SREE 2020

Title: *The Long-Run Achievement Impacts of Early Head Start: Evidence from Program Roll-out*

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Background

Since its creation in 1995, Early Head Start (EHS) has provided comprehensive early intervention services to pregnant women and low-income families with infants and toddlers. Designed around developmental theories demonstrating the ability for early interventions to change later outcomes, EHS programs offer a wide range of early intervention services including home visits, child care, prenatal and parenting education, and health care. The federally-mandated Early Head Start Evaluation experiment revealed benefits for EHS child participants including higher cognitive and language development, higher emotional engagement with parents, and fewer aggressive behaviors relative to non-participants (Love et al., 2005). Follow-up analyses conducted when EHS Evaluation participants reached fifth grade found no effects on study outcomes including in cognitive and socio-emotional domains (Vogel et al., 2010). These experiments, however, cannot capture at the population-level the impacts of EHS on children's future life experiences. Our study exploits variation in the timing of EHS roll-out and adoption at the county level to examine the impact of EHS on long-run achievement outcomes. In this way, we build upon similar work examining the impact of the county-level roll-out of key War on Poverty programs, such as Food Stamps and WIC, on key human capital outcomes (Almond, Hoynes, & Schanzenbach, 2011; Hoynes, Schanzenbach, & Almond, 2016).

Data & Analytical Design

We use a quasi-experimental difference-in-differences (DD) design to estimate the impact of EHS on two achievement outcomes, measured at the county level, comparing counties with an EHS grantee (treatment) with counties without an EHS grantee (counterfactual). We use the Head Start Program Information Report (PIR) data from 1997 through 2002 to identify EHS adoption at the grantee level and the characteristics of these grantees (see Figure 1). In 2002, approximately 14% (N = 424) of counties are EHS adopters and 86% were not. We then aggregate these data to the county level using the Missouri Census Data Center geographic correspondence tool to determine the county with the highest proportion of the population living in a particular zip code. This is necessary for assigning zip codes that cross county lines to a single county. County-year observations are coded as 0 if the county did not have an EHS grantee in that year and as 1 if the county includes a grantee that year. County-level math and English/language arts (ELA) achievement outcomes for 8th graders come from the Stanford Education Data Archive, available from 2009 through 2015. The achievement means are estimated on a standardized scale across all counties in which a given state-subject-grade-year case has a marginal mean of 0 and standard deviation of 1 (Reardon et al., 2019). We use 1997 through 2002 as the intervention period to correspond with the 2009 through 2015 8th grade school year.

A key assumption of DD designs is that the treatment and counterfactual groups both have parallel fluctuations in the outcome variable prior to the onset of treatment. Because county-level

achievement data are not available prior to the 2008-2009 school year, we rely on auxiliary outcome measures that are similarly related to EHS, but are available in the years preceding program roll-out, to test the common trends assumption. As a preliminary analysis of county pre-trends, we use birthweight, measured annually at the county level for high population counties only, available in the public-use versions of the data collected by the Centers for Disease Control and Prevention's National Vital Summary Statistics from 1990-1995. (We are in the process of obtaining the restricted-use versions of these data which include all counties.) EHS has a strong focus on prenatal health and aims to recruit women during pregnancy, so this measure can capture any potential differences in adoption versus non-adopting counties in infant health and development that may affect both adoption and test scores. Pre-trends on birthweight are shown in Figure 2 and indicate high comparability during the five year period prior to EHS roll-out for adopting- and non-EHS-adopting counties, meeting the key assumption of the DD design. We will be adding additional measures to assess for pre-trends.

To conduct covariate balance tests to alleviate concerns that other differences are contributing to our estimates, we are in the process of procuring the Regional Economic Information System (REIS) data for all counties in 1989. REIS contains rich income and employment data including total personal income, full and part-time employment, transfer payments, and population. Although the DD controls for time-invariant characteristics of counties, it does not address other time-varying characteristics of counties that may affect our estimate of interest. To address this limitation, the REIS variables will also be added to our regression models.

Preliminary Results

Preliminary models suggest that eighth graders living in counties with an EHS grantee when students were born perform better on English/language arts achievement scores ($p < 0.05$) compared to those living in counties without an EHS grantee (see Table 1). Analyses conducted separately by race suggest these effects are strongest for white students. However, eighth graders living in counties with an EHS grantee when students were born and those living in counties without an EHS grantee perform similarly on math achievement tests. We will next explore models that examine third grade achievement scores, which are more proximal to the EHS intervention, and include vectors of time-varying county-level controls (e.g., socioeconomic and race characteristics) and examine the extent to which EHS impacts are heterogeneous by county characteristics, including median income and educational attainment.

Implications

In 2014-2015, EHS programs served 153,073 children under the age of 4 and 13,329 pregnant women costing nearly $1.9 billion (Barnett & Friedman-Krauss, 2016). Our study will provide a more complete understanding of the effects of this large, federal early intervention program serving diverse families and children from under-resourced communities, and the extent to which short-term achievement impacts might persist in the intermediate- and long-run. Understanding the population-level impacts of EHS has the potential to advise current EHS program practices and inform developmental theories of continuity and change for children at risk of negative future outcomes.

References

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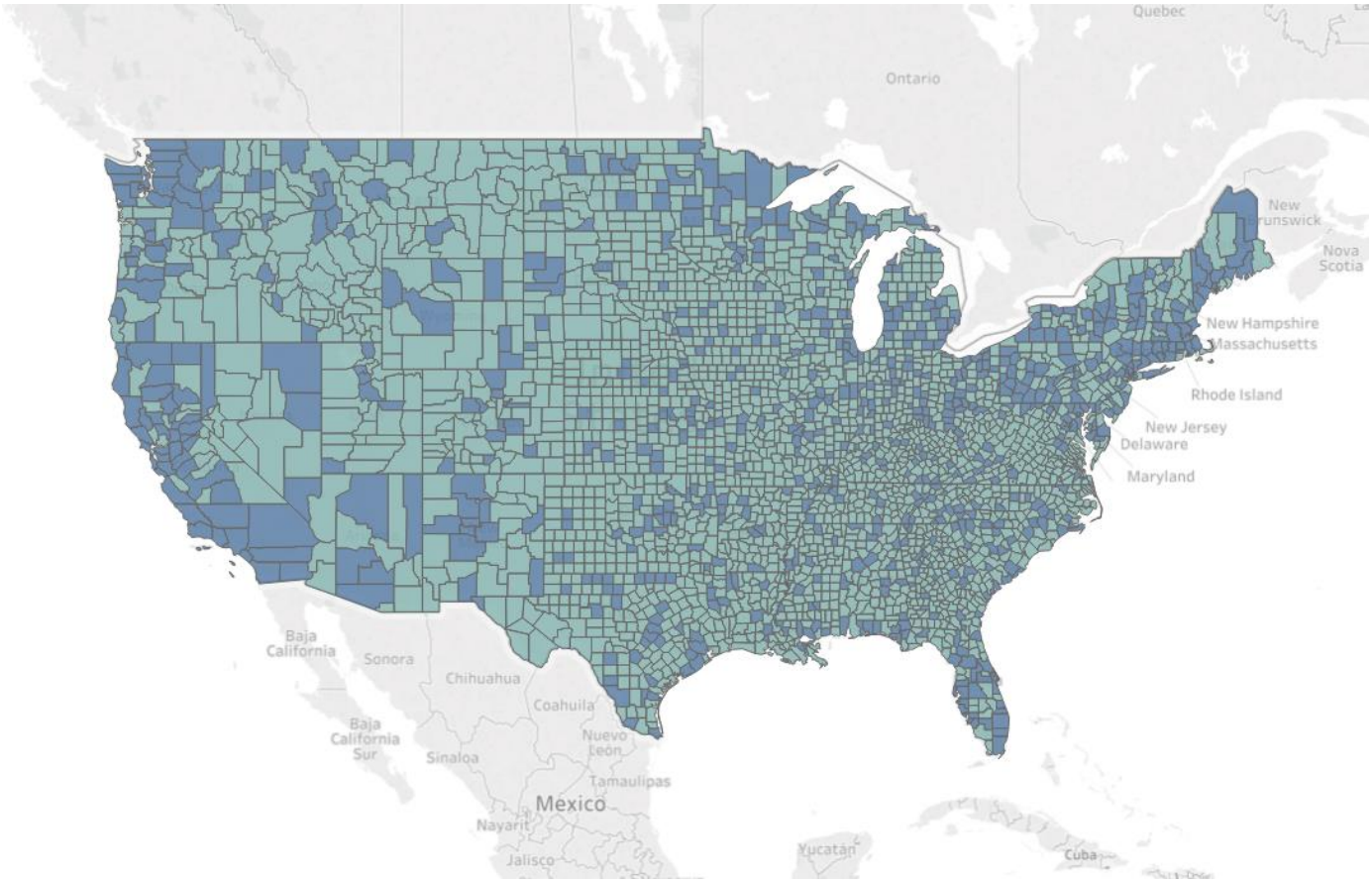
Figure 1.

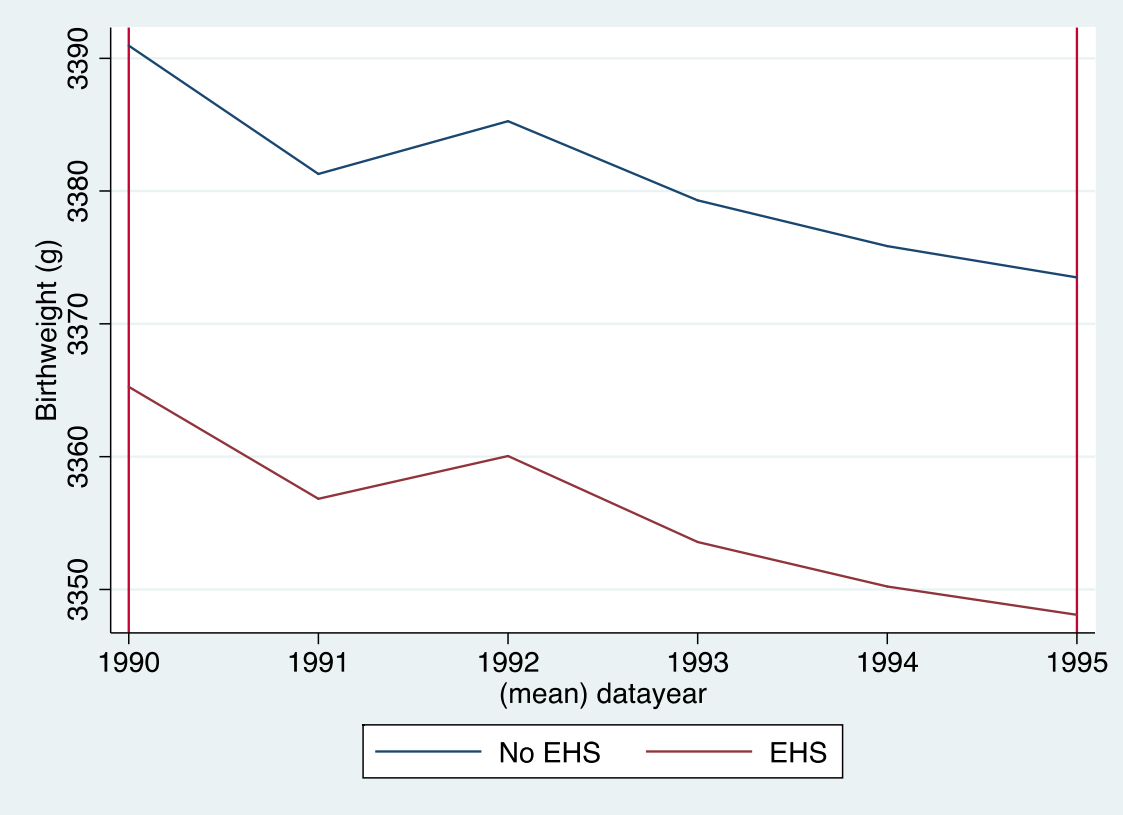
Map of Counties With and Without Early Head Start Grantees (1996-2010)



Note. The dark blue counties adopt EHS and the mint green counties never adopt EHS. The data come from the Office of Head Start Program Information Report (PIR) data (1996-2010).

Figure 2.

Parallel Trends Assumption Check for Birthweight



Note. The data come from the Centers for Disease Control's Public Use Natality Data (1990-1995) but only represent high-population counties.

Table 1.

Difference in Difference (DD) Regression Model on County-level Math and English Language Arts Outcomes in Eighth Grade

	English/Language Arts				
	All	*White*	*Black*	*Hispanic*	*Asian*
EHS Adoption	0.013*	0.011	0.005	0.007	-0.018
	(0.007)	(0.007)	(0.011)	(0.011)	(0.017)
Observations	17137	16173	7186	6971	2744
	Math				
	All	*White*	*Black*	*Hispanic*	*Asian*
EHS Adoption	0.002	0.004	0.008	-0.014	0.008
	(0.008)	(0.009)	(0.014)	(0.013)	(0.020)
Observations	14114	13428	5869	5523	2327
Year Fixed Effects	X	X	X	X	X
County Fixed Effects	X	X	X	X	X

Note. Standard errors in parentheses. Data come from Head Start Program Information Reports (PIR) and Stanford Education Data Archive (SEDA).

$^{\dagger}p<0.1$ * $p<0.05$ ** $p<0.01$ *** $p<0.001$