteristics of children stratified by diagnosis of parental serious mental illness

4

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	Without SMI	Bipolar disorder	Major depression	Schizophrenia
	(%)	(%)	(%)	([•] ⁄%)
≥40	10.7	11.9	10.2	16.9
Mother's age at birth (years)				
<20	1.8	2.4	2.3	2.4
20-24	13.1	15.5	15.2	17.2
25–29	33.6	33.4	33.8	32.0
30–34	36.6	33.1	33.7	32.0
≥35	15	15.6	15	16.4
Unmarried mother	3.1	8.2	6.8	8.3
Foreign-born mother	9.9	3.8	3.9	8.6
Urbanicity of residence ^b				
1 (highest urbanicity)	20.3	21.0	19.6	18.2
2	32.2	34.2	36.2	29.6
3	23.7	22.4	21.8	23.6
4	14.4	13.7	14.0	16.1
5	1.7	1.5	1.5	2.1
6	3.5	3.5	3.3	5.0
7	4.4	3.8	3.7	5.5
Family income ^b				
High	20.3	12.3	16.7	8.5
Upper-middle	20.2	15.8	17.7	13.5
Middle	21.4	21.4	21.1	20.5
Lower-middle	20.2	22.7	21.3	25.3
Low	17.9	27.9	23.3	32.2
Father's occupation ^b				
Civil servants and teachers	5.7	5.0	5.9	4.1
Employees, employers, and professionals	75.6	68.7	71.3	65.3
Union members, farmers, and fishermen	5.5	6.1	5.6	7.8
The unemployed and low-income household	9.9	16.1	13.4	19.0
Dependents	3.3	4.0	3.8	3.8
Mother's occupation ^b				
Civil servants and teachers	5.5	4.0	4.7	2.6
Employees, employers, and professionals	63.3	51.7	55.7	42.2
Union members, farmers, and fishermen	3.5	4.2	3.9	5.4
The unemployed and low-income household	6.6	16.4	13.0	18.3
Dependents	21.2	23.8	22.8	31.5
Father's EI (≥ 1)	6.4	7	6.9	8
Mother's EI (≥ 1)	4.4	8.4	6.6	7.1

^a Missing data: Father's age (n=1 paternal schizophrenia); Urbanicity of residence (n=13 without paternal SMI); Family income (n=3,942 without paternal SMI, 27 paternal bipolar disorder, 46 paternal major depression, 22 paternal schizophrenia); Father's occupation (n=28,001, 27,549 without paternal SMI, 111 paternal bipolar disorder, 254 paternal major depression, 87 paternal schizophrenia); Mother's occupation (n=8,310 without paternal SMI, 47 paternal ^b Missing data: Father's age (n=1 maternal schizophrenia); Urbanicity of residence (n=13 without maternal SMI); Family income (n=3,844 without maternal

SMI, 53 maternal bipolar disorder, 118 maternal major depression, 22 maternal schizophrenia); Father's occupation (n=27,063 without maternal SMI, 235 maternal bipolar disorder, 601 maternal major depression, 102 maternal schizophrenia); Mother's occupation (n=8,202 without maternal SMI, 74 maternal bipolar disorder, 201 maternal major depression, 46 maternal schizophrenia)

Abbreviation: EI: Elixhauser index

Init (%) birth (%)		Without SMI (%)	Diagnosis made before	Diagnosis made after	
Patternal SMI n= 1,962,933 n= 23,721 n= 12,668 Male 5.1 5.2.3 52.3 7.8 7.9 7.3 7.4 7.4 7.8 7.9 7.3 7.8 7.8 7.8		Without SIVII (70)	birth (%)	birth (%)	
Male 52.1 52.3 52.0 53.3 55.0 6.6 6.8 6.8 6.8 6.8 7.8	Paternal SMI	n= 1,962,933	n= 23,721	n= 12,668	
Birthweight < 2500 grams 5.9 6.6 6.8 Gestational age < 37 weeks	Male	52.1	52.3	52.0	
Gestanional age -37 weeks 6.9 7.8 7.8 7.8 -25 5.0 10.0 10.2 $25-29$ 21.9 20.5 23.3 $30-34$ 38.4 30.0 36.6 $35-39$ 24.0 24.0 20.0 $20-44$ 10.7 15.5 11.1 Mother's age at birth (years)	Birthweight <2500 grams	5.9	6.6	6.8	
Father's age at birth (years)* 5.0 10.0 10.2 $< 25 > 29$ 21.9 20.5 24.3 $30 - 34$ 38.4 30.0 33.6 $30 - 34$ 10.7 15.5 11.1 Mother's age at birth (years)	Gestational age <37 weeks	6.9	7.8	7.8	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Father's age at birth (years) ^a				
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	<25	5.0	10.0	10.2	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	25–29	21.9	20.5	24.3	
35-39 240.4 24.0 24.0 26.9 24.0 26.9 24.0 26.9 24.0 26.9 24.0 26.4 10.7 15.5 11.1 Mother's age at birth (years) 20-24 13.0 21.0 20.2 25-29 33.6 31.0 33.9 30-34 36.6 29.2 28.7 35.5 15 15.4 12.3 30-34 36.6 29.2 28.7 25.5 15.4 12.3 31.0 6.0 7.00 750reign-born mother 9.6 20.6 13.5 Urbanicity of residence' 1 (highest urbanicity) 20.3 20.2 19.1 2 32.3 33.3 36.6 21.7 22.2 4 14.4 14.6 15.1 15.5 15.4 14.3 13.6 30 7.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0	30–34	38.4	30.0	33.6	
	35-39	24.0	24.0	20.9	
Mother's age at birth (years) <20	≥40-44	10.7	15.5	11.1	
20-24 1.7 3.4 4.9 $20-24$ 13.0 21.0 20.2 $25-29$ 33.6 31.0 33.9 $30-34$ 36.6 29.2 28.7 235 15 15.4 12.3 Unmaried mother 9.6 20.6 13.5 Greign-born mother 9.6 20.6 13.5 Urbanicity of residence ^a	Mother's age at birth (years)				
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	<20	1./	3.4	4.9	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	20-24	13.0	21.0	20.2	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	25-29	33.6	31.0	33.9	
≥35 15 15.4 12.3 Ummaried mother 3.1 6.0 7.0 Foreign-born mother 9.6 20.6 13.5 Urbanicity of residence* 23.3 23.3 33.3 33.6 1 (highest urbanicity) 20.3 20.2 19.1 2 2 32.3 33.3 33.6 33.5 33.6 33.5 33.6 33.5 33.6 33.5 34.0 35.5 4.0 35.5 4.0 35.7 4.4 4.2 4.6 4.4 4.2 4.6 4.6 15.1 15.1 15.9 15.1 15.9 15.1	30-34	36.6	29.2	28.7	
Demarted mother 3.1 6.0 7.0 Foreign-born mother 9.6 20.6 13.5 Urbanicity of residence* 20.3 20.2 19.1 2 32.3 33.3 33.6 3 23.6 21.7 22.2 4 14.4 14.6 15.1 5 1.7 2.1 19.9 6 3.5 4.0 3.5 7 2.4 4.2 4.6 Family income* 11.7 2.1 1.9 6 3.5 4.0 3.5 1 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation* 7.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4	\geq 35	15	15.4	12.3	
Foreign-born mother 9.6 20.6 13.5 Urbancity of residence ^a 32.3 20.2 19.1 1 (highest urbanicity) 20.3 20.2 19.1 2 32.3 33.3 33.6 3 23.6 21.7 22.2 4 14.4 14.6 15.1 5 1.7 2.1 1.9 6 3.5 4.0 3.5 7 4.4 4.2 4.6 Family income ^a High 20.3 12.9 13.1 Upper-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation* T 17.9 30.0 28.7 Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3	Unmarried mother	3.1	6.0	7.0	
Ubing 20.3 20.2 19.1 1 (highest urbanicity) 20.3 20.2 19.1 2 32.3 33.3 33.6 3 23.6 21.7 22.2 4 14.4 14.6 15.1 5 1.7 2.1 19 6 3.5 4.0 3.5 7 4.4 4.2 4.6 Family income* 10 12.9 13.1 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0	Foreign-born mother	9.6	20.6	13.5	
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Urbanicity of residence ^a	20.2	20.2	10.1	
2 33.3 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.5 33.6 33.5 12.2 22.2 4 11.4 14.4 14.6 15.1 15.7 1.7 2.1 1.9 9 6 3.5 4.0 3.5 7 4.4 4.2 4.6 7 15.1 7 4.4 4.2 4.6 10.9 </td <td>1 (highest urbanicity)</td> <td>20.3</td> <td>20.2</td> <td>19.1</td>	1 (highest urbanicity)	20.3	20.2	19.1	
3 23.0 21.7 22.2 4 14.4 14.6 15.1 5 1.7 2.1 1.9 6 3.5 4.0 3.5 7 4.4 4.2 4.6 Family income ^a 4.4 4.2 4.6 Family income ^a 20.3 12.9 13.1 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 7 7 7.5 Civil servants and teachers 5.7 4.7 4.9 Dependents 3.3 4.5 6.3 Nother's occupation ^a 7 7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 <td>2</td> <td>32.3</td> <td>33.3</td> <td>33.6</td>	2	32.3	33.3	33.6	
4 14.4 14.0 15.1 5 1.7 2.1 1.9 6 3.5 4.0 3.5 7 4.4 4.2 4.6 Family income ^a 11.1 11.1 11.1 High 20.3 12.9 13.1 Upper-middle 20.2 13.7 15.1 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 7 64.2 63.0 Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 11.5 11.5 11.5 Mother's El (≥ 1) 6.3 14.5 11.5 Maternal SMI 52.1 51.6 53.0 Mate 52.1 51.6 <td>3</td> <td>23.6</td> <td>21.7</td> <td>22.2</td>	3	23.6	21.7	22.2	
3 1.7 2.1 1.9 6 3.5 4.0 3.5 7 4.4 4.2 4.6 Family income ^a 10 20.3 12.9 13.1 High 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 7 11.4 12.1 Dependents 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Fat	4	14.4	14.6	15.1	
0 5.3 4.0 5.5 7 4.4 4.2 4.6 Family income ^a 20.3 12.9 13.1 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's El (≥ 1) 6.3 14.5 11.5 </td <td>5</td> <td>1./</td> <td>2.1</td> <td>1.9</td>	5	1./	2.1	1.9	
I 4.4 4.2 4.0 Family income* High 20.3 12.9 13.1 High 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation* 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation* 7.7 7.5 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's El (≥ 1) 6.3 14.5<	6	5.5	4.0	5.5	
Framiny income 12.9 13.1 High 20.3 12.9 13.7 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a	/ Formilar in come a	4.4	4.2	4.0	
Ingn 20.3 12.9 13.1 Upper-middle 20.2 13.7 15.1 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a Civil servants and teachers 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI Maternal SMI 4.4 4.8 Male 52.1 51.6 53.0 <	Family income"	20.2	13.0	12.1	
Dependence 20.2 15.7 15.7 Middle 21.5 18.9 19.5 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 7 4.9 Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 7 11.4 4.3 Employees, employers, and professionals 63.1 53.0 32.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI 7 7.9 9 Gestational age <37 weeks	nigii Unner middle	20.3	12.9	15.1	
Mutue 21.3 16.9 19.3 Lower-middle 20.2 24.5 23.7 Low 17.9 30.0 28.7 Father's occupation ^a 75.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Vioi servants and teachers 5.8 7.7 7.9 Gestational age <37 weeks	Middle	20.2	13./	10.1	
Lower-Initiale 20.2 24.3 25.7 Low 17.9 30.0 28.7 Father's occupation ^a 2 23.7 Civil servants and teachers 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 2 2 2 Civil servants and teachers 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 39 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 4.4 4.8 4.4 Male 52.1 51.6 53.0 Birthweight <2500 grams	Lower middle	21.3	10.9	19.3	
Father's occupation ^a 11.5 30.0 28.7 Father's occupation ^a 5.7 4.7 4.9 Employees, employers, and professionals 75.7 64.2 63.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 20.0 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Male 52.1 51.6 53.0 Birthweight <2500 grams	Lower-Initiale	20.2	24.3	23.7	
Civil servants and teachers5.74.74.9Employees, employers, and professionals75.764.263.0Union members, farmers, and fishermen5.57.77.5The unemployed and low-income household9.918.918.4Dependents3.34.56.3Mother's occupation ^a 75.74.44.3Civil servants and teachers5.54.44.3Employees, employers, and professionals63.153.052.5Union members, farmers, and fishermen3.53.03.9The unemployed and low-income household6.711.412.1Dependents21.228.327.2Father's EI (≥ 1)4.44.84.4Maternal SMI52.151.653.0Male52.151.653.03.9Gestational age <37 weeks	Low Father's accumation ^a	17.7	50.0	20.7	
End between the technologies of the second secon	Civil servents and teachers	57	17	10	
Inprojects, thip by est, and professionals 15.7 04.2 05.0 Union members, farmers, and fishermen 5.5 7.7 7.5 The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a 63.1 53.0 52.5 Union members, farmers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI Male 52.1 51.6 53.0 Birthweight <2500 grams	Employees employees and professionals	5.7 75 7			
The unemployed and low-income household 9.9 18.9 18.4 Dependents 3.3 4.5 6.3 Mother's occupation ^a	Union members, farmers, and fishermen	5 5	04.2	7 5	
Inclute introject and row-income household 3.3 16.5 16.7 Dependents 3.3 4.5 6.3 Mother's occupation ^a 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI $Male$ 52.1 51.6 53.0 Birthweight <2500 grams	The unemployed and low income household	J.J 0 0	/./	1.5	
Mother's occupation ^a 5.5 4.4 4.3 Civil servants and teachers 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI 52.1 51.6 53.0 Male 52.1 51.6 53.0 Birthweight <2500 grams	Dependents	3.3	10.9	63	
Civil servants and teachers 5.5 4.4 4.3 Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI 14.5 11.5 Male 52.1 51.6 53.0 Birthweight <2500 grams	Mother's occupation ^a	5.5	4.5	0.5	
Crivit services5.54.44.5Employees, employers, and professionals 63.1 53.0 52.5 Union members, farmers, and fishermen 3.5 3.0 3.9 The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI \mathbf{Male} 52.1 51.6 53.0 Birthweight < 2500 grams	Civil servants and teachers	5 5	4 A	43	
Imposed, employed, and processionals00.100.0Union members, farmers, and fishermen3.53.03.9The unemployed and low-income household6.711.412.1Dependents21.228.327.2Father's EI (≥ 1)6.314.511.5Mother's EI (≥ 1)4.44.84.4Maternal SMI \mathbf{M} 52.1 51.653.0Birthweight <2500 grams	Employees employers and professionals	63.1	53.0	4.5 52 5	
The unemployed and low-income household 6.7 11.4 12.1 Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMI \mathbf{Male} 52.1 51.6 53.0 Birthweight <2500 grams	Union members farmers and fishermen	3.5	3.0	3.9	
Including logical and row mean induction11.111.1Dependents 21.2 28.3 27.2 Father's EI (≥ 1) 6.3 14.5 11.5 Mother's EI (≥ 1) 4.4 4.8 4.4 Maternal SMIMale 52.1 51.6 53.0 Birthweight <2500 grams	The unemployed and low-income household	5.5	11.4	12.1	
Dependents21.220.521.2Father's EI (≥ 1)6.314.511.5Mother's EI (≥ 1)4.44.84.4Maternal SMI \mathbf{Male} 52.151.653.0Birthweight <2500 grams	Dependents	21.2	28.3	27.2	
Mother's EI (≥ 1)4.44.84.4Maternal SMI $IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII$	Father's EI (> 1)	63	14 5	11.5	
Maternal SMI 10^{-11} 10^{-11} 10^{-11} Male 52.1 51.6 53.0 Birthweight <2500 grams	Mother's EI (> 1)	4.4	4.8	4.4	
Male 52.1 51.6 53.0 Birthweight <2500 grams	Motornal SMI		1.0	1.1	
Hate 52.1 51.0 53.0 Birthweight <2500 grams	Male	52.1	51.6	53.0	
Bit invergit 2500 grains 1.7 1.5 Gestational age <37 weeks	Birthweight ~2500 grams	5.8	51.0 7 7	7 9	
Father's age at birth (years)° 5.0 5.0 9.7 <25 5.0 5.2 9.1 $25-29$ 21.9 22.3 26.0 $30-34$ 38.4 36.3 33.7 $35-39$ 24.0 24.0 20.7	Gestational age <37 weeks	5.0 6 Q	0.6	07	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Eather's age at hirth $(vears)^c$	0.9	9.0	5.1	
25-29 21.9 22.3 26.0 30-34 38.4 36.3 33.7 35-39 24.0 20.7 20.7	<25	5 0	57	Q 1	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	25-29	5.0 21 Q	5.2 22 3	2.1 26 0	
35-39 24 0 24 0 20 7	30-34	21.9 38 4	36.3	20.0	
	35-39	24 0	24.0	20.7	

Supplementary Table 5 Characteristics of children stratified by timing of diagnosis of parental serious mental illness

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	Without SMI (%)	Diagnosis made before birth (%)	Diagnosis made after birth (%)
≥40	10.7	12.3	10.6
Mother's age at birth (years)			
<20	1.8	1.4	3.8
20–24	13.1	12.0	21.0
25–29	33.6	32.2	35.4
30–34	36.6	36.7	28.1
≥35	15	17.7	11.8
Unmarried mother	3.1	7.5	7.0
Foreign-born mother	9.9	2.3	8.0
Urbanicity of residence ^b			
1 (highest urbanicity)	20.3	20.5	18.5
2	32.2	35.5	33.6
3	23.7	21.6	23.1
4	14.4	13.7	15.0
5	1.7	1.5	1.8
6	3.5	3.4	3.9
7	4.4	3.8	4.2
Family income ^c			
High	20.3	15.3	13.3
Upper-middle	20.2	16.9	16.1
Middle	21.4	21.2	21.0
Lower-middle	20.2	21.3	23.6
Low	17.9	25.4	26.1
Father's occupation ^b			
Civil servants and teachers	5.7	5.5	5.3
Employees, employers, and professionals	75.6	70.9	68.2
Union members, farmers, and fishermen	5.5	5.7	6.6
The unemployed and low-income household	9.9	14.4	15.6
Dependents	3.3	3.5	4.4
Mother's occupation ^b			
Civil servants and teachers	5.5	4.4	3.9
Employees, employers, and professionals	63.3	55.0	49.3
Union members, farmers, and fishermen	3.5	4.2	4.3
The unemployed and low-income household	6.6	15.1	13.6
Dependents	21.2	21.3	28.9
Father's EI (≥ 1)	6.4	7.2	6.9
Mother's EI (≥ 1)	4.4	8	5.8

^a Missing data: Father's age (n=1 diagnosis made before birth); Urbanicity of residence (n=13 without paternal SMI); Family income (n=3,942 without paternal SMI, 53 diagnosis made before birth, 42 diagnosis made after birth); Father's occupation (n=28,001, 27,549 without paternal SMI, 220 diagnosis made before birth, 232 diagnosis made after birth); Mother's occupation (n=8,523, 8,310 without paternal SMI, 129 diagnosis made before birth, 84 diagnosis made after birth)

Abbreviation: EI: Elixhauser index; SMI: serious mental illness ^b Missing data: Father's age (n=1 diagnosis made before birth); Urbanicity of residence (n=13 without maternal SMI); Family income (n=3,844 without maternal SMI, 93 diagnosis made before birth, 100 diagnosis made after birth); Father's occupation (n=27,063 without maternal SMI, 523 diagnosis made before birth, 415 diagnosis made after birth); Mother's occupation (n=8,202 without maternal SMI, 143 diagnosis made before birth, 178 diagnosis made after birth)

Supplementary Table 6 Pairwise comparisons of injury risk for number and identity of parent(s) with serious mental illness

	Adjusted Incidence rate ratio (95% Confidence intervals)	
	Model 1	Model 2
Injury events		
Both vs maternal SMI only	1.08 (1.03-1.14)	1.07 (1.02-1.12)
Both vs paternal SMI only	1.12 (1.06-1.18)	1.11 (1.05-1.17)
Maternal SMI only vs paternal SMI only	1.04 (1.02-1.05)	1.04 (1.02-1.05)
Injury hospitalizations		
Both vs maternal SMI only	1.17 (0.87-1.58)	1.09 (0.81-1.48)
Both vs paternal SMI only	1.38 (1.02-1.87)	1.26 (0.92-1.71)
Maternal SMI only vs paternal SMI only	1.18 (1.06-1.31)	1.15 (1.03-1.28)

Model 1: adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence. Model 2: adjusted for the above variables and unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, child's LBW and preterm birth.

Supplementary Table 7 Pairwise comparisons of injury risk for parental serious mental illness diagnosis

	Adjusted Incidence rate ratio (95% Confidence intervals)	
	Model 1	Model 2
Injury events		
Maternal		
Schizophrenia vs Bipolar disorder	1.02 (0.98-1.05)	1.02 (0.98-1.05)
Schizophrenia vs Major depression	1.04 (1.01-1.07)	1.03 (1.00-1.06)
Bipolar disorder vs Major depression	1.02 (0.99-1.05)	1.02 (0.99-1.04)
Paternal		
Schizophrenia vs Bipolar disorder	1.00 (0.97-1.04)	1.01 (0.97-1.04)
Schizophrenia vs Major depression	1.04 (1.01-1.07)	1.04 (1.01-1.07)
Bipolar disorder vs Major depression	1.03 (1.00-1.07)	1.03 (1.00-1.07)
Injury hospitalizations		
Maternal		
Schizophrenia vs Bipolar disorder	1.18 (0.98-1.42)	1.15 (0.95-1.38)
Schizophrenia vs Major depression	1.52 (1.29-1.79)	1.46 (1.24-1.72)
Bipolar disorder vs Major depression	1.28 (1.11-1.49)	1.27 (1.09-1.48)
Paternal		
Schizophrenia vs Bipolar disorder	0.86 (0.70-1.06)	0.86 (0.70-1.06)
Schizophrenia vs Major depression	1.16 (0.96-1.41)	1.12 (0.92-1.36)
Bipolar disorder vs Major depression	1.35 (1.11-1.64)	1.30 (1.06-1.58)

Model 1: adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence. Model 2: adjusted for the above variables and unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, spouse's (mother's/father's) serious mental illness, child's LBW and preterm birth.

Supplementary Table 8 Pairwise comparisons of injury risk for timing of diagnosis of parental serious mental illness

	Adjusted Incidence rate ratio (95% Confidence intervals)	
	Model 1	Model 2
Injury events		
Maternal		
Before childbirth vs after childbirth	1.00 (0.98-1.02)	1.00 (0.98-1.02)
Paternal		
Before childbirth vs after childbirth	0.99 (0.96-1.02)	0.99 (0.96-1.02)
Injury hospitalizations		
Maternal		
Before childbirth vs after childbirth	1.00 (0.87-1.14)	1.00 (0.87-1.15)
Paternal		
Before childbirth vs after childbirth	0.89 (0.74-1.08)	0.87 (0.72-1.05)

Model 1: adjusted for birth year, child sex, child age, birth order, maternal and paternal ages, foreign-born mother, and urbanicity of residence. Model 2: adjusted for the above variables and unmarried mother, family income, maternal and paternal occupations, maternal and paternal Elixhauser indexes, spouse's (mother's/father's) serious mental illness, child's LBW and preterm birth.

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