

## **Over diagnosed or over-looked? The effect of age at time of school entry on students receiving special education services**

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**Background/Context:** Disparities in special education placement for children along sociodemographic characteristics are well-studied but not well understood. While much of the literature has focused on estimating disproportionality in placement rates by socioeconomic status, race, and gender, less attention has been paid to the role that relative age in a grade cohort can play in changing the likelihood a child receives special education services, particularly in the early grades. Special education may be susceptible to age bias because placement is determined by a referral system that can use peer group comparisons to flag potential need. Especially in early grades, when the range of developmental differences in classrooms is broad, these relative age effects may be particularly salient. In fact, a large body of work has found that children who are among the youngest in their grade are more significantly more likely to be diagnosed with ADHD in Germany (Schwandt & Wupperman, 2015), the Netherlands (Krabbe et. al., 2014) and the United States (Elder, 2009; Layton et. al., 2018). A recent study in Florida also found that among children born to the same mother, those born just before the kindergarten entrance date (i.e., relatively young for grade) are ~4.0 percentage points more likely to receive special education services than their siblings who are relatively old for grade (Dhuey et. al., 2019). Given the importance of special education services to the academic success of children with disabilities, and the limited resources of school districts required to provide these programs, these findings have implications for schools and for policymakers seeking to improve special education program provision.

**Objective:** The current study builds on the findings described above by estimating the effect of relative age on special education placement in Michigan. In other words, are younger students differentially likely to be placed in special education compared with their older peers at kindergarten entry and do these effects persist through middle school? Importantly, the current study looks specifically at kindergarten entry to estimate the long-term relative age effect on young students. Using data on over 1 million students across 10 statewide cohorts, I also expand upon current evidence in several ways. First, I estimate the timing of any potential disparities over the course of K-8 using year-by-year measures. Second, I explore heterogeneity in effects by student characteristics and several possible mechanisms for why relative age might cause these effects. Third, I use impact variation estimation methods to identify heterogeneity in effects by school district and the characteristics of school districts that predict this variation.

**Setting:** The context of this study is Michigan public schools enrolling kindergarten students between school years 2002-2003 and 2012-2013. In Michigan, eligibility for kindergarten is determined by a statewide birthday cutoff. Thus, the kindergarten entrance law serves as an exogenous determination of the age at which children are eligible to start kindergarten, sorting children with birthdays just before the cutoff into being young for their grade and children with birthdays just after the cutoff into being old for their grade.

**Population/Participants/Subjects:** The sample includes all students who enrolled in a Michigan public school (including charter schools) for kindergarten. The sample is roughly 1,285,165

students across 10 kindergarten cohorts and the study follows students through 8<sup>th</sup> grade (for the earlier cohorts) and through 5<sup>th</sup> grade for all cohorts.

**Research Design:** This study uses a fuzzy regression discontinuity design to estimate the effect of being young at school entry on special education receipt in elementary and middle school. I also estimate heterogeneity in effects by race/ethnicity, gender, and free/reduced price lunch status and heterogeneity in effects within race/ethnicity categories by gender. Finally, I use impact variation methods (Bloom et. al., 2017) to estimate differences in effects across school districts and to identify district-level characteristics that predict this variation.

**Data Collection and Analysis:** I use data from the Michigan Education Data Center (MDEC), a longitudinal data set including student demographic information, enrollment records, and scores on Michigan state standardized tests. Using a fuzzy regression discontinuity design, where the running variable is days between an individual students' birthday and the kindergarten cutoff date, I estimate an intent-to-treat (ITT) effect of being *eligible* to begin kindergarten at a younger age on my outcomes of interest. I also estimate the local average treatment effect (LATE) of *enrolling* in kindergarten on time at age five, using eligibility as an instrument for enrollment. My main outcome of interest is special education placement from kindergarten through 8<sup>th</sup> grade as measured by having an Individualized Education Plan (IEP). I also include measures of disability category, service duration, and special education exit.

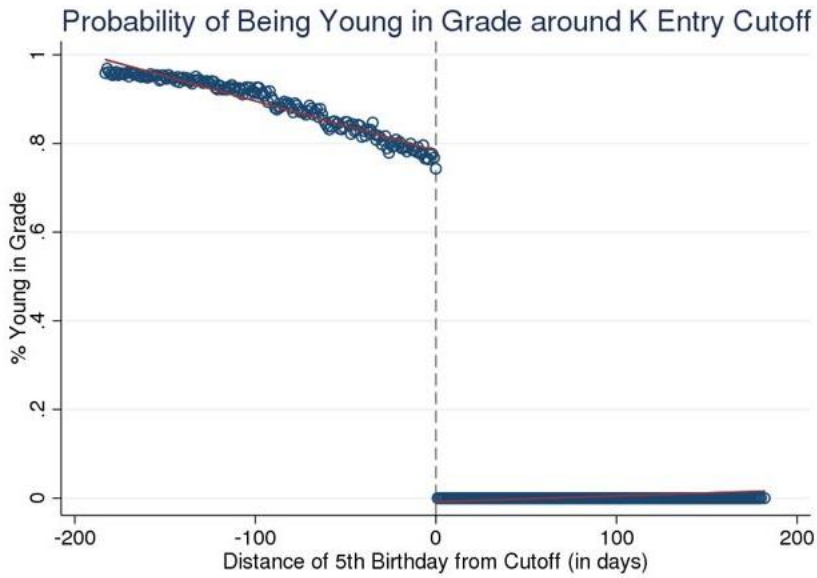
**Preliminary Findings:** I find a strong first stage relationship between eligibility for and enrollment in kindergarten at a young age (Figure 1) and a large discontinuity in the likelihood of placement in special education in kindergarten at the eligibility threshold (Figure 2). On the primary outcome of special education placement, I find that students who enroll in kindergarten at a younger age are 2.5-3.3 ( $p < 0.001$ ) percentage points more likely to be placed in special education in kindergarten and 4.3 percentage points ( $p < 0.001$ ) more likely to ever be placed in special education through 5<sup>th</sup> grade (Table 1). Preliminary results also indicate that these effects at kindergarten entry are heterogeneous by gender, with boys more likely to experience a relative age effect than girls. Further, within race/ethnicity groups, I find that these effects are concentrated among white boys and black girls.

**Conclusions:** By the time of the SREE annual meeting, I will have also expanded this preliminary work to address several hypotheses for why children who are relatively young for age may be more likely to be placed in special education. Pending impact variation work will also identify school district characteristics that predict more or less disparity in special education placement by relative age, which in turn may inform policy decisions at the school district level around special education referral and diagnosis.

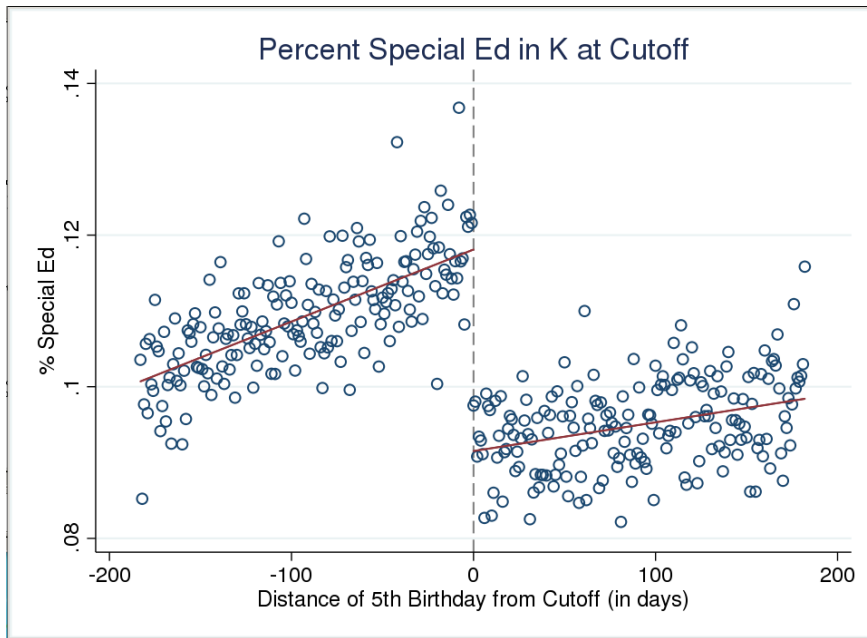
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**Figure 1:** First stage relationship between eligibility for kindergarten at a relatively young age and actual enrollment in kindergarten at a young age



**Figure 2:** Likelihood of special education placement in kindergarten at the kindergarten entrance cutoff along the running variable (distance of birthday from kindergarten cutoff) for the full sample (through 5<sup>th</sup> grade)



**Table 1:** Impacts of being young in grade on special education placement in kindergarten through fifth grade and on ever receiving services in elementary school

	Sped in K	Sped in 1st	Sped in 2nd	Sped in 3rd	Sped in 4th	Sped in 5th	Ever in Special Ed
First Stage	0.85***	0.82***	0.82***	0.83***	0.83***	0.80***	0.83***
First Stage CI	[0.84, 0.86]	[0.81, 0.84]	[0.81, 0.83]	[0.82, 0.85]	[0.82, 0.84]	[0.79, 0.82]	[0.82, 0.85]
Enroll - Young	3.3***	3.1***	2.3***	2.3***	2.5***	2.7***	4.3***
Robust SE	0.6	0.6	0.6	0.6	0.5	0.6	0.7
Robust CI	[2.1 , 4.5]	[2.0 , 4.4]	[1.0 , 3.6]	[1.1 , 3.5]	[1.5 , 3.7]	[1.5 , 3.9]	[2.9 , 5.6]
BW N	50	40	39	43	43	37	43

*Note:* Results are estimated using local polynomial estimation (*rdrobust* command in Stata) with a mean squared error optimal bandwidth selector. Covariates are binary indicators for female, black, Hispanic, Asian, FRPL, Migrant, Early On (indicates prior access to early intervention but not receiving services), and fixed effects for kindergarten eligible year 03-04 through 11-12. Standard errors are clustered at the district-level (district most enrolled in child's first kindergarten year- i.e., year 0). The polynomial order is P=1, the optimal bandwidth selector used is mserd, VCE= enrolled district yr0, Kernel= triangular.