Do Children's New Mental Health Conditions Spillover onto Parents and Siblings?

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Motivation

- **U.S. children are experiencing a mental health crisis.**
  - 7.5% of children aged 3-17 have experienced anxiety or depression (CDC, 2022).
    - ~30% increase 2016-2020 (Lebrun-Harris et. al., 2022).
  - 42% of high schoolers had persistent feelings of sadness of hopelessness in 2021, up from 28% in 2011 (CDC, 2023). 57% of females; 69% of LGBTQ+.
  - 22% of high schoolers seriously considered suicide (CDC, 2023).
  - Oct 2021: AAP, AACAP, CHA declare National State of Emergency in Children's Mental Health.
- **Many MH disorders first manifest during childhood/adolescence and can have lifelong consequences.**
- **Treatment is consequential and can be inertial.**
- **Early, accurate diagnoses can improve wellbeing and save money.**

This Paper

Are there mental health spillovers among siblings during childhood?

In particular, does a new diagnosis of anxiety, depression, or adjustment disorders with features of anxiety or depression (DAA) for one child effect the diagnosis and treatment of their siblings?

- Focus on anxiety/depression/adjustment because at core of current crisis.
- Focus initial episodes for exogeneity + agenda setting.
- Focus on siblings because understudied and potentially important channel.
- Not a priori clear:
  - What mechanisms are involved.
  - Whether spillovers are harmful or helpful.

Some Hypotheses

Why sibling spillovers?

- Spillovers are directly causal (Eisenberg et. al., 2014; Breining, 2014; Aizer, 2008).
- Common shock: e.g., household stress.
- Revelation of shared genetics/environment (Pettersson et. al., 2016; Golberstein et. al., 2019; Bubonya et al, 2017).
- Confirmation bias: typecasting families (Persson et. al., 2021).

  (not mutually exclusive)

Consequently, implications can be good or bad (or a mix).

- Individual or aggregate shocks are distressing.
- Early detection.
- Misdiagnosis + wasteful/harmful treatment.

Other Themes from the Family Spillovers Literature

- **Consistent positive correlations in intrafamily mental health**
  - **Spillovers between adults**: Fletcher, 2009; Fletcher and Marksteiner, 2017; Wittenberg et. al., 2013; Mervin and Frijters, 2014; Marcus, 2013
  - **Spillovers from parents to children**: Brown et. al., 2019; Ahammer and Packham, 2020; Schepman et. al, 2011; Dahlen, 2016
  - **Spillovers from children to parents**: Daysal et. al., 2022; Wittenberg et. al., 2013

- **Sibs of children with MH conditions more likely to also be diagnosed**
  - Ma et. al., 2015, Barnett and Hunter, 2011

- **Gaps**
  - Little focus on sibling spillovers.
  - Little focus on causality in medical and psychology literatures.

Main Results

- **Notable sibling effects on mental health diagnosis, treatment, and spending.**
  - ~25% increases in MH diagnosis and treatment in first 6 months, concentrated on DAA.
  - Equally large reversal within first year.
  - Consistent with early detection hypothesis.
  - Clinical response favors therapy over drugs.
  - May suggest mental health benefits from spillovers.

- **No evidence of effects on acute or chronic physical health or overall health spending.**
  - Also consistent with early detection.
  - Avoidance of adverse consequences bolsters the case for salubrious spillovers.

Contributions

- First evidence in economics about sibling depression/anxiety/adjustment spillovers.
- Policy relevance: early detection valuable; families can be a revelation mechanism.
- Extension of stacking solution to TWFE DID problems to setting where outcomes are conditional on treatment.

BCBS Data

Data are from Blue Cross Blue Shield Alliance for Health Research (BCBS) Axis database, the largest source of commercial insurance claims data in the U.S.

- Full professional, facility, and pharmacy claims by all members.
- Pros: large; decade-long; national; administrative; info on diagnoses + treatment..
- Cons: health ≠health claims; limited demographics/socioeconomics.
- Overall: 118.8m people; 69.1m kids; 4.9m kids w/ DAA.

Sample

All families with a child with an observed first DAA diagnosis, 2012-2022.

How we get there:

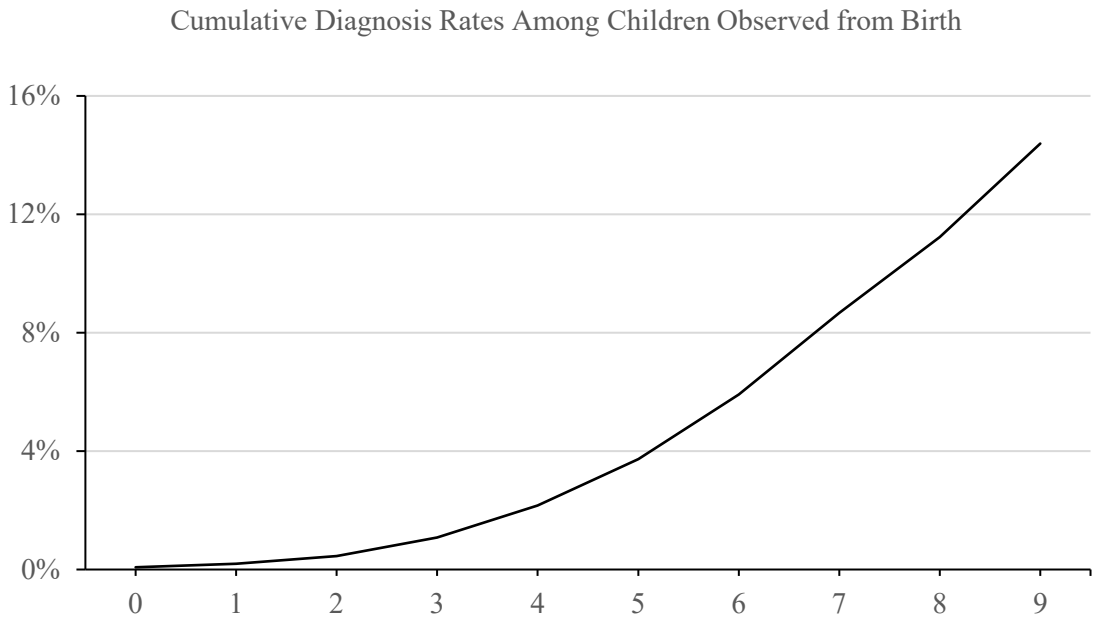
- All children <18, observed before age 10, with +/-months coverage around first DAA.
- Additional restrictions: never pharmacy carve out; consistent demographics; technical stuff.
- Link family members by subscriber.
- Take 10% random sample of index children
- Result: 30.6k families; 119.4k people; 71.3k kids; 37.8k kids w/ DAA.
    - For reference, full BCBS data includes ~10.9m families w/o DAA and ~2.7m families w/ DAA.

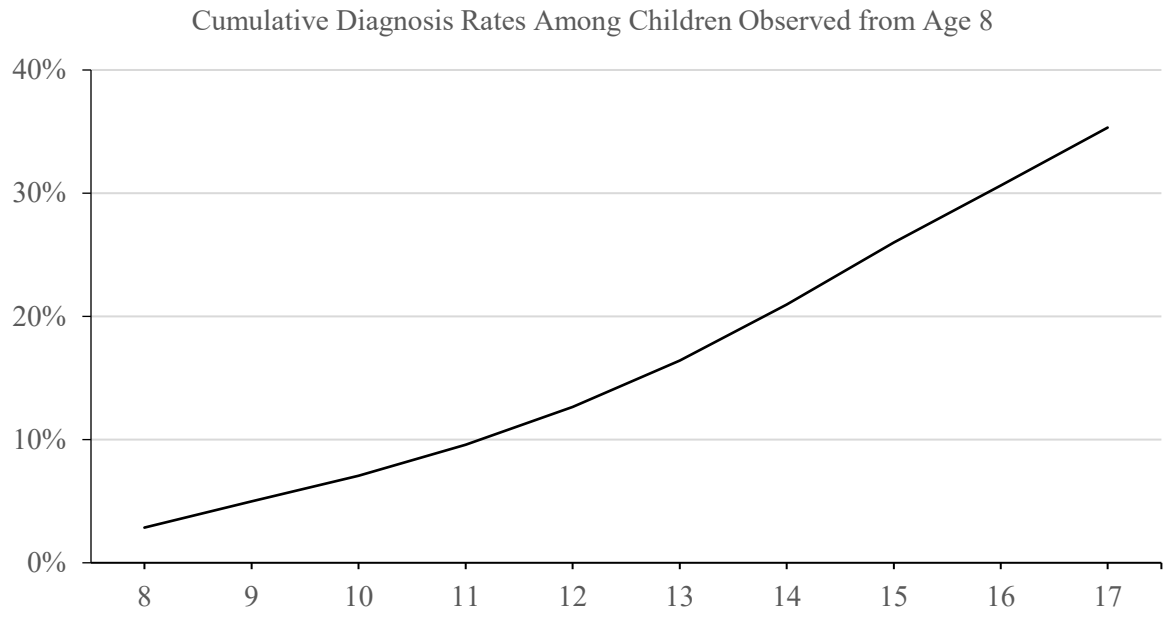
Rationale

- Want to make sure we're not missing anything (that we can control).
- Want to capture first diagnosis.

Context: First DAA Diagnoses

- ~500k BCBS children observed for 10 years.
- 15% of children observed from age 0 will receive a DAA diagnosis by age 10 (left).
- 35% of children observed from age 8 will receive a DAA diagnosis by age 18 (right).
- Suggests ~45% of children receive a DAA diagnosis.





Empirical Design

- Extension of stacked cohort solution for TWFE DID ((Fadlon and Nielsen, 2019; Deshpande and Li, 2019) to setting where outcome is conditional on treatment.

- Under parallel trends and no-anticipation assumptions, conventional dynamic (event study) difference-in-differences estimated using two-way fixed effects consistently estimates the average treatment effect on the treated (ATT) IF treatment occurs at a single point in time or effects are homogenous across individuals.

- Problems when treatment is staggered in calendar time and treatment effects may be heterogenous.

- Carefully choosing comparison cohorts and stacking them (into a new panel), avoids forbidden comparisons under the assumption that among similar individuals, the timing of treatment is as good as random within small windows.

- BUT when outcome of interest is conditional on treatment, comparison to units treated slightly later will create mechanical zeros.

The Stacking Process

1) **Choose symmetric analysis bandwidth around treatment month (12 months).**

2) **For each month *C* in data:**

   1) Assign **treatment** to any child (a) whose first-DAA-diagnosed sibling is first diagnosed month *C*, and (b) who has never yet been DAA diagnosed themselves.

   2) Assign **control** to any child who (a) has *any* sibling first DAA diagnosed at month *C+BW*, and (b) has never yet been DAA diagnosed themselves.

      Note: Conventionally, the control group would be children whose first-DAA-diagnosed sibling is first diagnosed month *C+BW*, but this would mean the child of interest has no chance of being diagnosed within BW.

   3) Then month C forms a cohort where

      a) Month C is the true treatment month for the treatment group

      b) Month C = true treatment month – bandwidth for the control group.

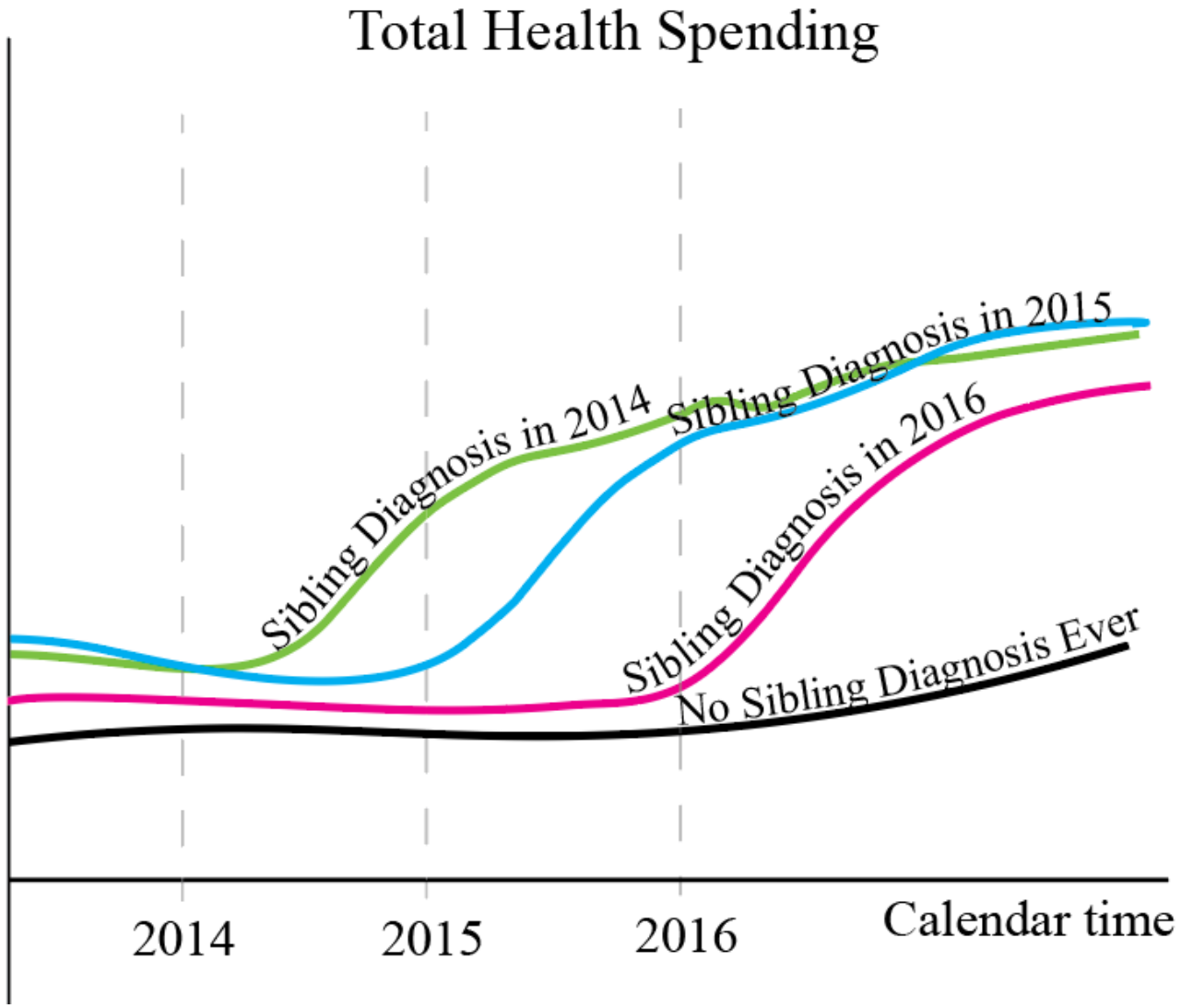
3) **Stack the cohorts together into a reformulated panel.**

   1) Individuals can appear more than once, as both treatment and control.

   2) To guard against reverse causality, we exclude all families with two children diagnosed in the same month.

   3) 99 cohorts (1/2013-3/2021); 41.3k cohort-siblings; 1.03m observations.

Intuition


Total Health Spending
Sibling Diagnosis in 2014
Sibling Diagnosis in 2015
Sibling Diagnosis in 2016
No Sibling Diagnosis Ever
2014
2015
2016
Calendar time

Sample Means, Period M=-1

Variable	Control	Treatment	Difference	
			Coef	SE
Female	0.481	0.482	0.001	0.005
Age	8.68	8.75	0.07	0.06
Index Child Age	9.73	10.11	0.38**	0.08
Index Child Female	0.53	0.507	-0.023**	0.007
Index Child Younger	0.365	0.327	-0.038**	0.006
Index Child Same Sex	0.501	0.5	-0.001	0.005
Sibling Count	2.79	2.76	-0.03*	0.01
Family Size	4.47	4.44	-0.04*	0.02
Any Mental Health Diagnosis (0/1)	0.039	0.04	0.001	0.002
Any Non-MH Diagnosis (0/1)	0.298	0.293	-0.005	0.005
Dep/Anx/Adj Diagnosis (0/1)	0	0	0	0
ADHD (0/1)	0.014	0.016	0.002	0.001
MH Evaluation (0/1)	0.012	0.013	0.001	0.001
Therapy (0/1)	0.01	0.012	0.001	0.001
Log (Total Allowed Amt)	1.682	1.663	-0.019	0.03
Log (Non-MH Allowed Amount)	1.549	1.517	-0.032	0.028
Log (MH Allowed Amt)	0.211	0.215	0.004	0.011
Allowed Amt>0	0.319	0.317	-0.002	0.006
Non-MH Allowed Amt>0	0.298	0.293	-0.005	0.005
MH Allowed Amt>0	0.038	0.039	0.001	0.002
Hospitalization (0/1)	0	0.001	0	0
ER Visit (0/1)	0.009	0.008	-0.001	0.001
Asthma (0/1)	0.012	0.011	-0.001	0.001
Injury Diagnosis (0/1)	0.029	0.029	0	0.002
Wellness Visit (0/1)	0.068	0.064	-0.004	0.003
Any Mental Health Drugs (0/1)	0.036	0.037	0.001	0.002
Total Individuals	18,947	22,318		
Total Families	13,549	16,046		

Estimating Equation

For child *i* of cohort *c* in calendar month *t*,

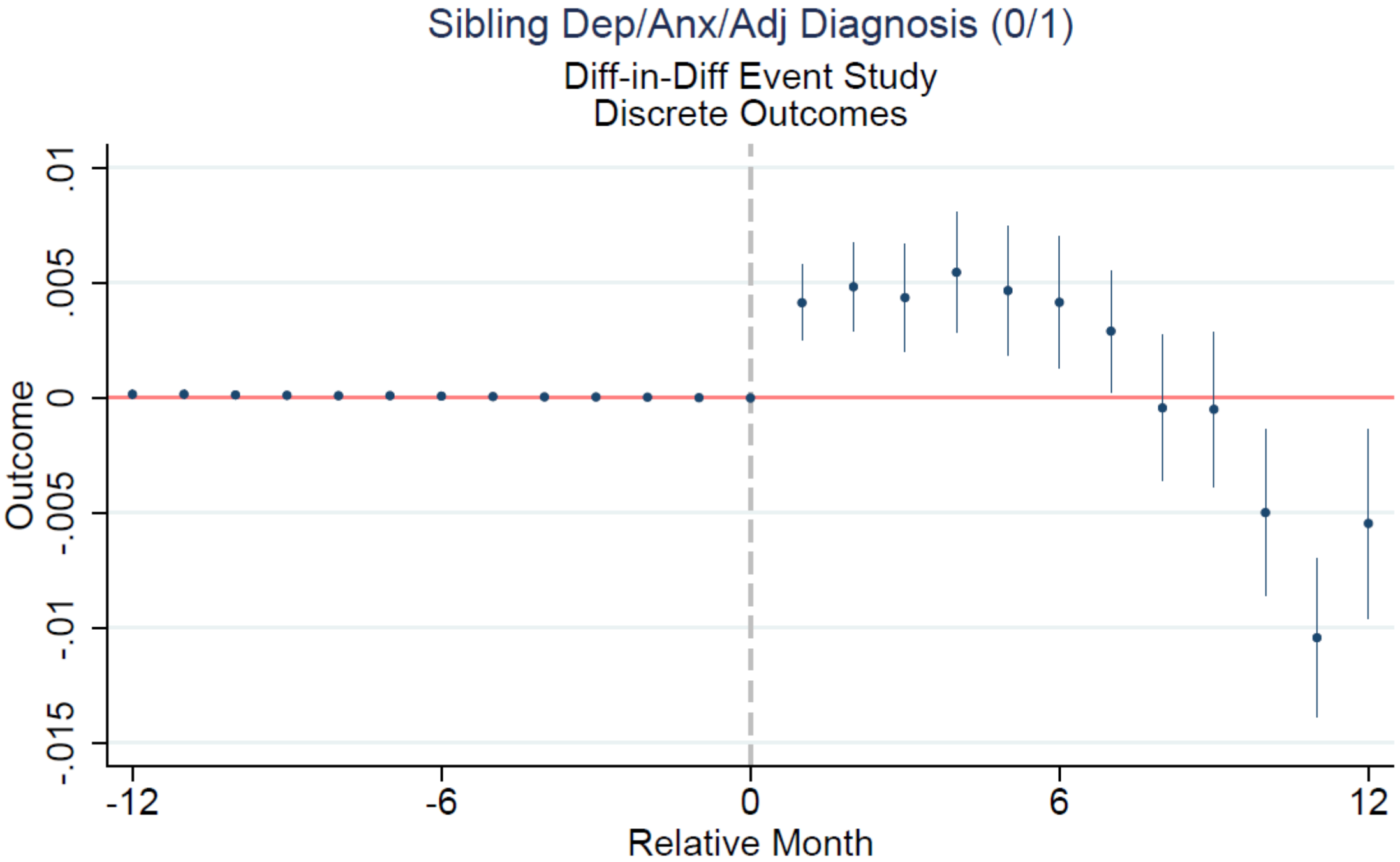
$$Y_{ict} = \alpha_i + \psi_c + \delta T_{ic} + \sum_{\substack{m \neq -1; \\ m=-12}}^{12} \gamma_m 1[M_{ct} = m] + \sum_{\substack{m \neq -1; \\ m=-12}}^{12} \tau_m 1[M_{ct} = m] \times T_{ic} + \mathbf{\beta X_{ict}} + \varepsilon_{ict}$$

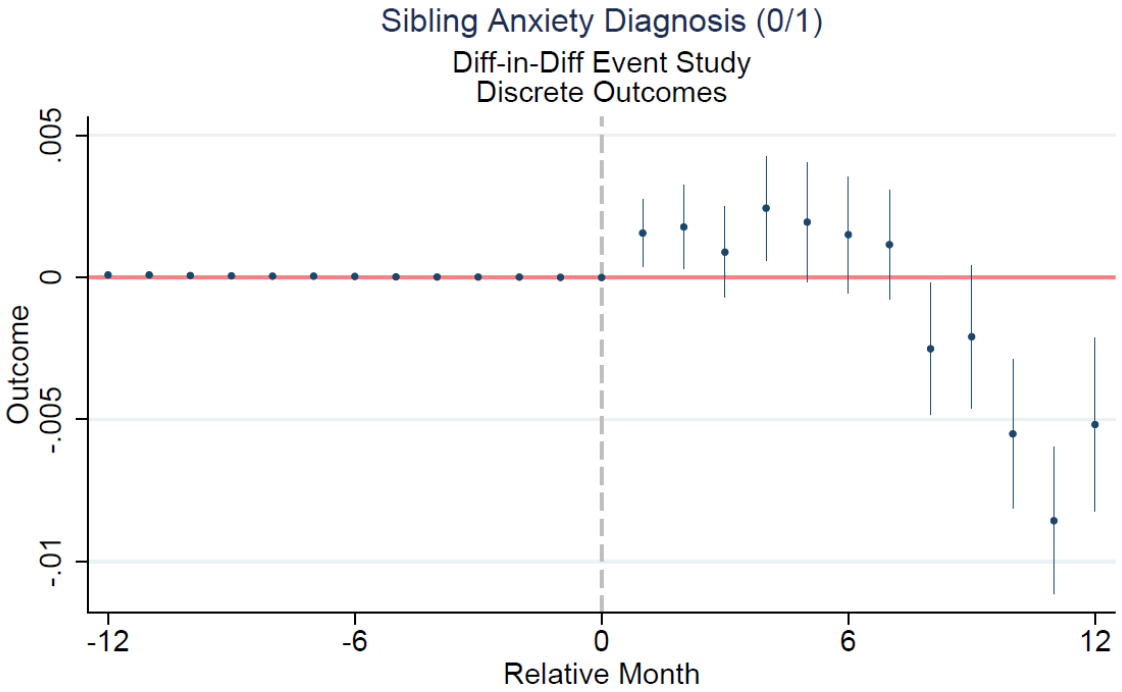
where cohort indexes treatment date and:

- Y_{ict} is an outcome
- α_i are an individual fixed effects
- ψ_c are cohort fixed effects
- T_{ic} is an indicator for being a member of the treatment group
- M_{ct} are a series of indicators for months relative to treatment month, i.e., $M_{ct} = t - c$
- $\mathbf{X_{it}}$ is a vector of time/cohort-varying covariates (age, index child age, family size, number of siblings)
- Standard errors are clustered by cohort

Results

Mental Health Diagnoses


Sibling Dep/Anx/Adj Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.01
.005
0
-.005
-.01
-.015
-12
-6
0
6
12
Relative Month


Sibling Anxiety Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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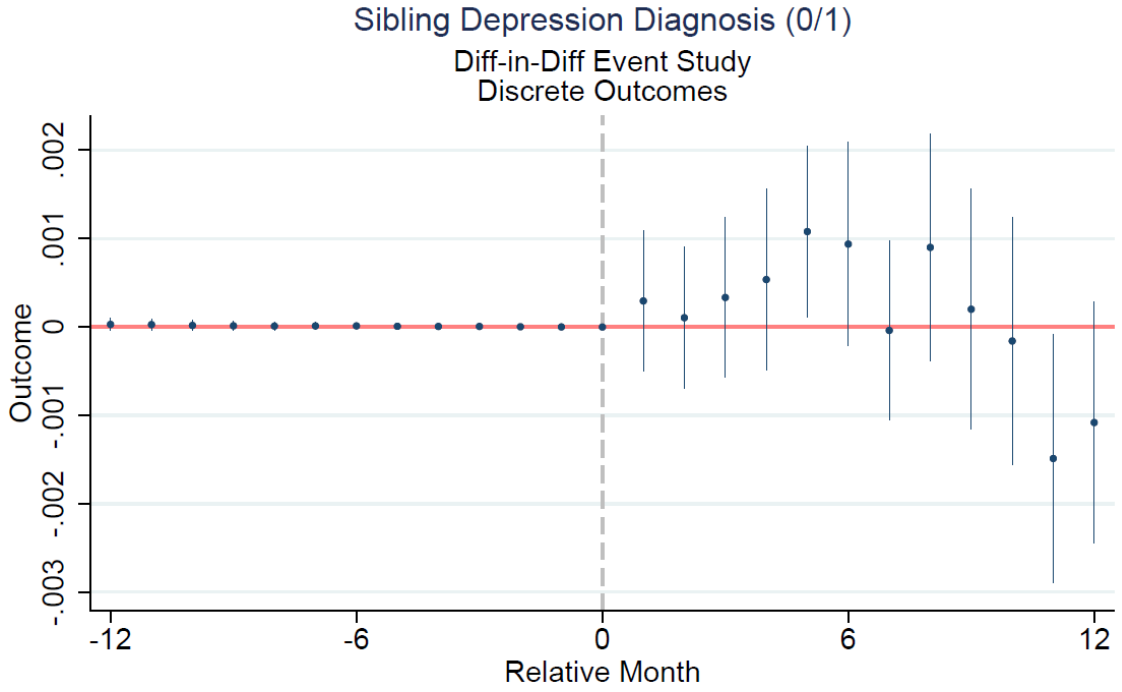
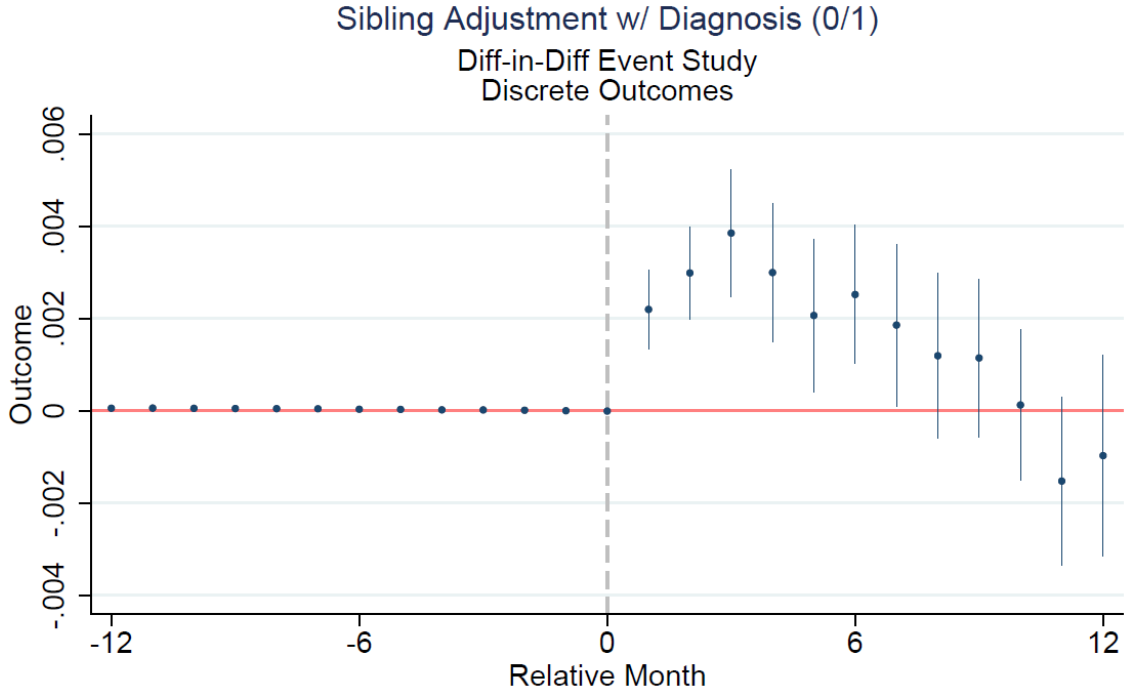
0
-.005
-.01
-12
-6
0
6
12
Relative Month


Sibling Depression Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.002
.001
0
-.001
-.002
-.003
-12
-6
0
6
12
Relative Month


Sibling Adjustment w/ Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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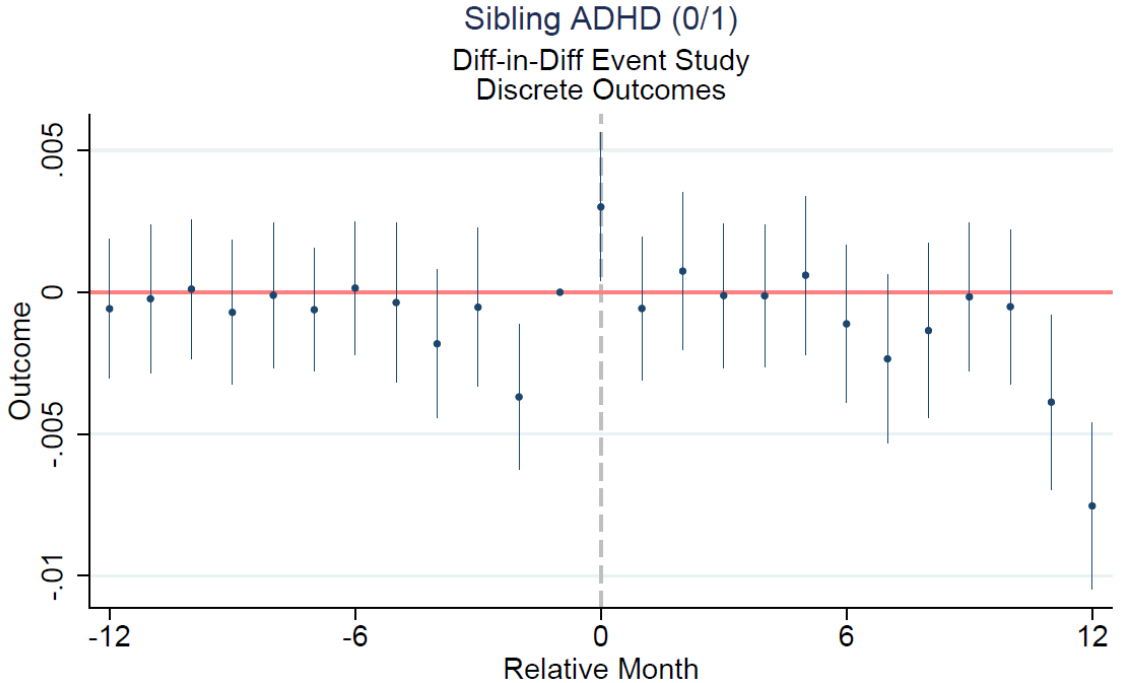
.004
.002
0
-.002
-.004
-12
-6
0
6
12
Relative Month


Sibling ADHD (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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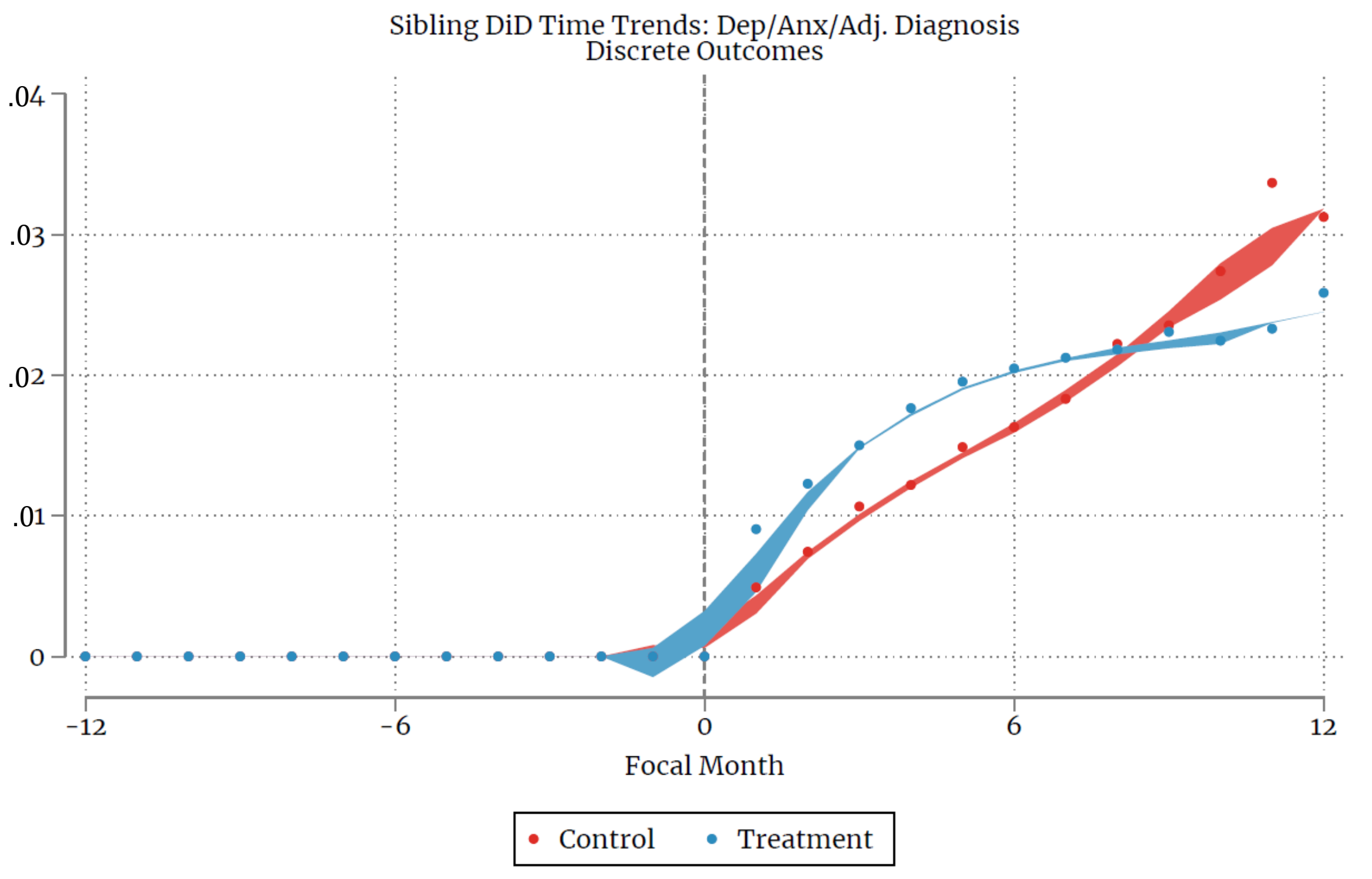
0
-.005
-.01
-12
-6
0
6
12
Relative Month

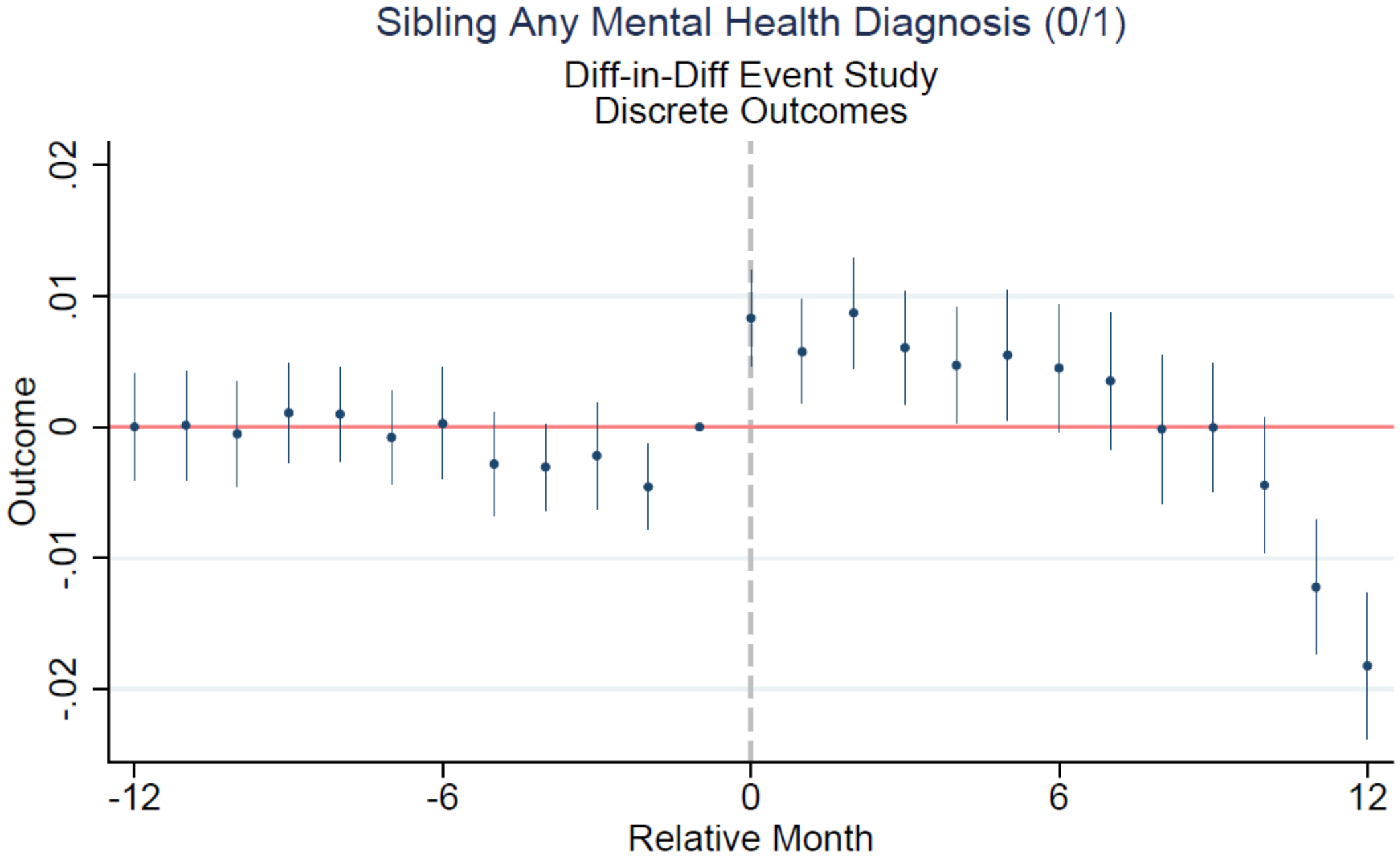

Sibling DiD Time Trends: Dep/Anx/Adj. Diagnosis
Discrete Outcomes
.04
.03
.02
.01
0
−12
−6
0
6
12
Focal Month
Control
Treatment

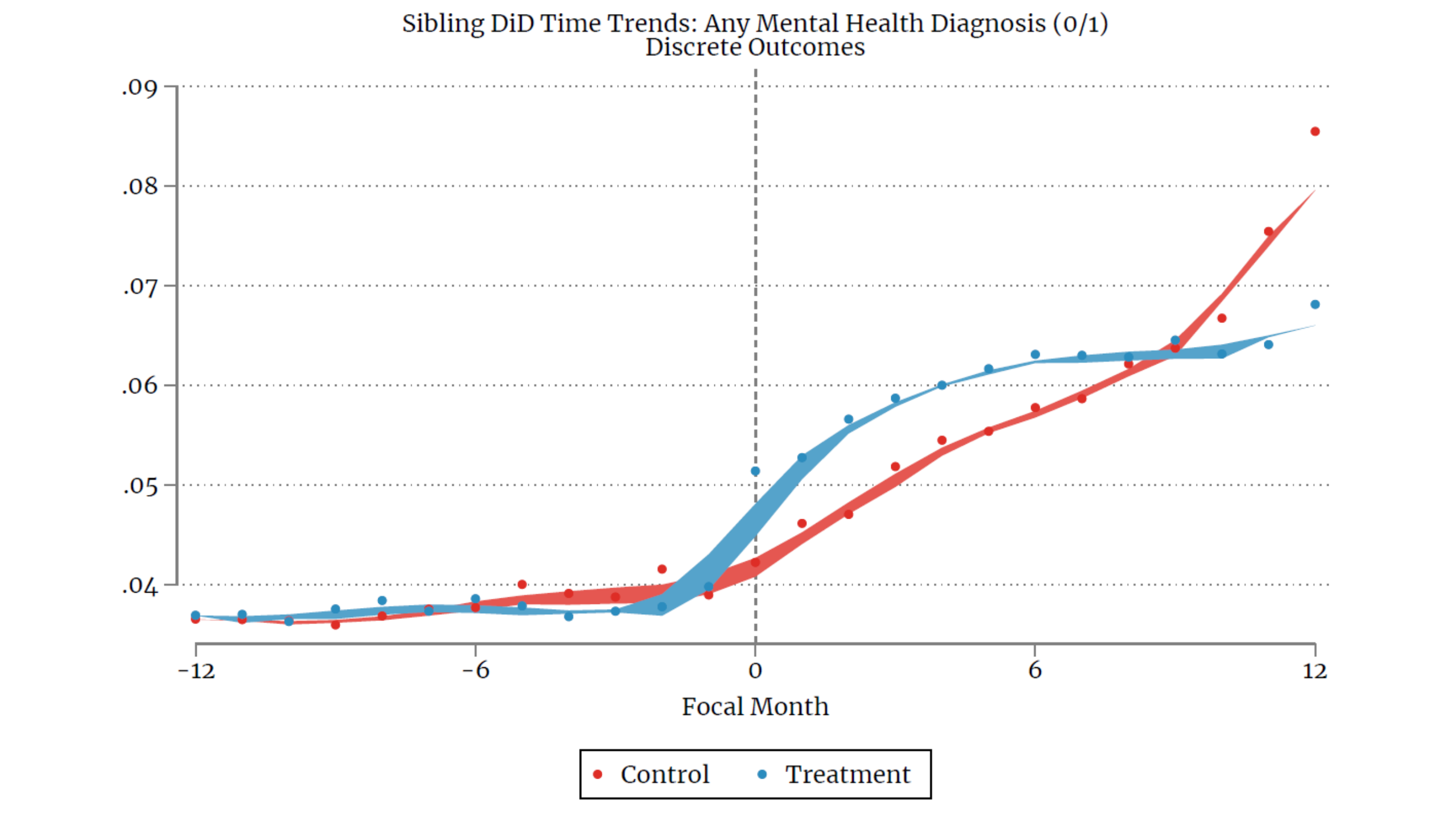
How large are these effects?

Two helpful baselines:

- **Control group means in months 0-11**
  - 1.6% chance of DAA diagnosis in given month
  - Suggests effect size ≈ 0.005/0.016 = +31% in first 6 months
  - ≈ -0.0075/0.016 = -47% in months 10-11

- **Full BCBS data diagnosis rates by age**
  - Mean sibling in our sample is ~9 years old
  - In full data, Pr(DAA diagnosis for 9-yo by age 10|no prior diagnosis) ≈ 0.035
  - Cumulative effect peak ≈ 0.01 at month 6-7
  - Suggests effect size of 0.01/0.035 = +29%


Sibling Any Mental Health Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.02
.01
0
-.01
-.02
-12
-6
0
6
12
Relative Month


Sibling DiD Time Trends: Any Mental Health Diagnosis (0/1)
Discrete Outcomes
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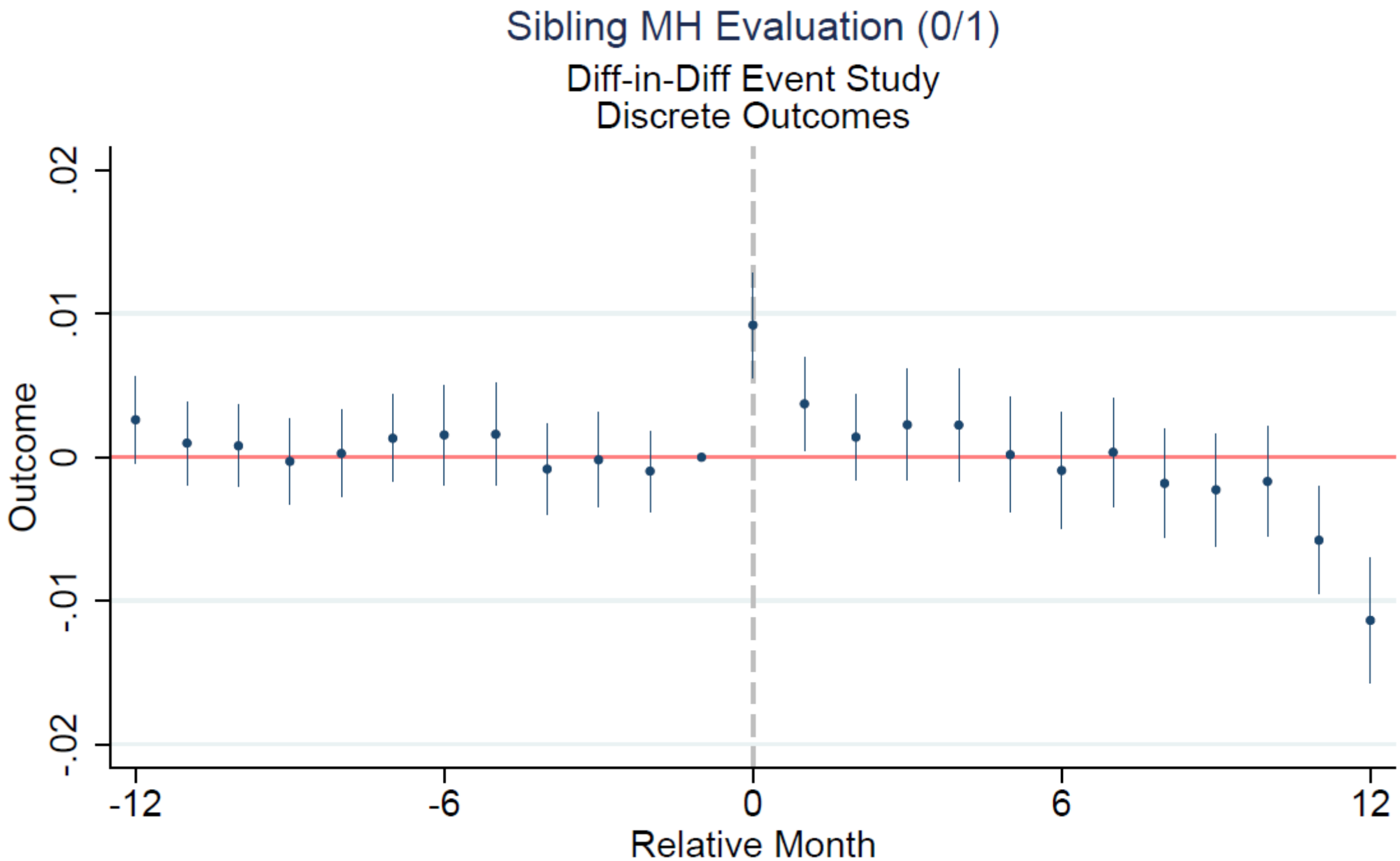
.08
.07
.06
.05
.04
-12
-6
0
6
12
Focal Month
Control
Treatment

Treatment


Sibling MH Evaluation (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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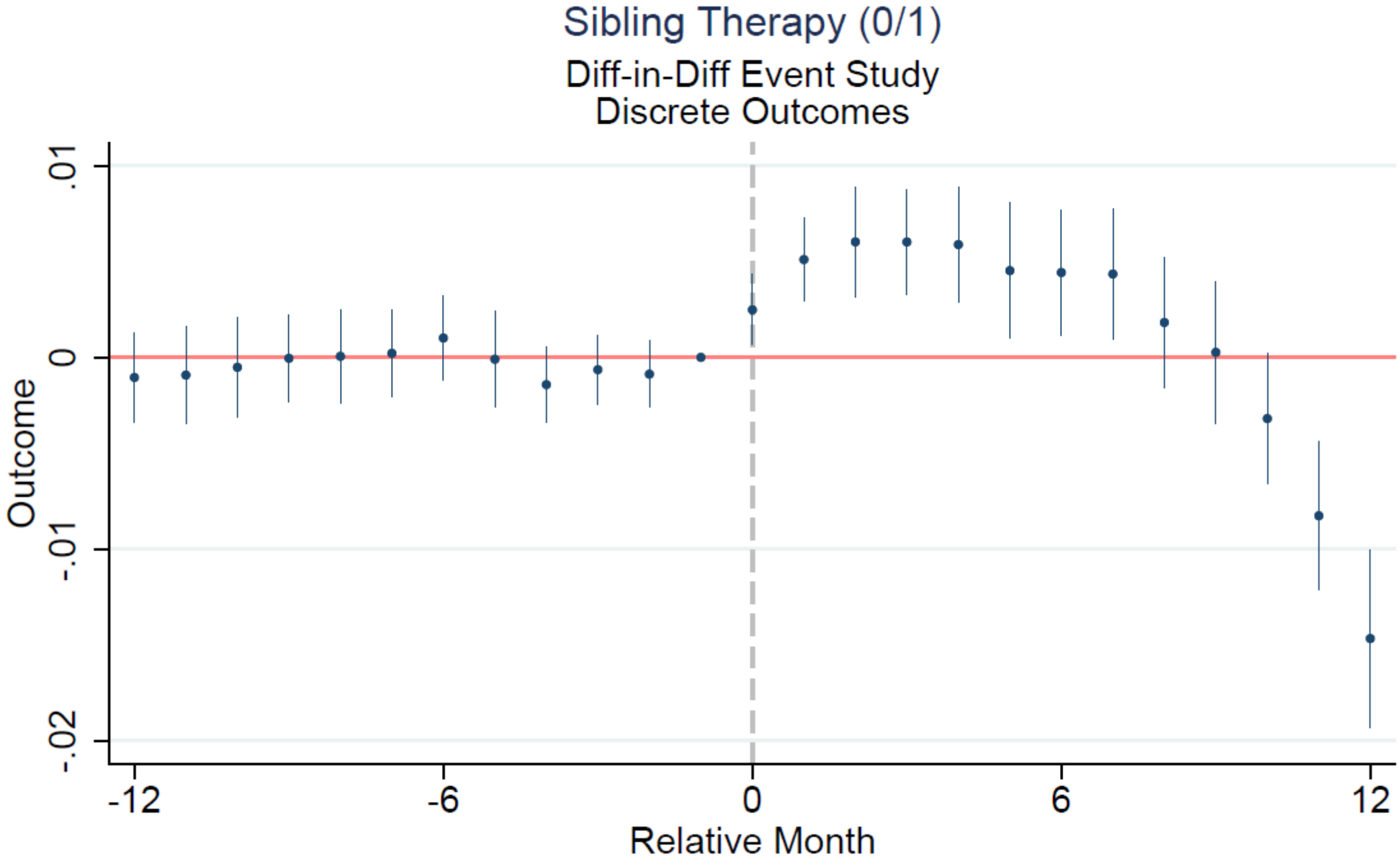
.01
0
-.01
-.02
-12
-6
0
6
12
Relative Month


Sibling Therapy (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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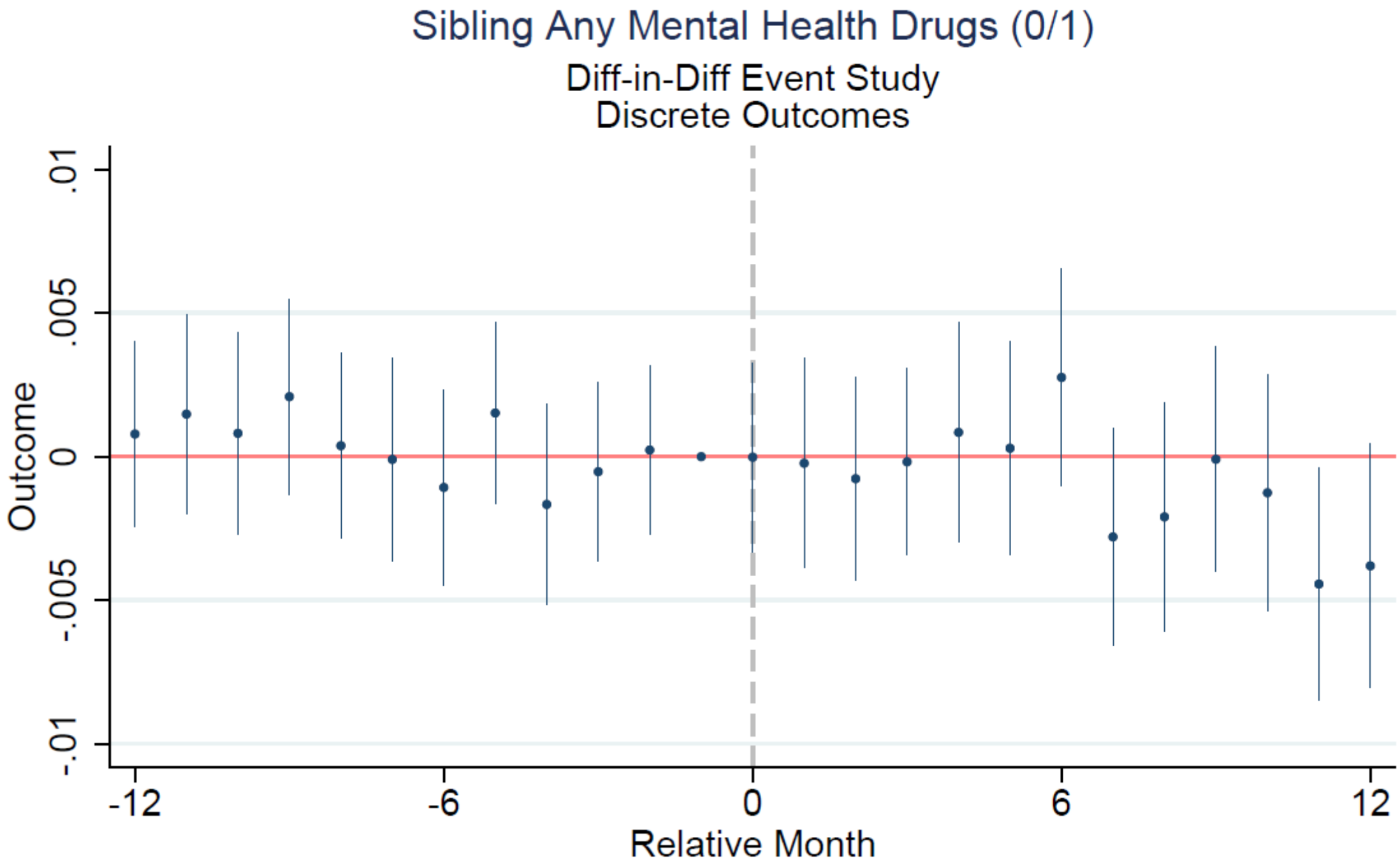
0
-.01
-.02
-12
-6
0
6
12
Relative Month


Sibling Any Mental Health Drugs (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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.005
0
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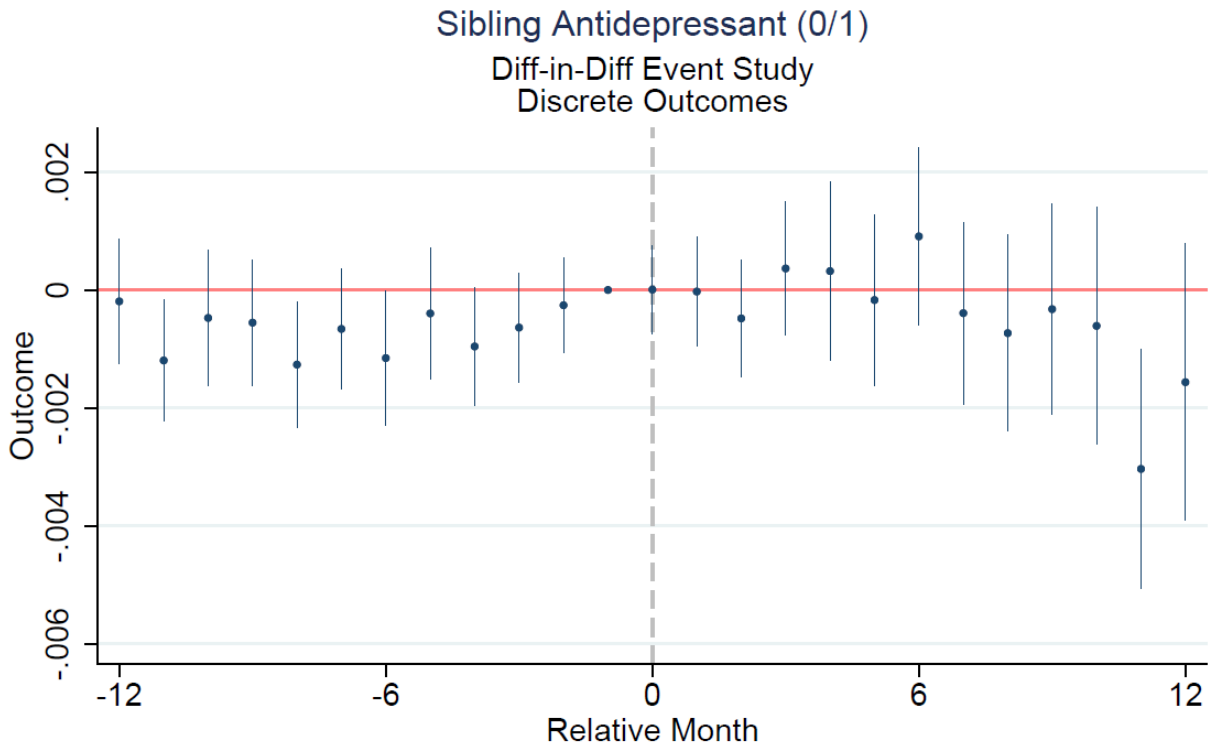
-6
0
6
12
Relative Month


Sibling Antidepressant (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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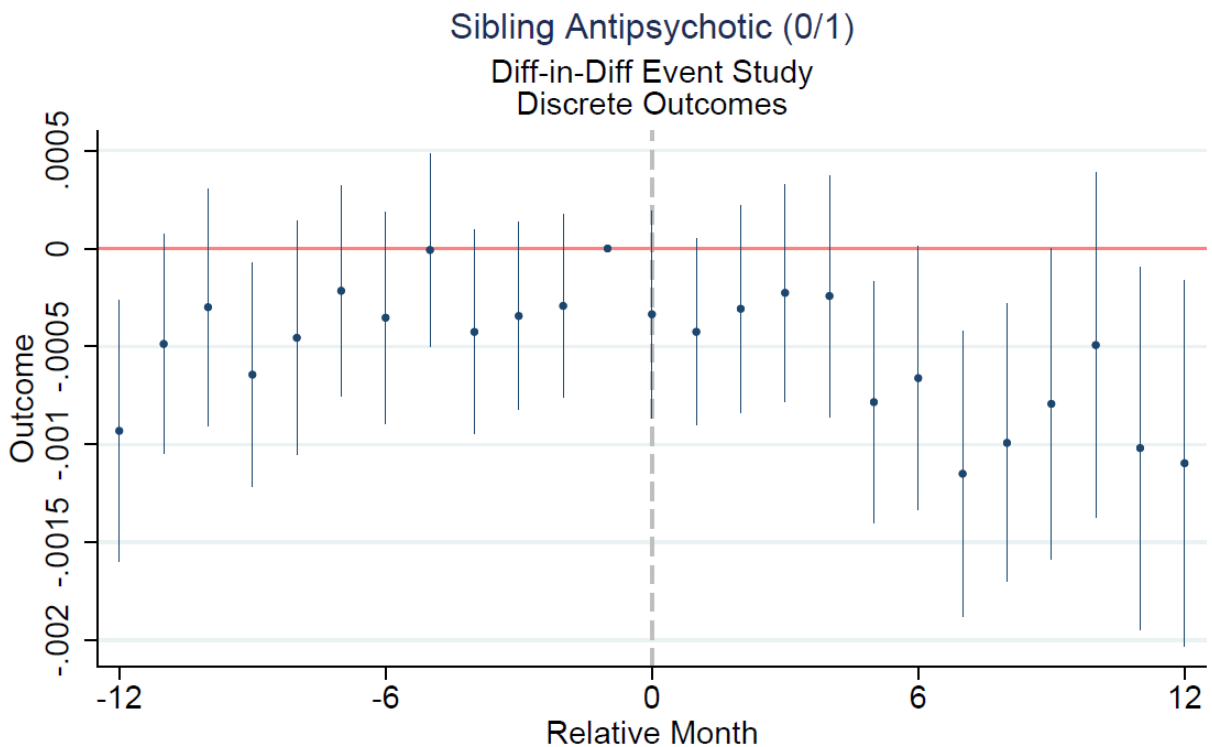
0
6
12
Relative Month


Sibling Antipsychotic (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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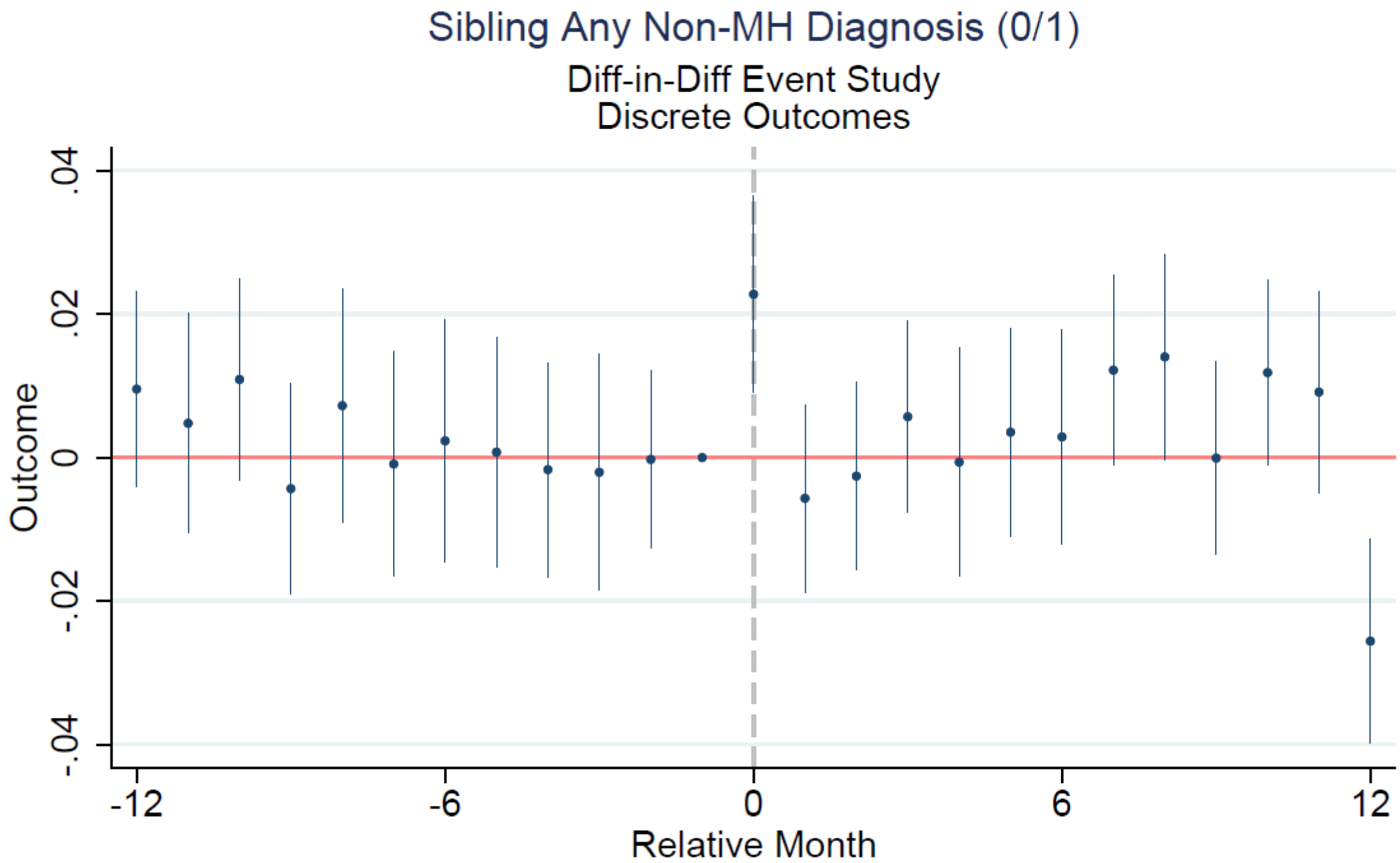
-12
-6
0
6
12
Relative Month

Overall Health & Wellbeing


Sibling Any Non-MH Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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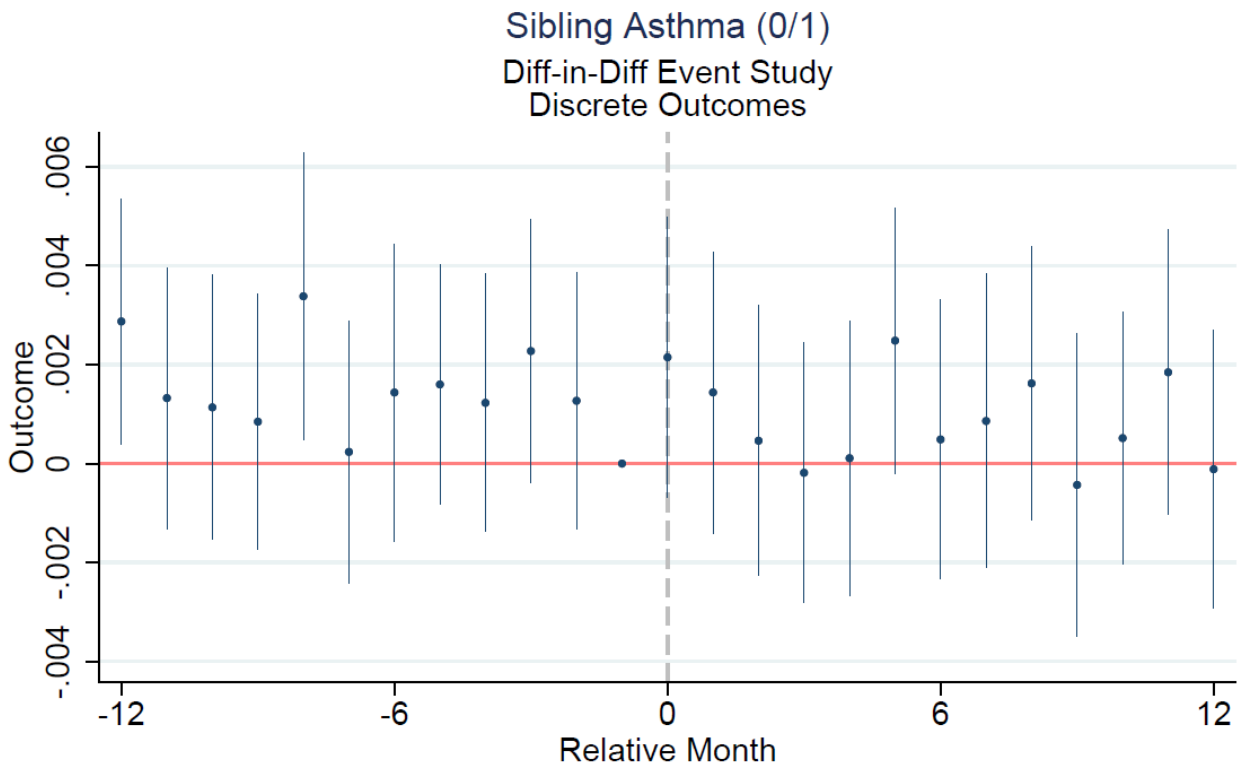
.02
0
-.02
-.04
-12
-6
0
6
12
Relative Month


Sibling Asthma (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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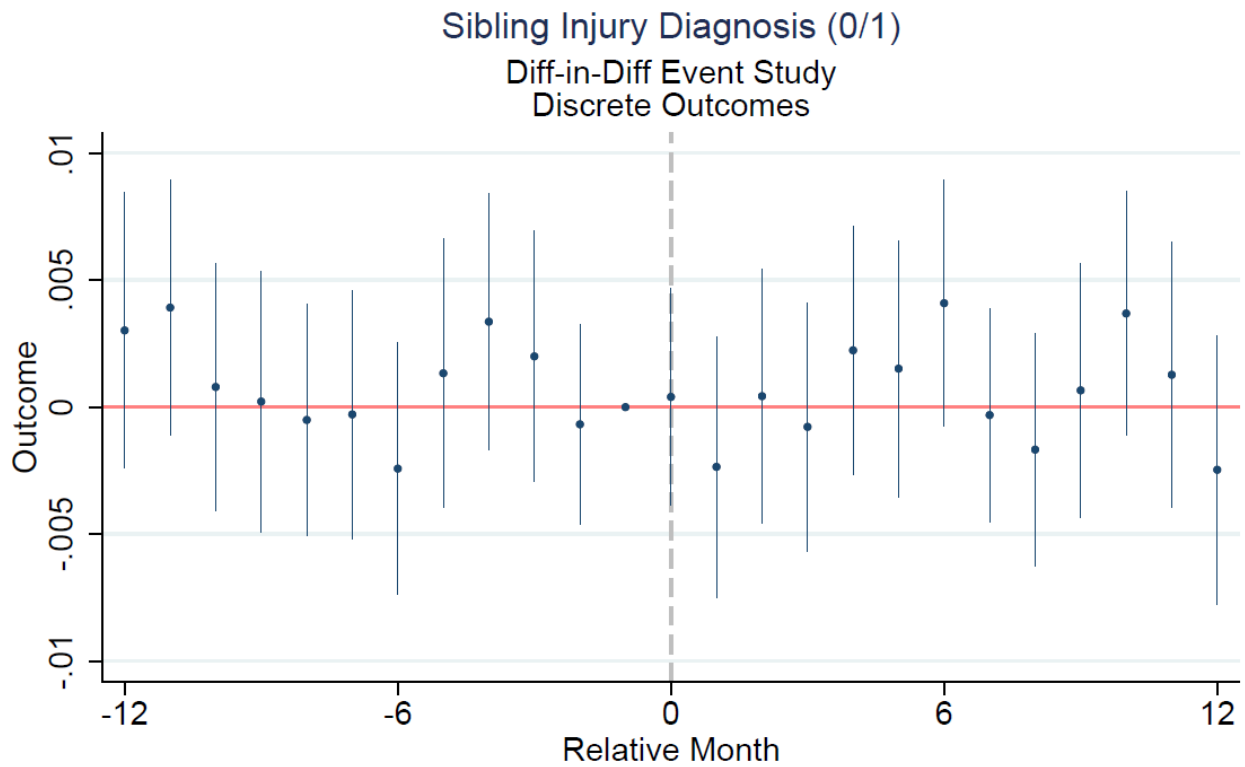
.004
.006
-12
-6
0
6
12
Relative Month


Sibling Injury Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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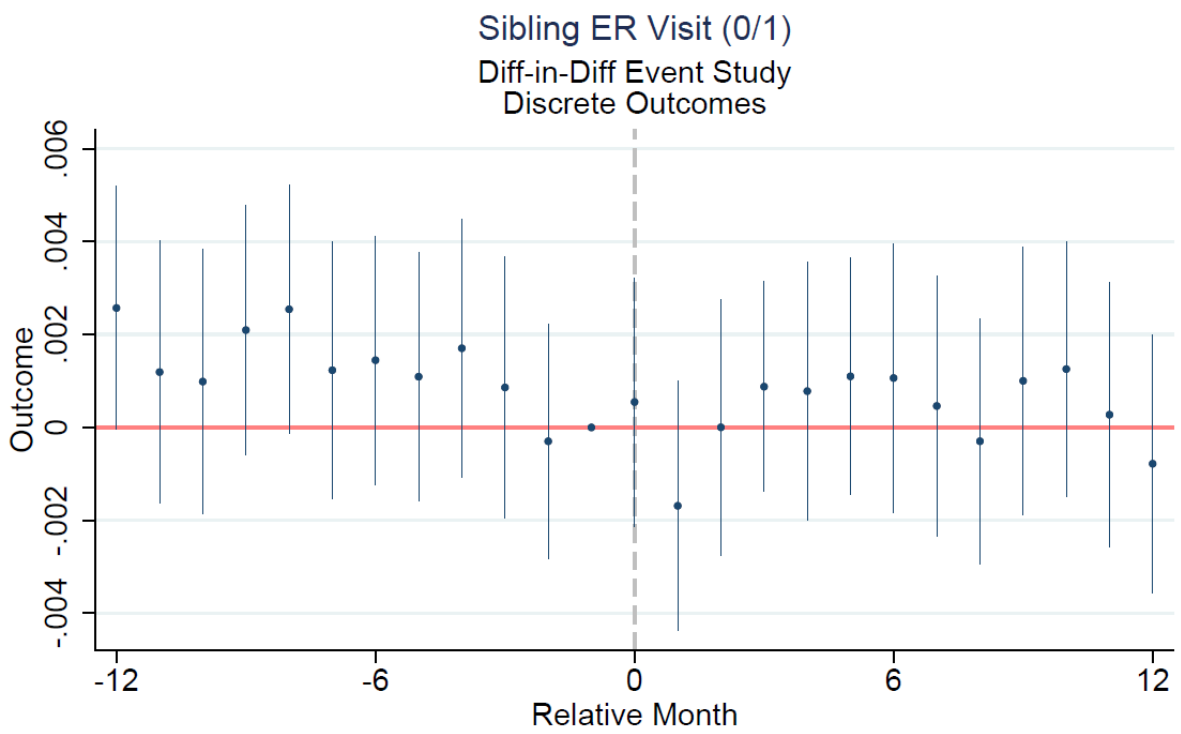
-.005
0
.005
.01
-12
-6
0
6
12
Relative Month


Sibling ER Visit (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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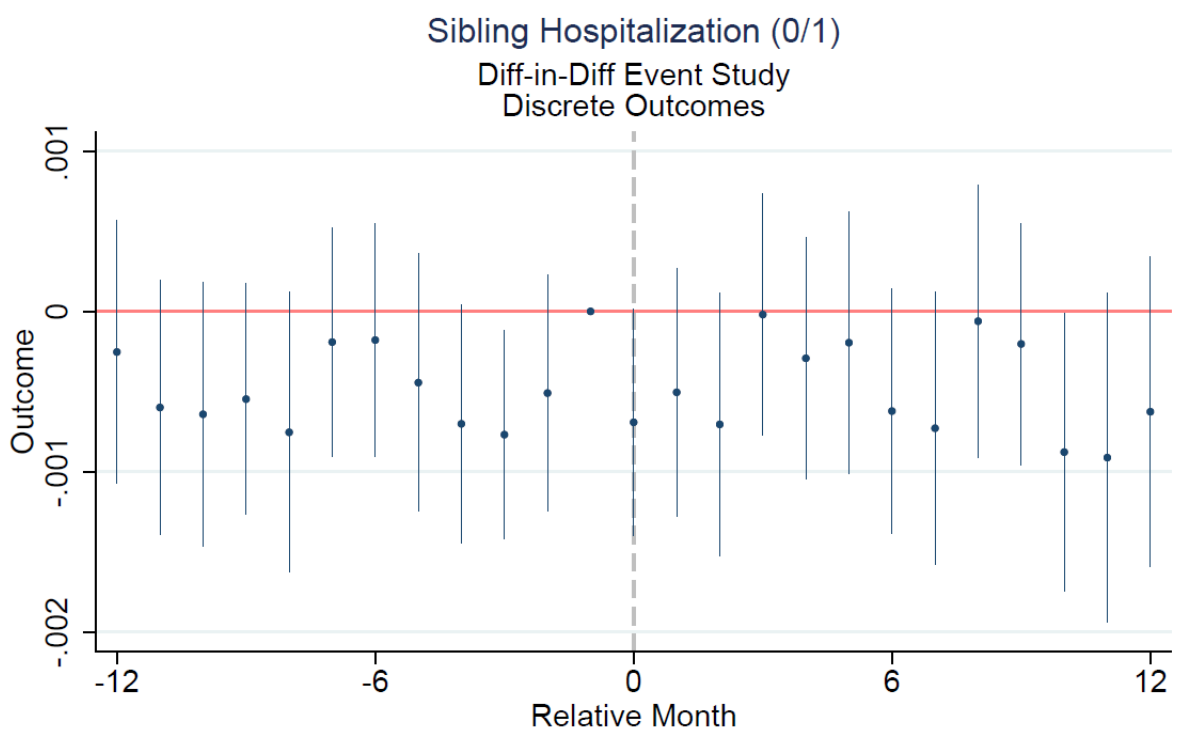
.004
.002
0
-.002
-.004
-12
-6
0
6
12
Relative Month


Sibling Hospitalization (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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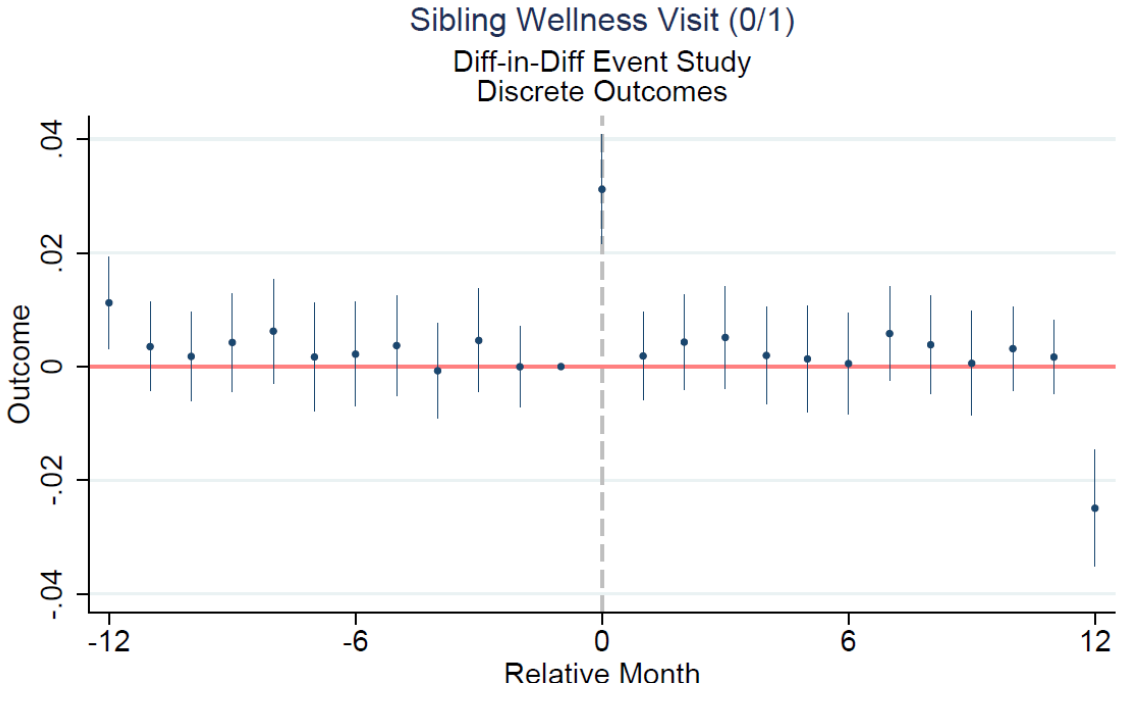
0
-.001
-.002
-12
-6
0
6
12
Relative Month


Sibling Wellness Visit (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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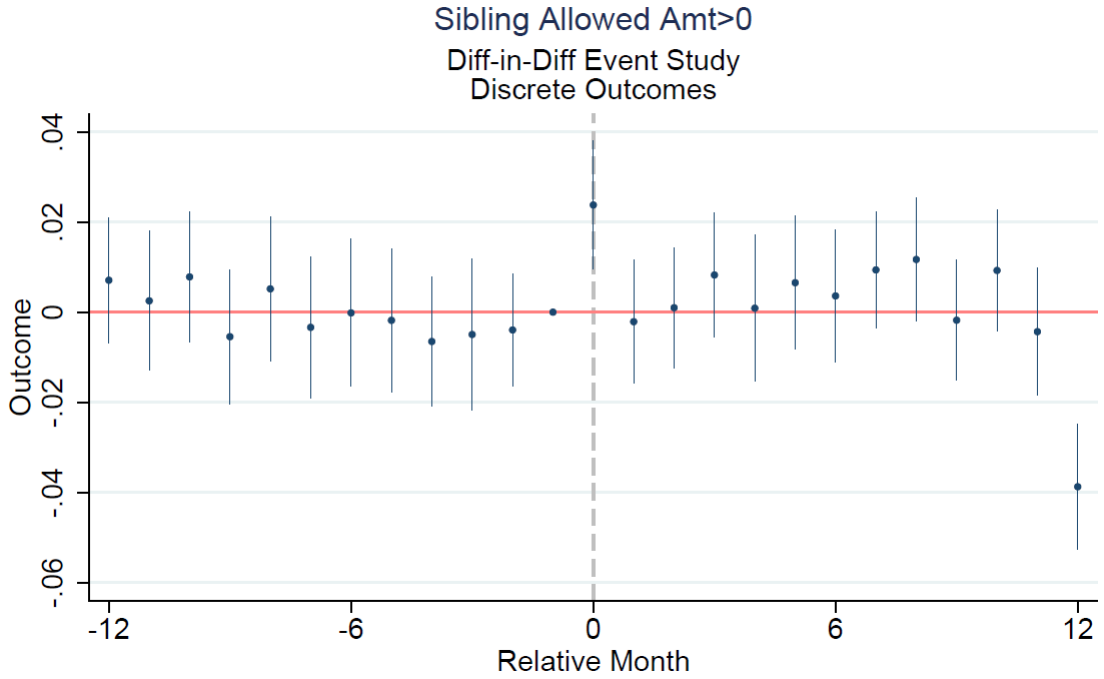
.02
0
-.02
-.04
-12
-6
0
6
12
Relative Month

Spending


Sibling Allowed Amt>0
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
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0
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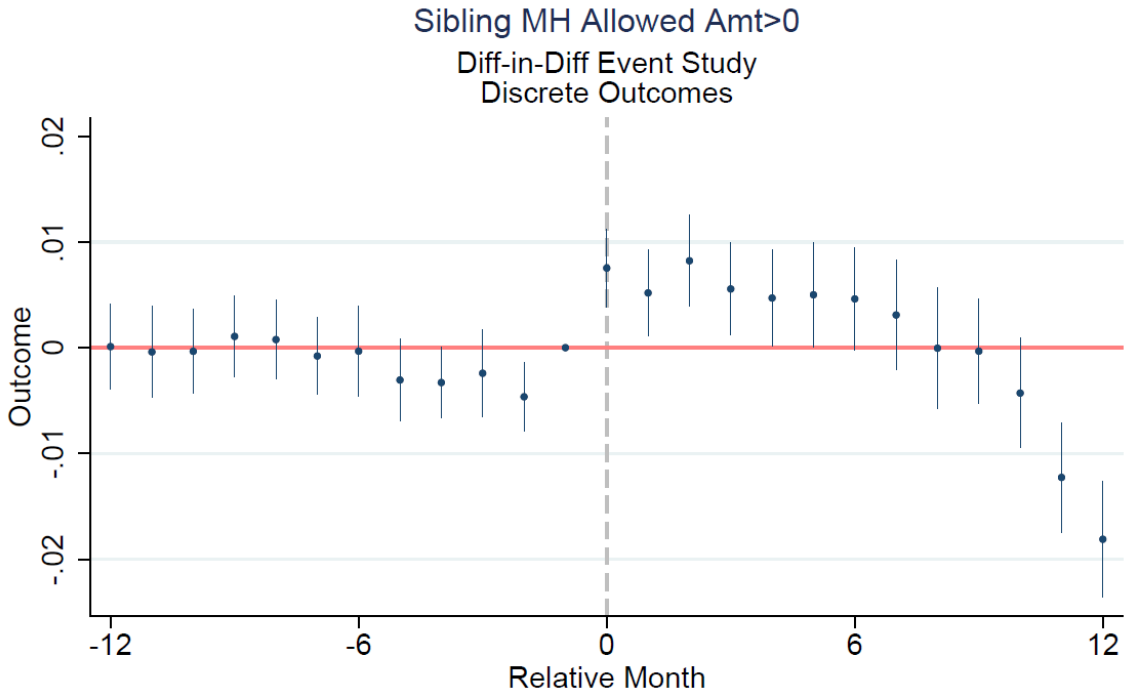
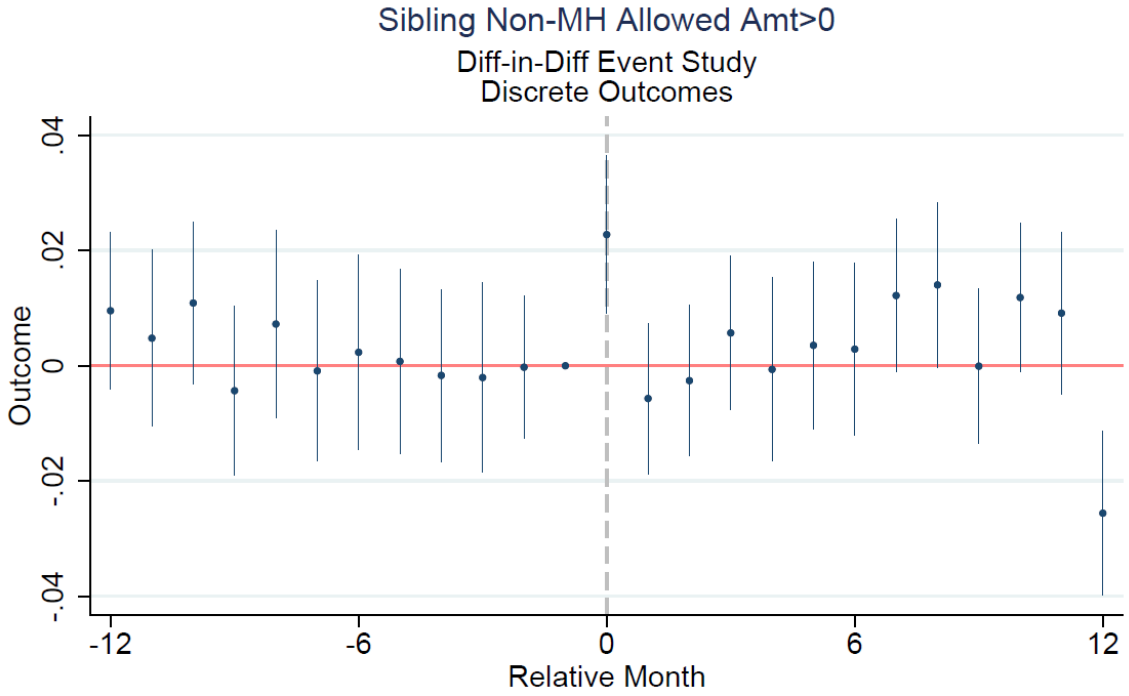
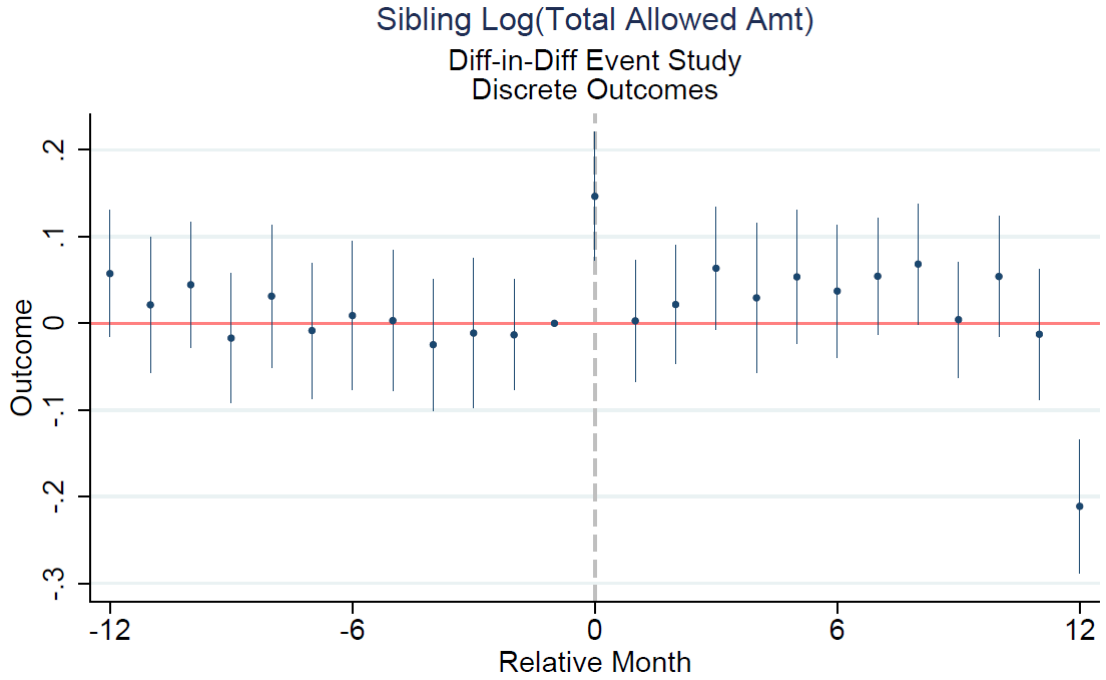
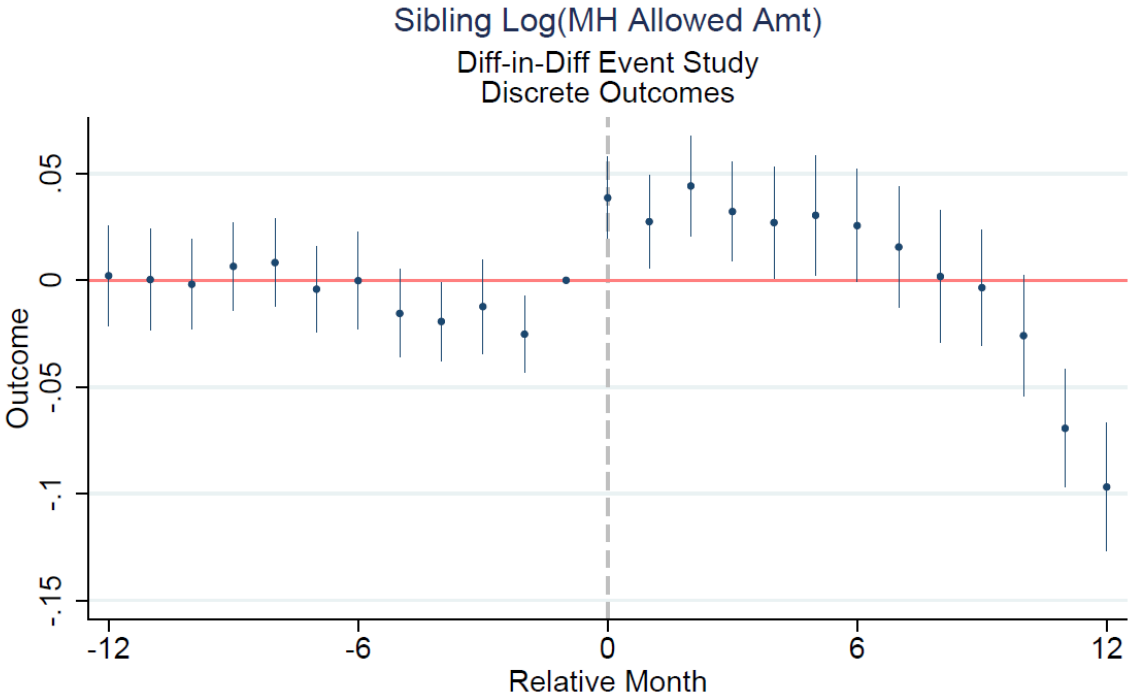
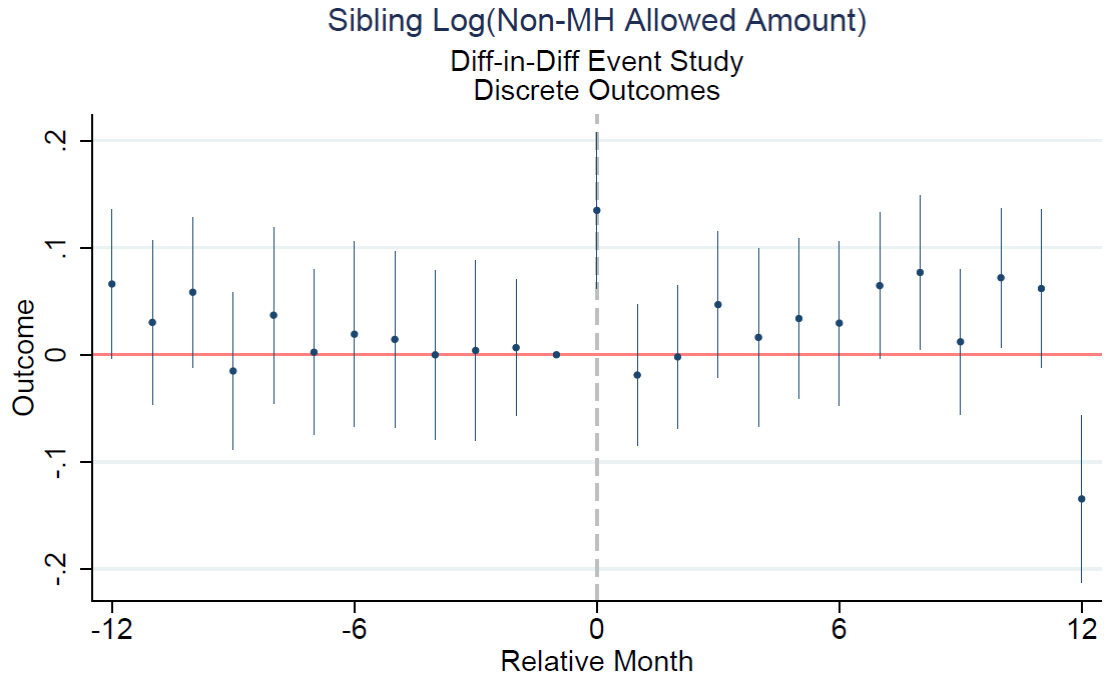
-12
-6
0
6
12
Relative Month


Sibling MH Allowed Amt>0
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.02
.01
0
-.01
-.02
-12
-6
0
6
12
Relative Month


Sibling Non-MH Allowed Amt>0
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.04
.02
0
-.02
-.04
-12
-6
0
6
12
Relative Month


Sibling Log(Total Allowed Amt)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.2
.1
0
-.1
-.2
-.3
-12
-6
0
6
12
Relative Month


Sibling Log(MH Allowed Amt)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.05
0
-.05
-.1
-.15
-12
-6
0
6
12
Relative Month


Sibling Log(Non-MH Allowed Amount)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.2
.1
0
-.1
-.2
-12
-6
0
6
12
Relative Month

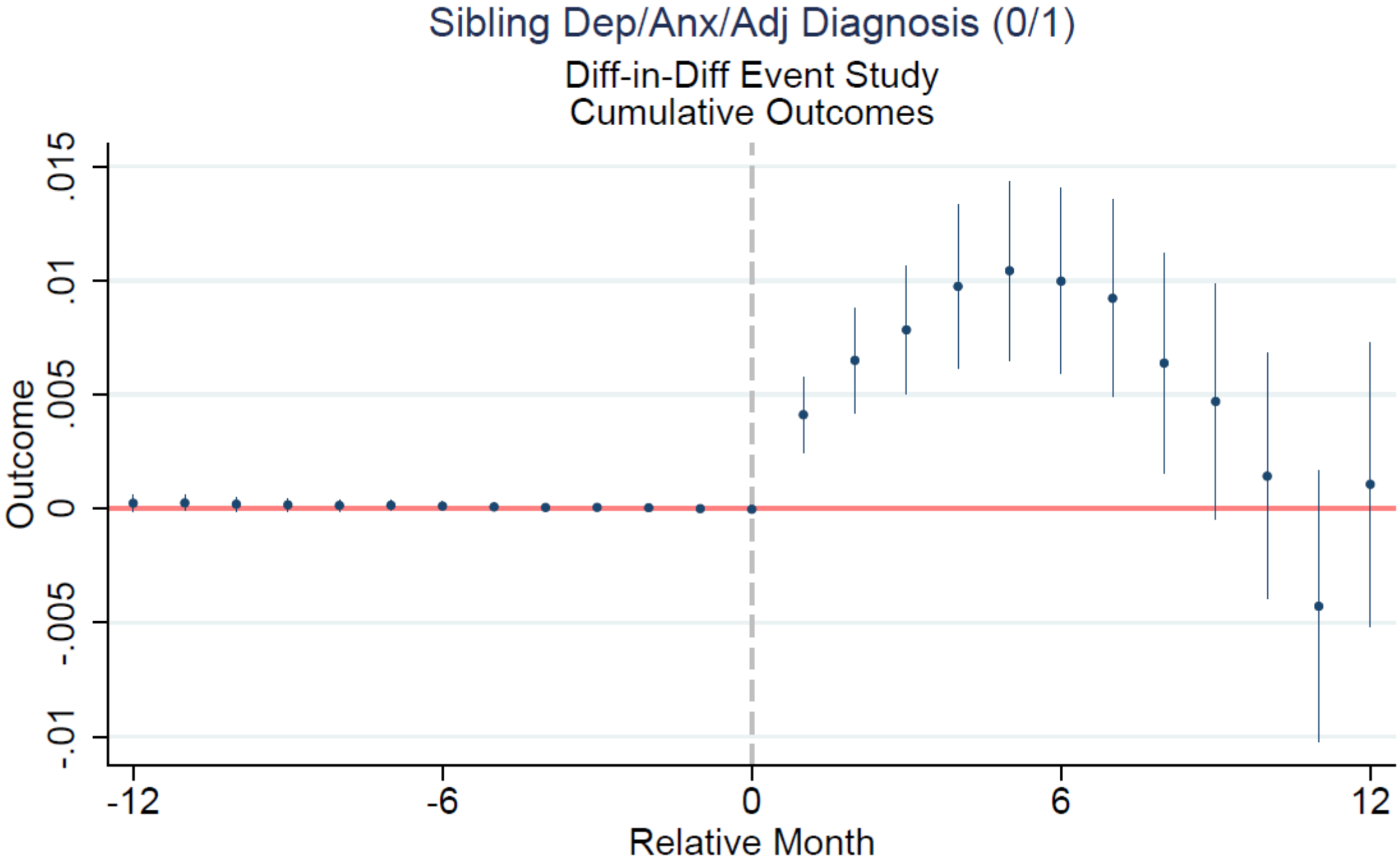
What's Next?

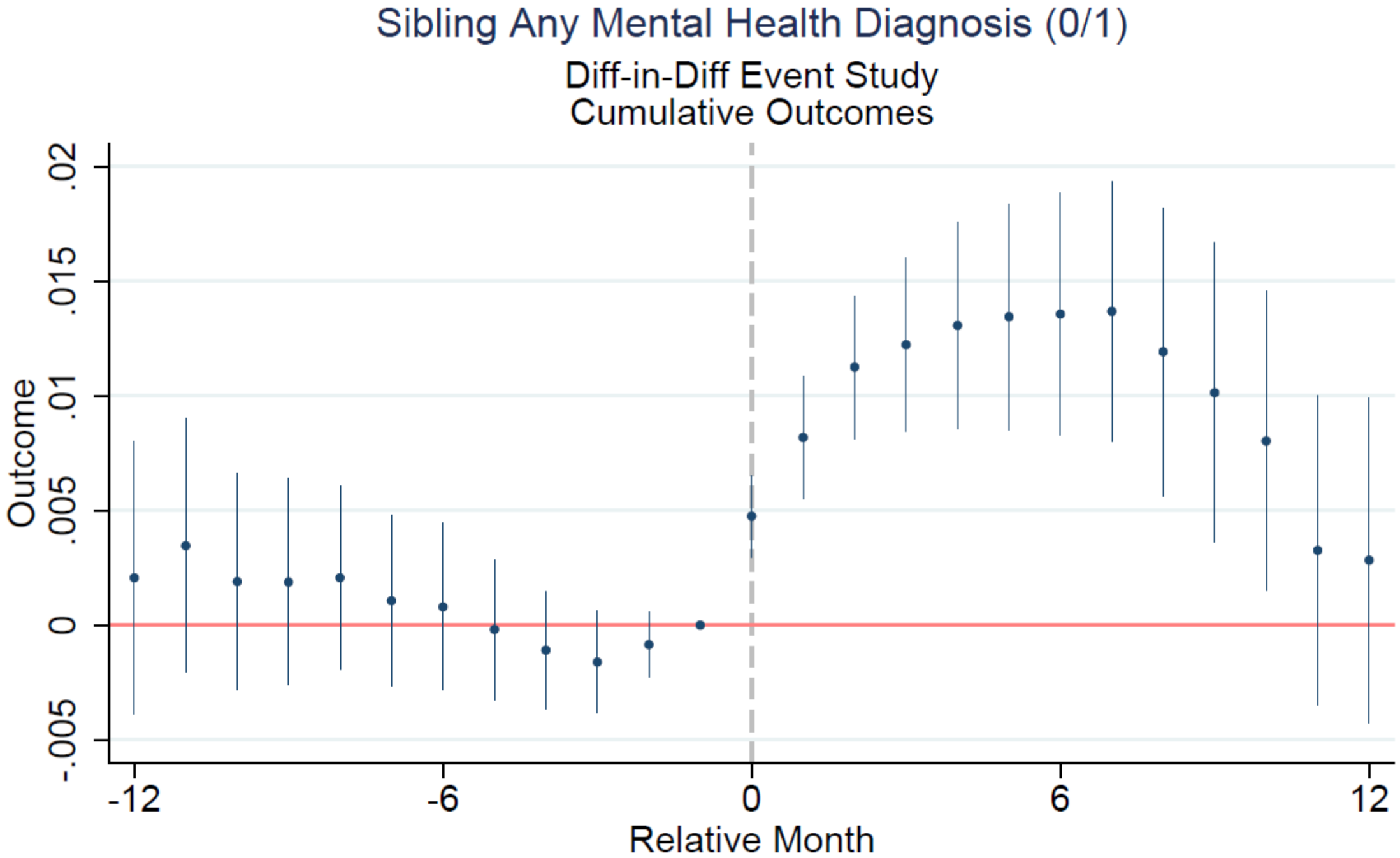
- **Robustness**
  - Varied bandwidths
  - Alternative outcomes
  - More time-varying covariates (e.g., pre-period spending)
  - Allow for cohort-specific treatment effect heterogeneity

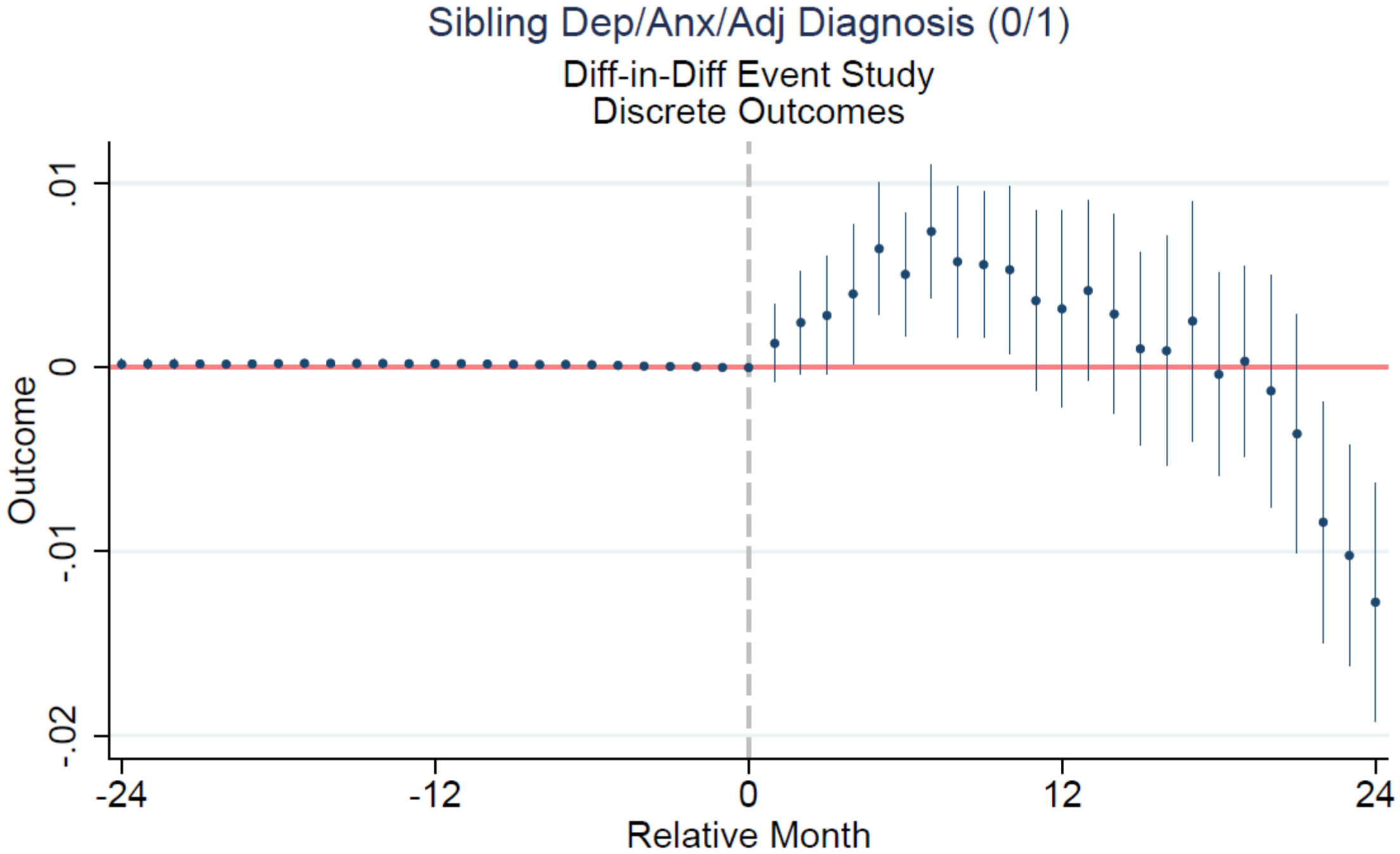
- **Heterogeneity & Mechanisms**
  - Severity: if spillovers directly causal, severity should matter
  - Specific conditions: if spillovers revelatory, would expect similarity in diagnoses

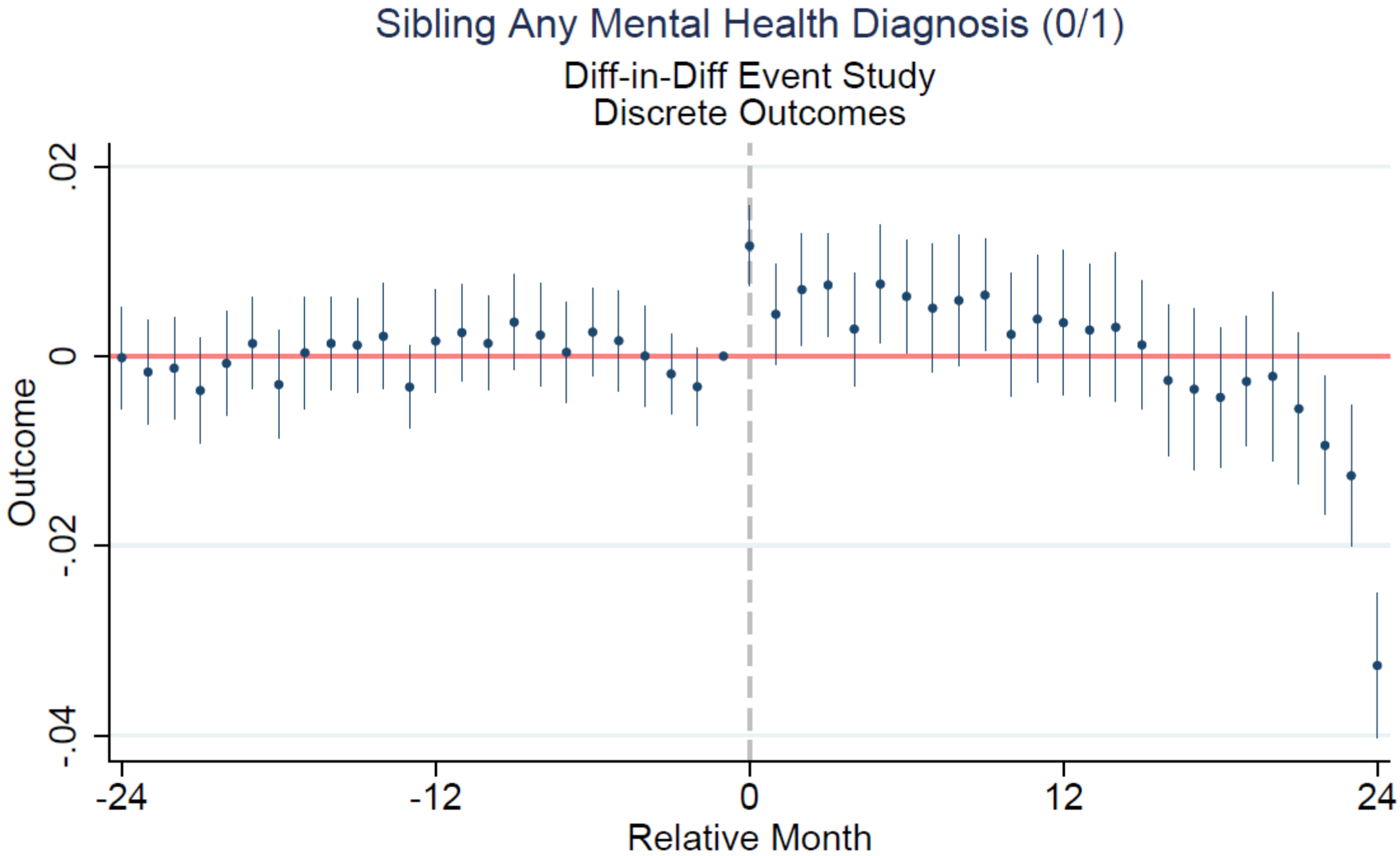
- **Parents**
  - Do children's mental health affect their parents?

Robustness

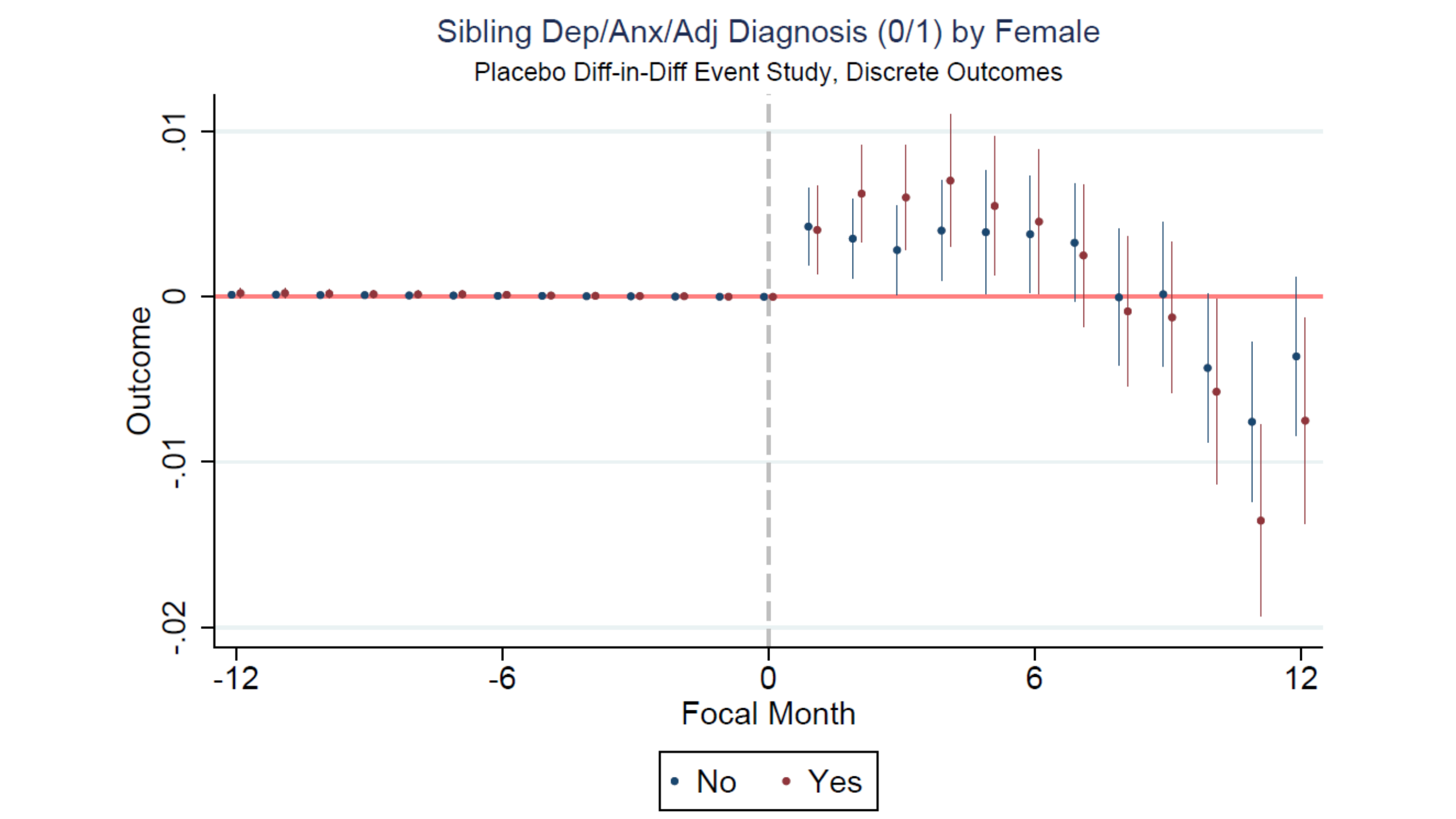

Sibling Dep/Anx/Adj Diagnosis (0/1)
Diff-in-Diff Event Study
Cumulative Outcomes
Outcome
.015
.01
.005
0
-.005
-.01
-12
-6
0
6
12
Relative Month

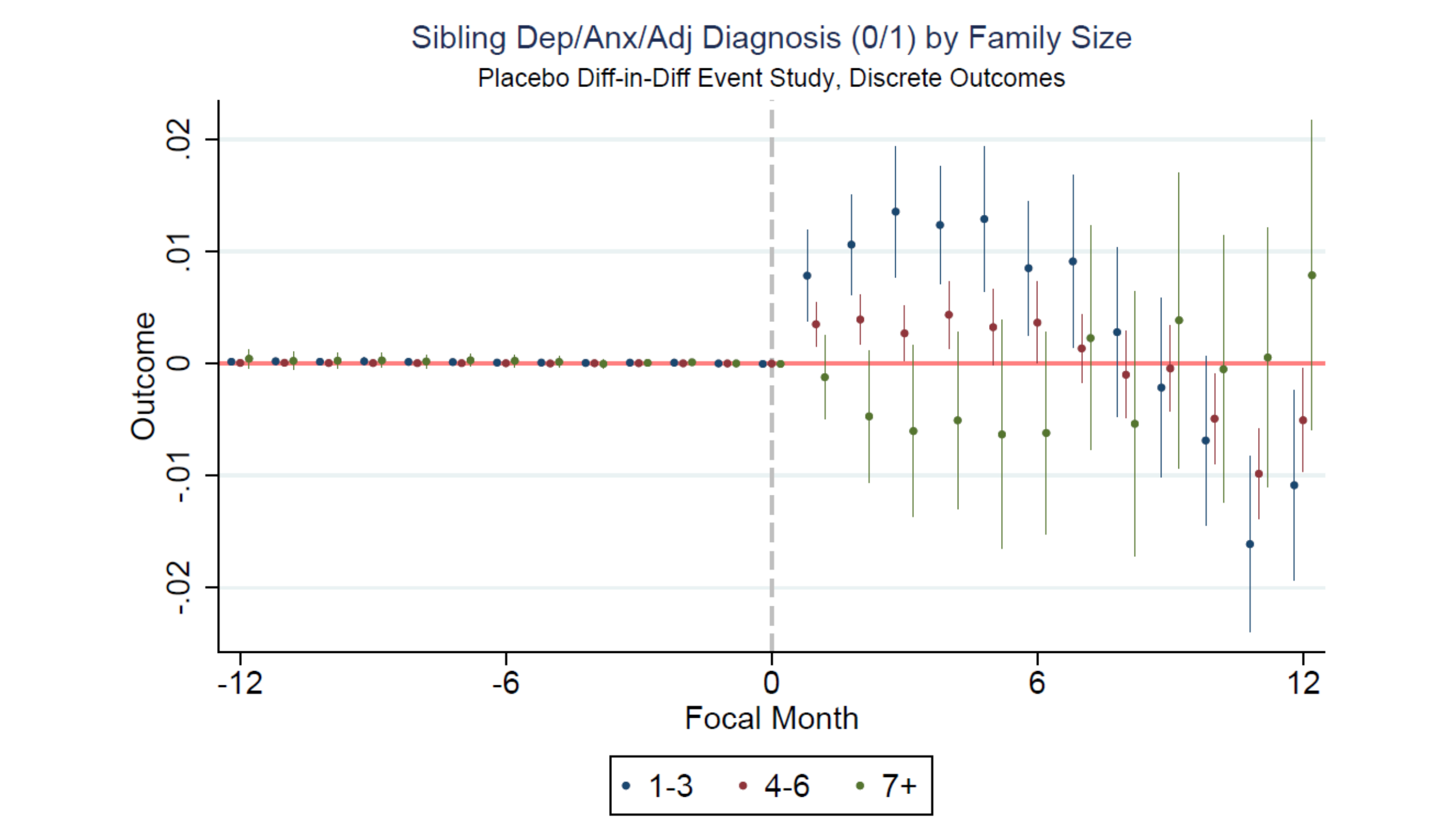

Sibling Any Mental Health Diagnosis (0/1)
Diff-in-Diff Event Study
Cumulative Outcomes
Outcome
-.005
0
.005
.01
.015
.02
-12
-6
0
6
12
Relative Month


Sibling Dep/Anx/Adj Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.01
0
-.01
-.02
-24
-12
0
12
24
Relative Month


Sibling Any Mental Health Diagnosis (0/1)
Diff-in-Diff Event Study
Discrete Outcomes
Outcome
.02
0
-.02
-.04
-24
-12
0
12
24
Relative Month

Heterogeneity


Sibling Dep/Anx/Adj Diagnosis (0/1) by Female
Placebo Diff-in-Diff Event Study, Discrete Outcomes
Outcome
.01
0
-.01
-.02
-12
-6
0
6
12
Focal Month
No
Yes


Sibling Dep/Anx/Adj Diagnosis (0/1) by Family Size
Placebo Diff-in-Diff Event Study, Discrete Outcomes
Outcome
.02
.01
0
-.01
-.02
-12
-6
0
6
12
Focal Month
1-3
4-6
7+

Effect Sizes

- Using control groups means as baseline, we have first 6 months effects of:
  - DAA: 0.5 pp (+31%)
  - Any MH: 0.6 pp (+10.5%)
  - Therapy: 0.5 pp (+22%)
  - Log(MH spending): +4.1%

- And months 10-11 effects of
  - DAA: -0.75pp (-47%)
  - Any MH: -0.75pp (-13%)
  - Therapy: -0.6pp (-26%)
  - Log(MH spending): -5.1%

- Similar for other outcomes

Summary of Findings

- **Notable sibling effects on mental health diagnosis, treatment, and spending.**
  - Increased incidence of MH detection and services in first 6 months.
  - Gradual fade out leading to full reversal within first year.
  - Consistent with early detection hypothesis.
  - Clinical response favors therapy over drugs.
  - May suggest mental health benefits from spillovers.

- **No evidence of effects on acute or chronic physical health or overall health spending.**
  - Also consistent with early detection.
  - Avoidance of adverse consequences bolsters the case for salubrious spillovers.

Policy Implications (so far)

- Your siblings affect your mental health.
  - Possibly in a net good way, even when things are going bad for them.
- Early detection may improve outcomes.
- Families can be a diagnostic device.

As for the hypotheses,

- **Spillovers are directly causal.**
  - Largest effect on adjustment disorders.
  - Should look at severity; pre-treatment spending.
- **Common shock: e.g., household stress.**
  - By design, some temporal spacing between sib diagnoses.
- **Revelation of shared genetics/environment.**
  - Early detection theme.
  - Should look at diagnosis correspondence.
- **Confirmation bias: typecasting families.**
  - Little evidence so far.