9.3 Month of School Enrollment and Diagnosis and Treatment of Attention Deficit-Hyperactivity Disorder (ADHD)

Some children (especially boys) have more trouble sitting still in the classroom and paying attention to the teacher than their classmates. One reason for this might be because they have Attention Deficit-Hyperactivity Disorder (ADHD), but in some cases it may also be because they are younger than their classmates. In states where children must be 5 years old by September 1 to start school, children born in August may be almost a year younger than their classmates born in September, who must wait almost a whole additional year before they are old enough to start school. To investigate whether this age difference contributes to children being diagnosed with and treated for ADHD, Harvard investigators [1] used a large insurance database to compare claims-based ADHD diagnoses and treatment among children born in August with those born in September. As they had predicted, children born in August were significantly more likely to be diagnosed with ADHD.

Excerpt from an advertisement for Evekeo® racemic amphetamine sulfate. From https://www.evekeo.com/pdfs/patient-profiles.pdf, accessed December 5, 2018. Poor Jake would have even more problems if he was born in August and about to start full day first grade.

For each of the next three results, indicate which of the techniques for enhancing causal inference discussed in Chapter 9 it represents.

A. The authors compared ADHD diagnoses in other pairs of adjacent months (Figure 1 from the paper pasted below.)

	January	February	March	April	May	June	July	August	September	October	November	December
Total no. of children	32,690	31,238	34,405	34,565	34,977	34,415	36,577	36,319	35,353	34,405	31,285	31,617
No. of children with ADHD	265	280	307	312	287	317	320	309	225	240	232	243
Rate per 10,000 children	81.1	89.6	89.2	90.3	90.6	83.4	87.5	85.1	63.6	69.8	74.2	76.9
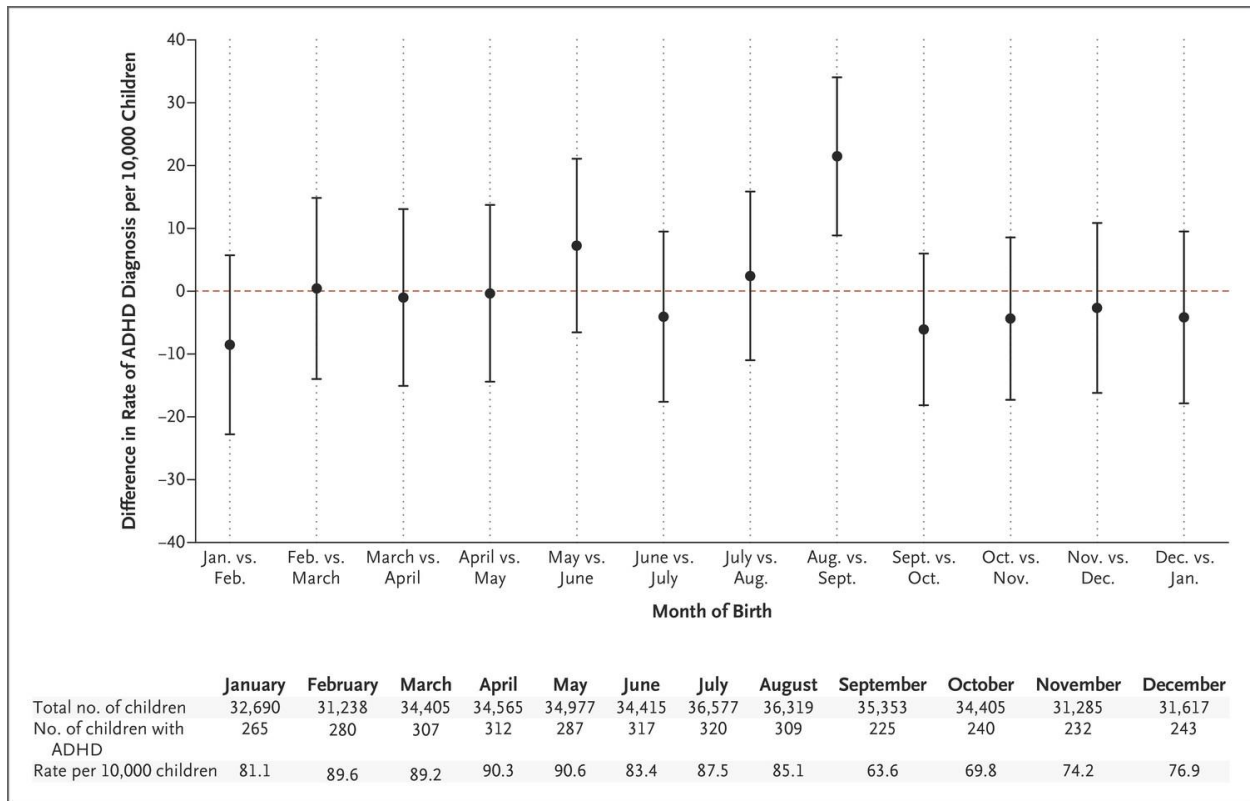
"Figure 1. Differences in Diagnosis Rates of Attention Deficit–Hyperactivity Disorder (ADHD) According to Month of Birth. Each point represents the absolute difference in the rate of ADHD diagnosis per 10,000 children between children born in a given month and children born in the following month…" From Layton TJ, Barnett ML, Hicks TR, Jena AB. Attention Deficit-Hyperactivity Disorder and Month of School Enrollment. N Engl J Med 379:2122-30. Copyright © 2018, Massachusetts Medical Society. Reprinted with permission from the Massachusetts Medical Society.

This is an example of comparing alternate predictors (different pairs of months) to see if other these other predictors have the same effect on outcome.

B.) The authors also compared results between states that do and do not have the September 1 cutoff for starting school (Figure 2).
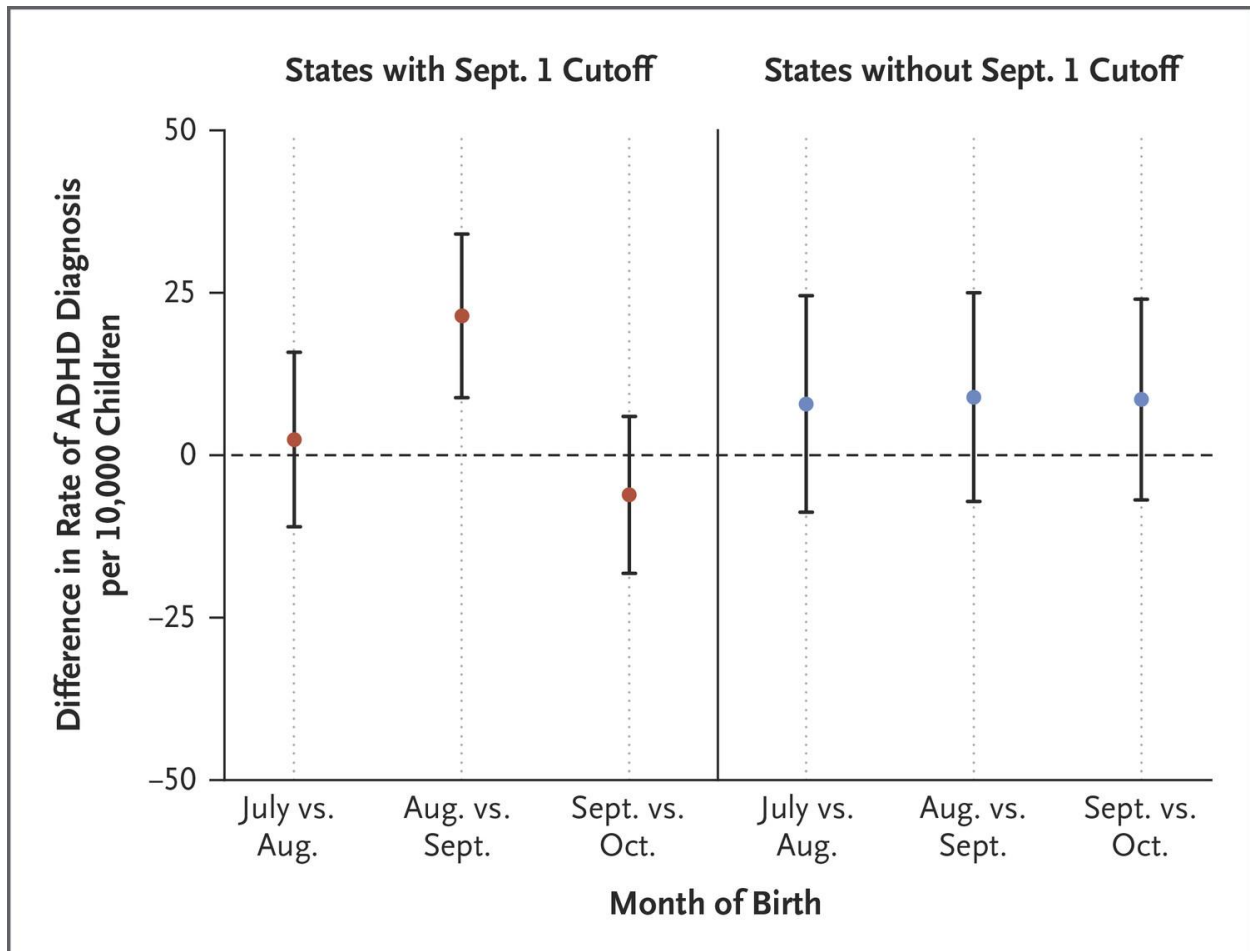
Figure 2. Differences in ADHD Diagnosis Rates According to Month of Birth in States with and States without a September 1 Cutoff. Shown are the differences in ADHD diagnosis rates between children in the 18 states with a September 1 cutoff for kindergarten entry and children in all states without a September 1 cutoff. The dashed line indicates no difference. I bars indicate 95% confidence intervals. ... From Layton TJ, Barnett ML, Hicks TR, Jena AB. Attention Deficit-Hyperactivity Disorder and Month of School Enrollment. N Engl J Med 379:2122-30. Copyright © 2018, Massachusetts Medical Society. Reprinted with permission from the Massachusetts Medical Society.

This is an example of comparing results in different populations with different predicted susceptibility to the exposure or treatment.

C.) From the abstract: "In addition, in states with a September 1 cutoff, no significant differences between August-born and September-born children were observed in rates of asthma, diabetes, or obesity."

This is an example of comparing the effects of the predictor on outcomes not hypothesized to be affected.

1.   Layton TJ, Barnett ML, Hicks TR, Jena AB. Attention Deficit-Hyperactivity Disorder and Month of School Enrollment. N Engl J Med. 2018;379(22):2122-30.