Note from Prof. Murdock: As background reading for you, an article from *The New York Times* is reproduced below (https://www.nytimes.com/2018/11/28/opinion/august-birthdays-adhd.html).

The Link Between August Birthdays and A.D.H.D.: A new study raises questions about age, maturity and overdiagnosis.

By Anupam B. Jena, Michael Barnett and Timothy J. Layton
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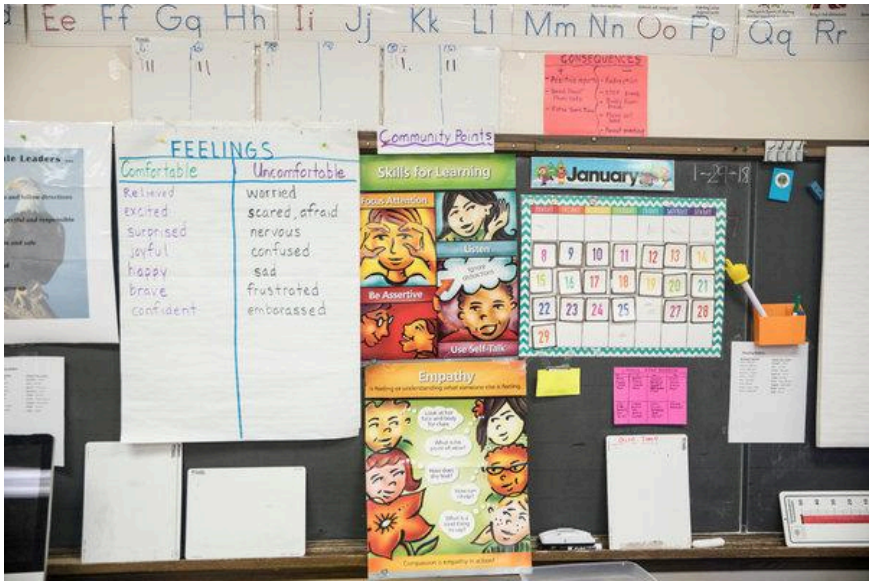

Posters about feelings, learning and empathy in a second-grade class in Minneapolis.
Tim Gruber for *The New York Times*

The rate of diagnosis of Attention Deficit Hyperactivity Disorder among children has nearly doubled in the past two decades. Rates of A.D.H.D. diagnoses also vary considerably across states, with nearly three times as many children getting the diagnosis in Kentucky (where one in five children are said to have the condition) as in Nevada. More than 5 percent of all children in the United States now take an A.D.H.D. medication. These facts raise the question of whether the disease is being overdiagnosed.

Diagnosing A.D.H.D. is difficult. Unlike other childhood diseases — such as asthma, obesity and diabetes — the diagnosis of A.D.H.D. is inherently subjective and depends on the assessment of parents, school personnel and health care providers. For a child who is easily distracted, an assessment of normal, inattentive behavior by one health care provider could be a formal diagnosis of A.D.H.D. by another.

It turns out that although diagnosing A.D.H.D. requires a subjective interpretation of facts by physicians, the month in which a child is born can be a strong, objective predictor.

Most states have arbitrary cutoffs for kindergarten entry, such that children who do not reach a given age by a certain date are required to wait a year. In 18 states, children who will turn 5 before Sept. 1 can enter kindergarten in the year that they turn 5; children who will turn 5 after Sept. 1 must wait until the

next year. So in states with Sept. 1 cutoffs, in any given class, August-born children will usually be the youngest and September-born children the oldest.

These arbitrary entry-age cutoffs have important implications for the diagnosis of A.D.H.D. In a study published in The New England Journal of Medicine, we found that among several hundred thousand children who were born between 2007 and 2009 and followed until 2016, rates of A.D.H.D. diagnosis *and* treatment were 34 percent higher among children born in August than among children born in September in states with a Sept. 1 school entry-age cutoff. No such difference was found among children in states with different cutoff dates. The effects were largest among boys.

We believe these findings reveal just how subjective the diagnosis of A.D.H.D. can be. In any given class, inattentive behavior among younger, August-born children may be perceived, in some instances, to reflect symptoms of A.D.H.D., rather than the relative immaturity that is biologically determined and to be expected among children who are nearly one year younger than September-born classmates.

The stakes of additional, potentially inappropriate diagnoses are high, particularly when diagnoses are accompanied by medical treatment, which has side effects. In cases where A.D.H.D. is appropriately diagnosed, we know that behavioral and medical treatments can improve concentration, school performance and other outcomes. And in these instances, the harms of medical treatments are, on average, outweighed by the benefits. But when the disease is improperly diagnosed, the clinical harms and dollar costs of treatment may not be met with commensurate benefits.

Unlike other diseases such as asthma and diabetes, whose diagnosis is more objective and is not based on peer-to-peer comparisons, the diagnosis of A.D.H.D. appears heavily influenced by how children behave in school relative to peers and how those differences in behavior are interpreted by school personnel, parents and ultimately, physicians. Indeed, some evidence suggests that teachers and other school personnel are more likely than physicians or parents to first suggest that a child may have A.D.H.D.

Our findings aren't new, but they suggest a continuing problem. Several older studies, both within and outside the United States, analyze rates of A.D.H.D. diagnosis among children born just before versus just after school entry-age cutoffs, similar in design to our study. Nearly all of these studies suggest that younger children within a grade are more likely to be diagnosed with A.D.H.D. than older children in the same grade. One studyfound that the relative age of a child in a class strongly affects teachers' assessments of whether a child demonstrates A.D.H.D. symptoms but does not affect parents' assessments, which suggests that many diagnoses may stem from teachers' perceptions of students that are based on a child's age relative to peers.

Our study, which uses recent data, tells us that the problem still exists and that it's not small. Despite growing awareness that A.D.H.D. may be overdiagnosed and the fact that the medications used to treat it have serious side effects, something as arbitrary as the month a child is born still has a meaningful impact on the likelihood that the child is determined to have the condition.

At a minimum, physicians who frequently diagnose A.D.H.D. in children should be aware of these findings. A simple mental "adjustment" for whether a child is born in August may be sufficient to help physicians reduce overdiagnosis.

School personnel and parents should also be aware of how simple cognitive biases can creep into how important clinical decisions are made. Both our and previous findings suggest that parents of children who are young for their grade could reasonably question whether the initiation of medical treatment for A.D.H.D. should be delayed.

In his 2008 book “Outliers,” Malcolm Gladwell describes the now well-known phenomenon that a disproportionate number of Canadian professional hockey players have birth dates in the beginning of the calendar year. This is explained by the Jan. 1 age eligibility cutoff for hockey programs in Canada, which leads to the oldest hockey players within an age-based division exceeding the age of the youngest players by nearly a year, conferring them a performance advantage. A similar phenomenon is true for A.D.H.D., where a child’s age relative to peers confers a markedly different rate of diagnosis and treatment, but the stakes are higher.

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