Firstborn Children and Only Children More Likely to Have Anxiety and Depression Than Later-Born Children

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Key Findings:

- Firstborn children who have siblings are 48% more likely to have anxiety and 35% more likely to have depression compared to children who are born second or later.
- Only children are 42% more likely to have anxiety and 38% more likely to have depression compared to children who are born second or later.

There are various factors that are known to affect the likelihood of childhood mental health conditions. These factors include premature birth, sex, BMI, maternal history of mental health disorders, and trauma.[1,2] However, there is little research on the effect of birth order on the likelihood of childhood anxiety and depression. Understanding this could aid in identifying additional risk factors for mental health disorders.

We studied 182,477 children born between 2009 and 2016 who had a well-child visit during their eighth year of life, as this is when the U.S. Preventive Services Task Force suggests beginning anxiety screening.[3] We adjusted for patient age, sex, race, ethnicity, history of other mental health disorders, mother's history of anxiety or depression, insurance coverage type, premature birth, Social Vulnerability Index quintile, Rural Urban Commuting Area classification, and BMI.

Children born first who have siblings had a 48% greater likelihood of being diagnosed with anxiety by their eight-year well-child visit compared to children who were born second or later, as seen in Figure 1. Similarly, only children had a 42% greater likelihood of anxiety than children born second or later.
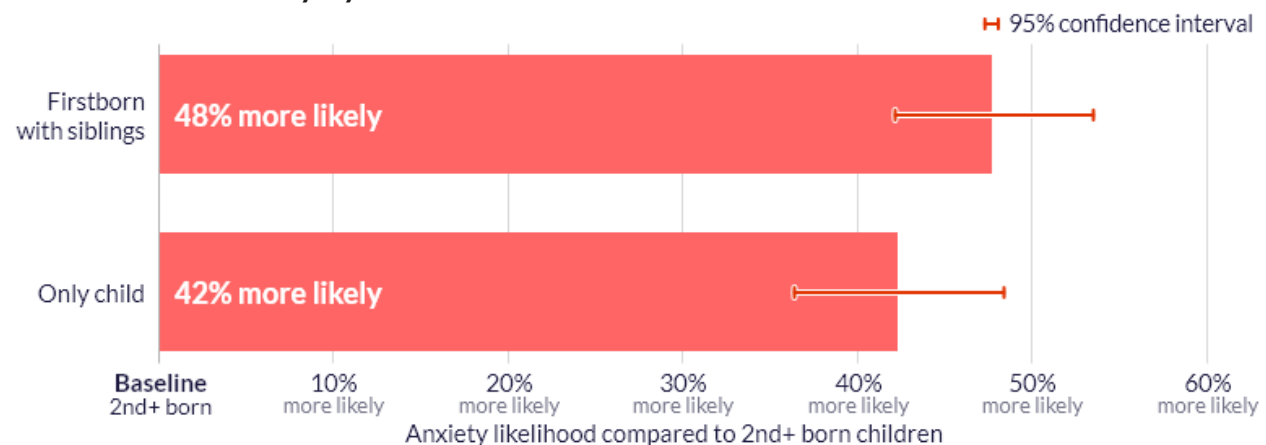
Likelihood of Anxiety by Birth Order

Figure 1. Likelihood of anxiety by birth order.

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The likelihood of depression is higher for both firstborn children with siblings and only children, as seen in Figure 2. Firstborn children were 35% more likely to be diagnosed with depression compared to those who were born second or later, while only children were 38% more likely.

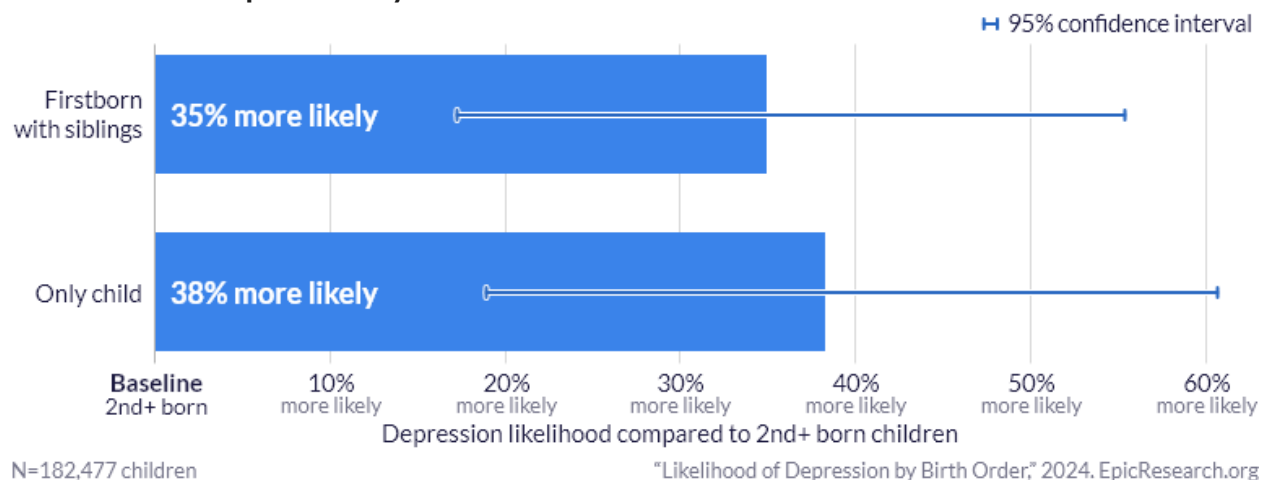## Likelihood of Depression by Birth Order

Figure 2. Likelihood of depression by birth order.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 274 million patient records from 1,500 hospitals and more than 36,000 clinics from all 50 states, Lebanon, and Saudi Arabia. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Brian Olson.

References

1. Kowalchuk A, Gonzalez SJ, Zoorob RJ. Anxiety disorders in children and adolescents. Am Fam Physician. 2022;106(6):657-664. https://www.aafp.org/pubs/afp/issues/2022/1200/anxiety-disorders-children-adolescents.html. Accessed September 3, 2024.
2. Moore PS, Mokrova I, Frazier JA, et al. Anxiety and depression correlates at age 10 in children born extremely preterm. J Pediatr Psychol. 2021;46(4):422-432. doi:10.1093/jpepsy/jsaa118
3. Anxiety in children and adolescents: Screening. U.S. Preventive Services Task Force. Published October 11, 2022. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/screening-anxiety-children-adolescents. Accessed September 30, 2024.

Data Definitions

Term	Definition
Study period	1/1/2009 to 8/1/2024

Study population	Inclusion criteria:
	 • Known birthing parent information
	 • A birth and pregnancy record must exist in Cosmos
	 • The birth and pregnancy record must indicate the birth order
	 • The pregnancy record must not have resulted in fetal or neonatal demise
	 • At least 8 years old at the end of the study period
	 • A **well-child** visit while age 8
	 Exclusion criteria:
	 • A sibling who has died
	     o Fetal demise or neonatal demise
	     o A death date before study patient's 8th birthday
	 • Multiples (twins+)
	 • Those whose 8-year-old well-child visit was paid by Medicare

Well-child visit	An encounter with at least one of the following: • A diagnosis with ICD-10-CM code Z00.1* • A procedure with CPT code 99391, 99392, 99393, 99381, 99382, or 99383
Anxiety	An encounter or billing diagnosis with ICD-10-CM code F40*, F41*, F06.4*, or F93.0*
Depression	An encounter or billing diagnosis with ICD-10-CM code F32*, F33*, F06.31*, F06.32*, or F34.1*
Race and ethnicity	Patients were classified by self-reported race and ethnicity and subsequently standardized to OMB race and ethnicity categorizations. Classifications were Hispanic (any race) or non-Hispanic of the following races: Black, White, Hawaiian or Pacific Islander, Asian, Native American, or multiracial.
Stratifications	Sex: male/female Age (in years) Only child

First born with siblings

RUCA score:
- Metropolitan
- Micropolitan
- Small Town
- Rural

Social Vulnerability Index quintile

Race and ethnicity

Census region:
- Northeast
- South
- West
- Midwest

Insurance coverage:
- Self-pay
- Medicaid
- Miscellaneous

BMI:
- Normal
- Overweight
- Obese

Preterm births:
- Extremely preterm: <28 weeks
- Very preterm: 28-32 weeks
- Moderate to late preterm: 32-37 weeks

Other mental health disorders:
- F20*, F21*, F22*, F23*, F24*, F25*, F28*, or F29*
- F30*, F31*, F32*, F33*, F34*, or F39* (depression outcome excluded F32*, F33*, F34.1*)

Maternal history of **anxiety**

Maternal history of **depression**

Model specifications	Logistic regression - outcome before 9th birthday
RUCA	Rural-Urban Commuting Area is a classification of geographic areas based on population density, urbanization, and daily commuting. It ranges from 1 to 10, with lower values indicating more urban areas and higher values indicating more rural areas. It was dichotomized into urban (1-3) and rural (4-10) for analysis.

Social Vulnerability Index	The social vulnerability quintile for the ZIP Code of the patient's most recent address

Table 1. Likelihood of Anxiety by Birth Order

	Lower CI	Upper CI	Odds Ratio
Multiracial	1.073	1.236	1.152
Black	0.650	0.754	0.700
Asian	0.581	0.730	0.651
Hawaiian or Pacific Islander	0.627	0.987	0.786
Native American	0.854	1.227	1.024
White	1.183	1.341	1.259
Hispanic	0.895	1.007	0.949
Other Mental Health Disorder	7.100	8.490	7.764
Mother History of Anxiety	1.557	1.685	1.619
Mother History of Depression	1.374	1.486	1.429
Coverage Self Pay	0.680	1.139	0.880
Coverage Medicaid	1.368	1.563	1.462
Coverage Misc	1.112	1.275	1.191
Preterm: Moderate to Late	1.044	1.177	1.109
Preterm: Very	0.918	1.303	1.093
Preterm: Extremely	1.449	2.181	1.778
Female	0.946	1.011	0.978
SVI [.2,.4)	0.907	1.003	0.954
SVI [.4,.6)	0.910	1.011	0.959
SVI [.6,.8)	0.979	1.089	1.032
SVI >=.8	0.772	0.867	0.819
RUCA Micropolitan	0.854	0.981	0.916
RUCA Small Town	0.810	0.969	0.886
RUCA Rural	0.722	0.892	0.802
Census Region NE	1.010	1.127	1.067
Census Region S	1.019	1.106	1.062
Census Region W	0.799	0.930	0.862
Only child	1.364	1.484	1.423
Firstborn w/ siblings	1.422	1.535	1.477
BMI Overweight	0.948	1.041	0.993
BMI Obese	1.031	1.121	1.075

Table 2. Likelihood of Depression by Birth Order

	Lower CI	Upper CI	Odds Ratio
Multiracial	0.796	1.317	1.024
Black	0.894	1.485	1.152
Asian	0.260	0.780	0.450
Hawaiian or Pacific Islander	0.439	2.082	0.956
Native American	0.586	1.964	1.073
White	1.031	1.626	1.295
Hispanic	0.915	1.373	1.121
Other Mental Health Disorder	10.026	15.231	12.358
Mother History of Anxiety	1.170	1.583	1.361
Mother History of Depression	1.985	2.669	2.302
Coverage Self Pay	0.264	2.001	0.727
Coverage Medicaid	1.149	1.800	1.438
Coverage Misc	0.782	1.235	0.983
Preterm: Moderate to Late	0.937	1.415	1.151
Preterm: Very	0.707	2.233	1.256
Preterm: Extremely	0.484	2.472	1.093
Female	0.691	0.881	0.780
SVI [.2,.4)	0.769	1.152	0.941
SVI [.4,.6)	0.863	1.294	1.057
SVI [.6,.8)	0.951	1.419	1.162
SVI >=.8	1.019	1.535	1.251
RUCA Micropolitan	0.900	1.424	1.132
RUCA Small Town	0.657	1.255	0.908
RUCA Rural	0.795	1.602	1.129
Census Region NE	0.808	1.201	0.985
Census Region S	0.714	0.971	0.833
Census Region W	0.822	1.368	1.060
Only child	1.190	1.606	1.382
Firstborn w/ siblings	1.172	1.554	1.350
BMI Overweight	1.157	1.599	1.360
BMI Obese	1.243	1.647	1.431