

# SCHOOL QUALITY & THE LONG-RUN EFFECTS OF HEAD START

RUCKER C. JOHNSON\*  
ASSOCIATE PROFESSOR  
GOLDMAN SCHOOL OF PUBLIC POLICY  
UNIVERSITY OF CALIFORNIA, BERKELEY

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## Executive Summary

*Introduction.* A growing body of research shows experiences before age 5 can have profound, lifelong consequences, shaping human capital in particular. The footprint of early-life experiences is reflected in the fact that roughly half of the achievement gap in 3<sup>rd</sup> grade exists by kindergarten (Fryer and Levitt, 2006). Early education programs and quality child care are one of the most effective known interventions for disadvantaged children. This paper provides new evidence on the long-run impacts of Head Start on adult attainment outcomes, including educational attainment, earnings, family income and poverty status, criminal involvement and incarceration, and health status.

The paper is motivated by the hypothesis that: (1) early-life interventions, such as Head Start, do not realize their potential long-run returns if they are not followed up by quality investments during the school-age years; and (2) the potential benefits of many important social and economic policies may be missed without evaluating longer-term outcomes, and that includes a focus beyond test scores. Controversy regarding potential fade-out of the benefits of Head Start has existed since its inception. A key contribution of this study is that it considers impacts of both pre-school and K-12 educational resources (and interactive effects between them) on adult attainments. I integrate the analysis of the linkages between educational investment opportunities across the continuum of developmental stages of childhood.

*Background.* Recent research in developmental neuroscience highlights the importance of the preschool years for cognition and establishing the building blocks of human capital formation. Evidence on the importance of early environments on a broad spectrum of health, labor market, and behavioral outcomes suggests that common developmental processes are at work and highlight the interconnectedness of cognitive, non-cognitive, and health formation. Common developmental processes appear to be in operation where cognitive and non-cognitive skills and health capacities at one stage of childhood cross-fertilize the productivity of investment at later stages (Heckman, 2007;

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\* I wish to thank Martha Bailey & Andrew Goodman-Bacon, and Doug Miller & Jens Ludwig, for sharing data on federal outlays for Head Start, Elizabeth Cascio for information on state-funded initiatives for kindergarten introduction, Hilary Hoynes for sharing the REIS data, and the PSID staff for access to the confidential restricted-use PSID geocode data.

2008). Education and health investments during childhood reinforce each other and lead to developmental multiplier effects over the life course. Furthermore, prior research has shown that child and family characteristics measured at school entry do as much to explain future outcomes as factors that labor economists have more traditionally focused on, such as years of education (Currie and Thomas, 1999; Almond and Currie, 2010).

Head Start is the largest targeted early childhood intervention program in the US and was established in 1964 as part of Lyndon Johnson's War on Poverty to provide education, health and other services to poor children. Head Start is a comprehensive, national, federally-funded program with the potential to improve the human capital, health capital, and school readiness of poor children, and thereby reduce the intergenerational persistence of poor economic status.

While Head Start has been shown to have positive long-run impacts on schooling and other outcomes (see e.g., Currie *et al.* (2000)), it is not of the same quality as model preschool programs, and more spending might help increase its lasting impacts. Health components have received less attention in cost-benefit evaluations of the effectiveness of the program. This is an important omission given that the return to education in terms of health is about half of the return to education on earnings (Cutler and Lleras-Muney, 2008; Johnson, 2011). The lack of data linking early childhood education and adult outcomes has limited some prior evaluation efforts; this paper aims to fill some of the gap.

*Data.* I use nationally-representative data from the longest-running longitudinal panel in the world—the Panel Study of Income Dynamics (PSID) spanning 1968-2007—matched to administrative data about Head Start budgets. The study analyzes the life trajectories of children born between 1956 and 1976, and followed through 2007, using the PSID and its supplements on early childhood education. The PSID data are linked with multiple data sources that describe the neighborhood attributes and school quality resources that prevailed at the time these children were growing up. Most importantly for this project, these data are linked to county Head Start spending during the first 15 years of the program, when these individuals were 3-5 years old, acquired from the National Archives and Records Administration (NARA). This historical county-level data enables me to compile an estimate of Head Start program expenditures per poor 4-year old in the county for most years between 1965 and 1980. The PSID sample to which this information is matched consists of 5,771 individuals from 2,085 childhood families, from 2,503 neighborhoods, 817 school districts, in 462 counties. The analysis examines all adult person-year observations of these individuals; the sample has a mean age of 35 and range from 20 to 51 yrs old. The PSID oversampled low-income and black families, which enables sufficient sample sizes of Head Start eligible children among these birth cohorts. The roll-out of Head Start and implementation of other “War on Poverty” policy initiatives during these birth cohorts’ childhood provide a unique opportunity to evaluate the long-run impacts of ground-breaking legislation designed to improve educational investment opportunities for poor children.

*Empirical Strategy.* The primary difficulty in disentangling the relative importance of childhood family, neighborhood, and school quality factors is isolating variation in school quality characteristics that are unrelated to family and neighborhood factors. Failure to adequately address the endogeneity of Head Start participation and resultant selection bias issues can lead one to understate the potential benefit of the program, since the program targets economically disadvantaged children. The data and methods improve upon prior research, which often lacked access to panel data that follow children from birth to adulthood, relied on aggregate state-level analyses, and/or failed to address the endogeneity of residential location and program participation.

The research design takes advantage of the geographic expansion of Head Start programs and spending increases during the first 10-15 years of the program to overcome these selection issues. I exploit policy-induced changes in Head Start spending and school resources that are unrelated to child family- and neighborhood-level determinants of adult socioeconomic and health status attainments. In particular, the identification strategy compares adult outcomes among those who grew up in communities where Head Start was not available when s/he reached 4 years of age with individuals from those same areas (the same childhood county of upbringing) after Head Start became available (controlling for year of birth and age effects, and the inclusion of childhood county fixed effects). The changing availability and quality of Head Start was largely beyond the control of parents during these early years of the program's inception and roll-out, and would not be expected to affect children independently of the programs themselves. As a result, residentially-immobile poor families were often able to enroll younger but not their older children. The empirical strategy compares adult outcomes between individuals who attended Head Start and those who did not within a childhood county of upbringing and asks whether this gap is smaller where per capita Head Start spending is higher (controlling for characteristics of individuals, families, and counties, and states).

The identification of causal estimates of the long-run impacts of Head Start in the expanded difference-in-difference models comes from variation across childhood counties across birth cohorts in adoption of Head Start and its program spending levels. The models include controls for childhood county fixed effects, race-specific birth cohort effects, age, gender, and the following set of child family/neighborhood background factors: parental income, parental education, mother's marital status at birth, birth weight, birth order, child health insurance, parental smoking and alcohol use, neighborhood poverty rate, and neighborhood and housing quality indices.

As a complementary strategy, I use sibling comparisons to identify the effects of Head Start pre-school participation and program spending levels on adult attainments (including socioeconomic status and health). The estimated longer-term effects of Head Start come from within-family comparisons of siblings who have and have not participated in the program. Sibling fixed effect models have the advantage of explicitly accounting for observed and unobserved between-family endowment and resource heterogeneity that often plague OLS estimates. This builds on and extends the work of Currie and Thomas (1995).

The roll-out of Head Start overlapped the same period as other federal “War on Poverty” initiatives were implemented and occurred against the backdrop of the broader civil rights movement. For example, this period included school desegregation (Johnson, 2011), the desegregation of hospitals (Chay et al., 2010) (and workplaces), state-funded initiatives for kindergarten introduction (Cascio, 2009), the introduction of Medicaid, Medicare, food stamps (Almond et al., 2011), and the Supplemental Nutrition Program for Women, Infants and Children (WIC) (Hoynes et al., 2011). Further, AFDC, Social Security, and disability income programs expanded. To control for the possible coincident expansion of other policies and safety-net programs, the models also include measures of school desegregation efforts, as well as childhood county per capita transfer payments for food stamps, cash income support, medical care, unemployment insurance, and retirement and disability programs (that prevailed during their school-age years), based on Regional Economic Information System (REIS) data for 1959-1978.

Early-life interventions, such as Head Start, may not realize their potential long-run returns without subsequent investments in quality schools during the school-age years. Prior research shows that initial gains in academic achievement tests from participation in Head Start “faded out” in elementary school; perhaps this decline occurred because the former Head Start participants generally attended lower quality schools (see Currie and Thomas, 2000). The returns to early investments in human capital depend on the extent of later investments. High returns of Head Start may be contingent on access to quality school investments during school-age years. The quality of early care may influence one’s ability to make use of later school opportunities and educational supports during school-age years. Simulation results reported in Restuccia and Urrutia (2004) highlight the importance of modeling early and later educational investments jointly, as the impact of policies at each investment stage has long-run consequences for investment at other stages.

Accordingly, I investigate the potential interactive influences of human capital investments from pre-school thru high school. I integrate the analysis of the linkages between educational investment opportunities across the continuum of developmental stages of childhood—including pre-school program participation, K–12 school resources—to investigate their long-run consequences on adult socioeconomic success and health status. The analysis considers long-run consequences of participation in pre-school programs such as Head Start, public school quality during adolescence (per-pupil spending, class size), K-12 private school attendance, college quality (institution’s expenditures per-student), and parental and neighborhood expectations for child achievement. I conceptualize school quality as the purchased inputs to a school (per-pupil spending; class size; teacher quality; quality of the curriculum) and use markers of these school quality inputs. Furthermore, I evaluate effects of advanced placement/gifted, placement in special education, grade repetition, expelled/suspended from school (exhibiting problem behaviors in school).

*Main Findings.* I find significant beneficial effects of Head Start participation on educational attainment and reductions in the likelihood of grade repetition. The results indicate that Head Start participation reduces the annual incidence of incarceration

between ages 18-29 by 5 percentage points for black males. I also find significant improvements in adult health status associated with Head Start participation, and increases in men's annual earnings and wages. Importantly, I find the estimated Head Start impacts on educational attainment and men's earnings and wages are greater when 1) Head Start spending is higher, and 2) when children subsequently attend schools with higher per-pupil spending during their adolescent years (ages 12-17). The impacts were less pronounced and, at times, non-existent when Head Start spending per 4-year old was below average and/or children attended poorly-funded schools during their adolescent years. Thus, the results are consistent with a dose-response relationship with regard to Head Start quality as well as synergistic impacts with K-12 school quality (both using spending as a marker for quality).

Furthermore, I find no pre-program trend in these adult attainment outcomes that could provide an alternative explanation for this pattern. I also find no impacts of county Head Start spending on those who did not attend Head Start nor do I find impacts during non-preschool ages, which is another falsification (placebo) test that is consistent with a causal interpretation of the findings.

While the magnitudes are large, it is unsurprising that some of the estimated significant Head Start effects have wide confidence intervals in these expanded difference-in-difference models, given the sample size and how saturated these models are with layers of fixed effects. The various fixed effects included still permit sufficient identifying variation to detect effects. The sibling models also indicate significant beneficial impacts of Head Start on adult attainment outcomes and paint a similar picture as the difference-in-difference model estimates. The results are robust to a variety of specification tests. That the pattern of results is similar across the empirical approaches (difference-in-difference, sibling fixed effect models) provides further support of a causal interpretation, and reveals significant long-run impacts of Head Start on a broad range of adult outcomes. I do not find any significant impacts on teen pregnancy among females, but the estimates are imprecise.

*Conclusion.* Taken together, one can view this evidence as a cup that is either half empty or half full: while Head Start does not bring attendees up to the level of the average child, this evidence does indicate that the program had long-lasting positive effects on schooling attainment, adult economic and health status outcomes for these birth cohorts. This evidence is consistent with an emerging set of recent research (Garces, Currie, and Thomas, 2002; Ludwig and Miller, 2007; Deming, 2009; Johnson, 2010) from three separate research designs (sibling difference, regression discontinuity, difference-in-difference), and three independent data bases that each yield similar findings of estimated long-term benefits for previous cohorts *despite* test score fade out. For example, Deming (2009) reports Head Start's effect on a summary index of young adult outcomes is about 80% as large as Perry Preschool's, yet Head Start costs roughly 50% as much per participant.

This paper contributes to the Head Start literature by providing a unified evaluation of long-run impacts on adult outcomes across several domains. In addition to

the extensive literature on the impacts of Head Start on test scores, the present study builds on and contributes to a burgeoning literature investigating long-term impacts of early life interventions (childhood programs in the first decade of life). The paper's results complement the findings of studies on the long-term impacts of other early childhood interventions, such as the Perry and Abecedarian preschool demonstrations, Nurse-Family Partnership, and kindergarten class size in the Tennessee STAR experiment (Chetty et al., 2010), which also find lasting impacts on adult outcomes despite fade-out on test scores.

Access to quality schools and educational resources for children are key engines of upward mobility in the US, holding the potential to break the cycle of poverty from one generation to the next. This project highlights the importance of studying the effect of education policies on a broad range of outcomes. Estimates of the returns to education that focus only on increases in wages substantially understate the total returns. Preliminary results also suggest that effective policies to promote long-term health lie outside of traditional health care policy, and instead may take the form of education policies. The findings point to the critical role early-life investments in children can play in narrowing long-run gaps in well-being.

*Directions for Future Work.* What are the implications of these findings and how does this compare to contemporary policy and more recent cohorts? The nature and amount of public investment in children has changed substantially during the post-World War II era. The major thrust of policies aimed at equal opportunity over this period has been intended to ensure educational access to quality resources K-12 and beyond, and more recently greater investments in pre-school years.

The Obama administration pledged to increase federal early education spending by \$10 billion annually. Prior to this commitment, the two largest federal early childhood programs, Head Start and the Child Care and Development Block Grant, spent about \$12 billion annually combined. A \$10 billion increase would almost double that investment. While 38 states have pre-kindergarten programs, previously they received no federal money for those programs, and their quality varied widely. The Obama administration has singled out early education as an important investment to be prioritized even in tight economic times. The major lesson from the past decade of state pre-K experiences is that how policymakers design and implement early education investments is just as important as the money they spend.

For the historic period examined in the present paper, there was no data available on how Head Start budgets were allocated among different aspects of the program. For future work, I have obtained detailed administrative data compiled at the county-level of Head Start funding levels and the composition of spending on different program components for the period 1988-2000. This data provide information about the educational qualifications and pay of the staff, the sources and disposition of Head Start program funds, breakdowns of enrollment by the type of children served, and information about the director and other administrative staff. I have already matched the PSID-CDS/TA data for cohorts born between 1984 through 2000 to these county-level Head

Start program expenditures by type for the period spanning 1988-2000. For the analyses of these more recent cohorts, I will examine child achievement (math and reading), grades, behavior problems & other child outcomes.

Given the central role schools play in the transmission of economic success from one generation to the next, it is imperative that we assess the effectiveness of policies that exhibit promise to alter developmental trajectories for disadvantaged sub-populations. Government expenditures targeted toward disadvantaged families may, in principle, substantially narrow the investment gap between children of rich and poor families, and thereby reduce the resultant education, earnings, & health gaps.

It is my hope that this research will inform contemporary policy debates about the most effective investments in children to improve life chances and promote a more level intergenerational playing field for those raised in disadvantaged families and neighborhoods.

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# School Quality & the Long-Run Effects of Head Start

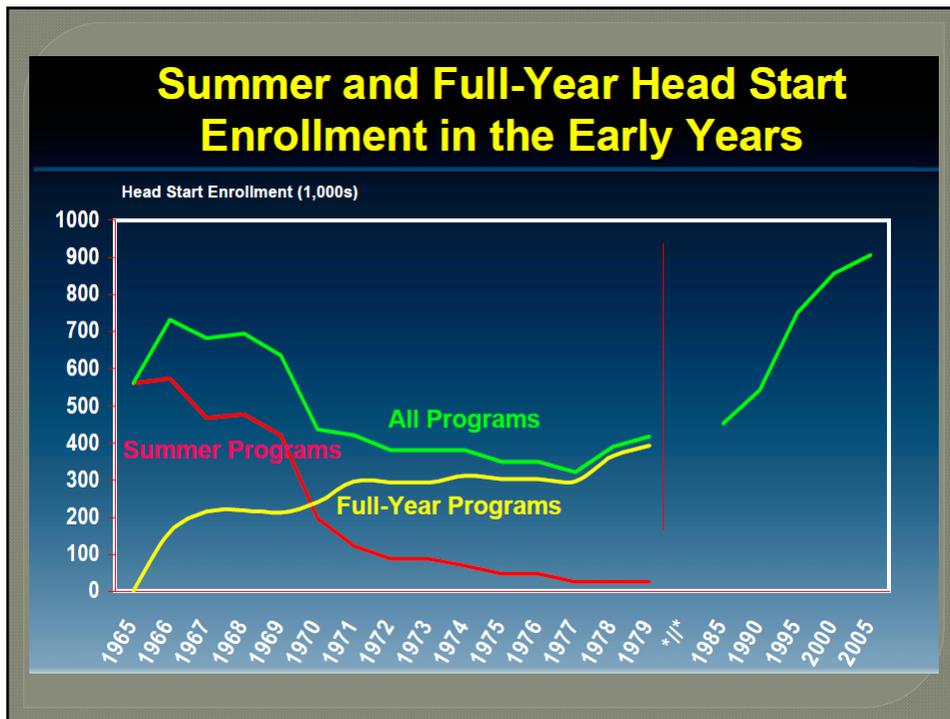
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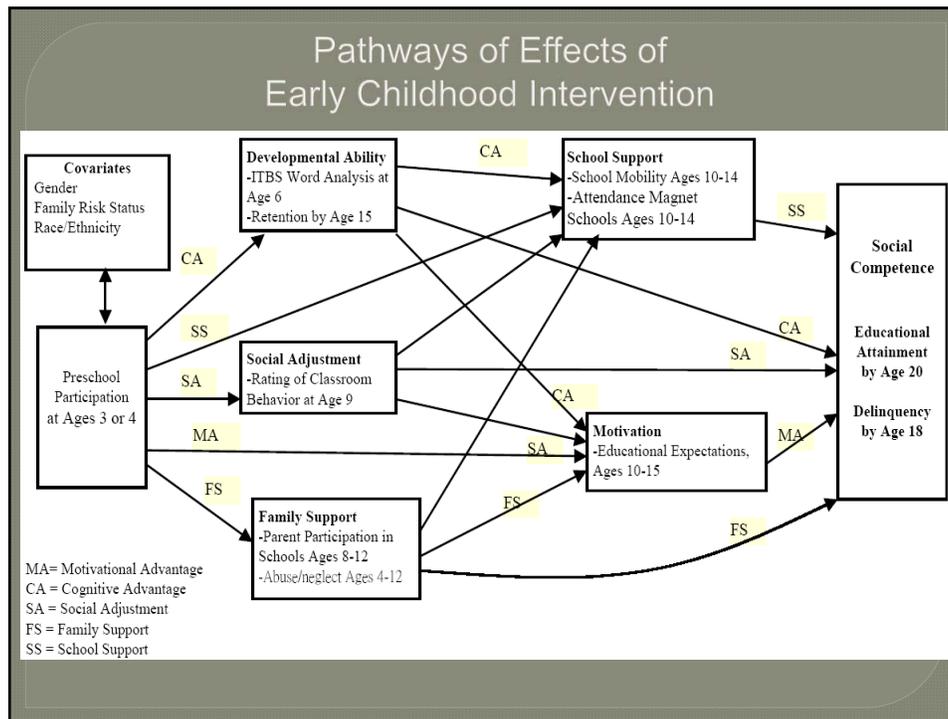
Rucker C. Johnson, UC-Berkeley  
Visiting Scholar, Russell Sage Foundation





## Stages of Analysis

- 1) How funding for Head Start & Project Follow Through was rolled out 1st 10-15 yrs of program (NARA data, 1965-80)
- 2) LR Effects of Head Start (& Project Follow Through) on adult outcomes; PSID kids born '56-76
  - Address selection issues
    - Difference-in-Difference
    - Sibling FE
- 3) Explore interactive/synergistic influences of human capital investments from pre-school thru high school



## Headstart

- Established 1964 under “War on Poverty”
- Purpose:
  - Improve human & health capital of poor children
  - Reduce intergenerational transmission of disadvantage
- Pathways to Achieve Purpose:
  - Enhance Nutrition
  - Access to Health Care
  - Enhance Cognitive Skills
    - Age-appropriate literacy
    - Numeracy
    - Reasoning & Problem Solving
    - Decision-making Skills

## Headstart (cont'd)

- Comprehensive, national, federally funded
- Number Children Served:
  - 22 million children since inception
  - 19,200 centers throughout U.S.
  - > 900,000 children today
  - \$7,000 per child in 2003
- Eligibility:
  - At least 90% children must be below poverty line
  - At least 10% children with disabilities
- Demographics
  - 3-4 yr olds
  - 32% black; 31% Hispanic; 28% white

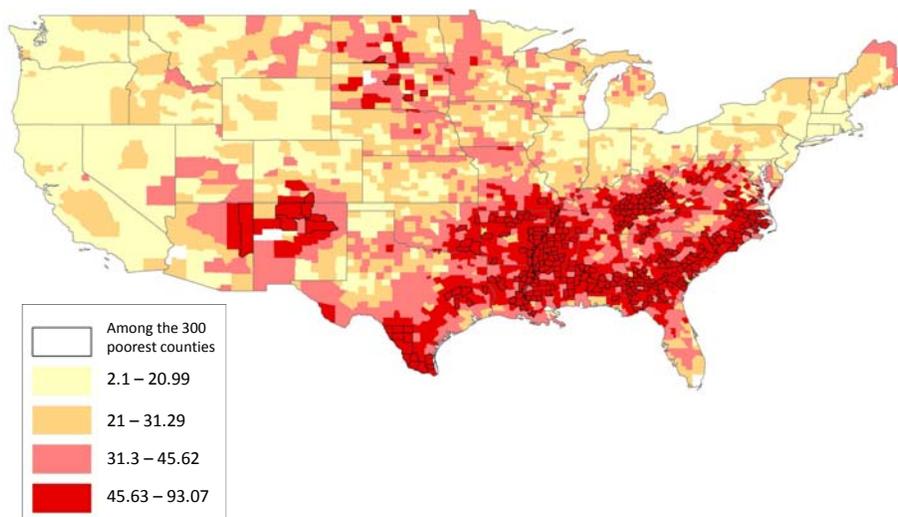
## Conflicting assessments of Head Start's value

- Cato Institute: *It's time to stop Head Start*
- Doug Besharov: *Head Start's broken promise*
  - "small gains will not do much to close the achievement gap..."
- National Head Start Association
  - "Head Start works because children experience long-term educational, social, and economic benefits"

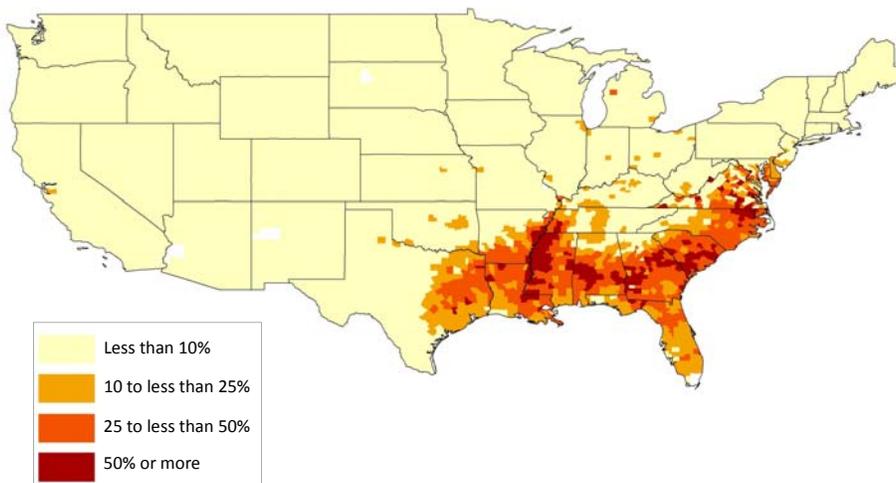
## The Big Questions

- Can Head Start generate long-term benefits for cohorts of low-income children?
- Can we learn anything about what we can do to improve life outcomes of Head Start participants?

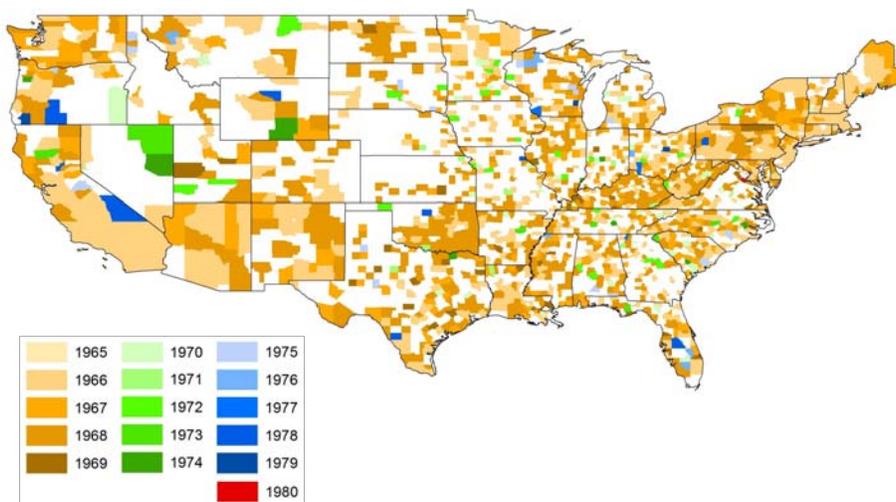
US County Poverty Rates in 1960

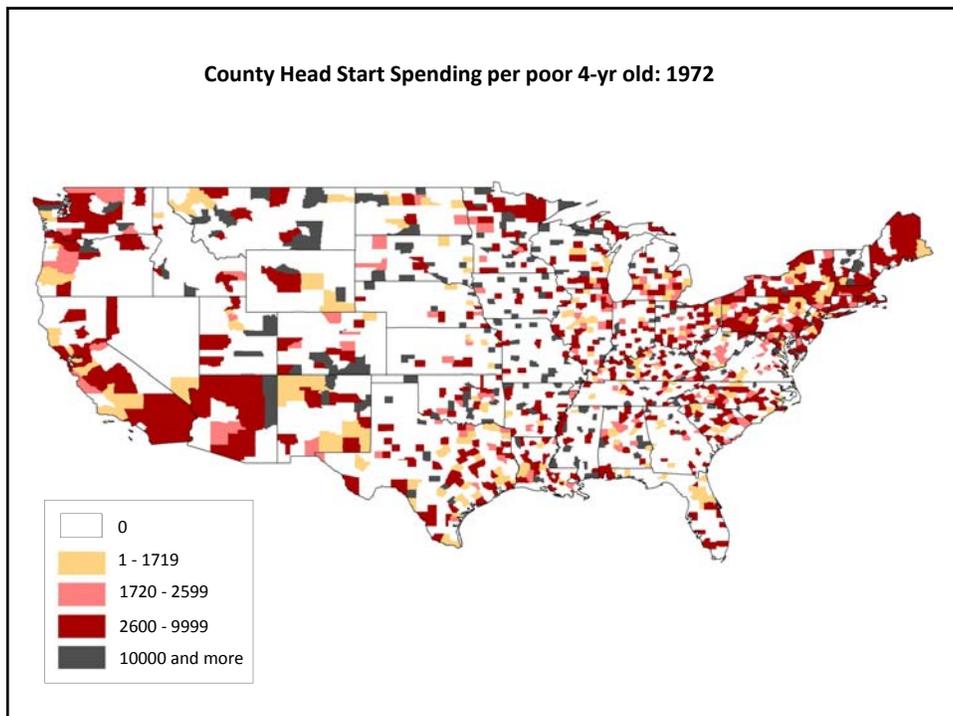
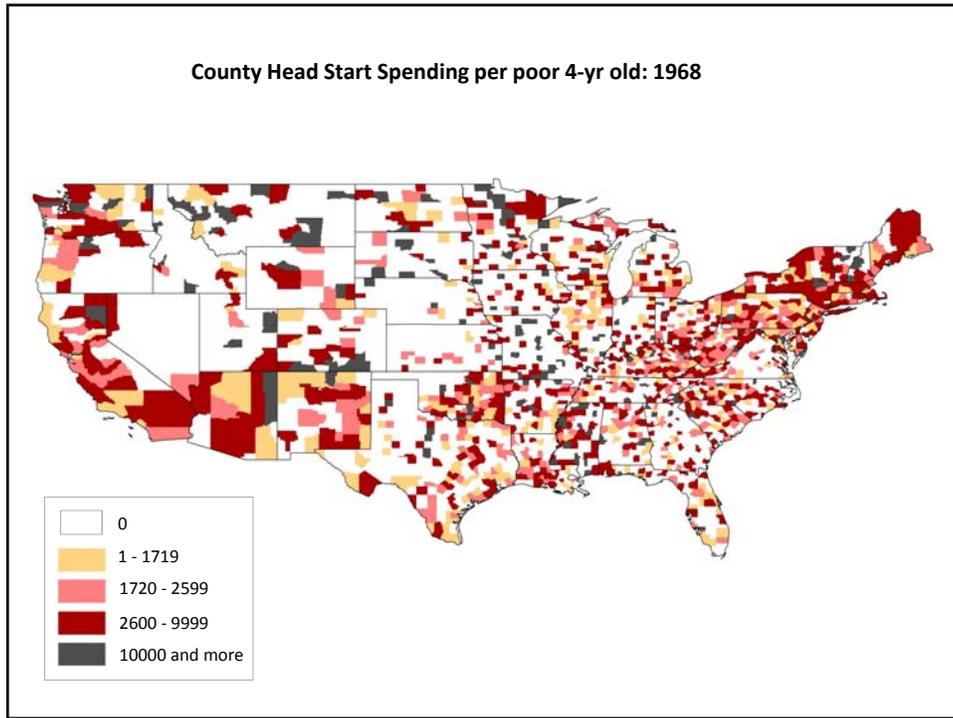


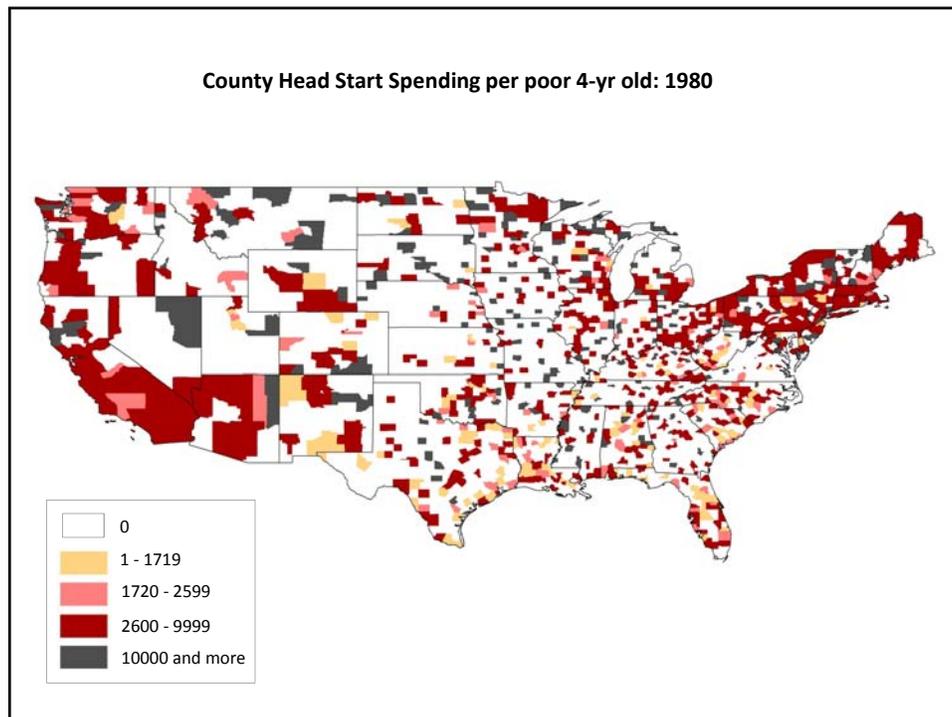
County Population: Percent African American - 1960



Year of Establishment of Head Start Centers







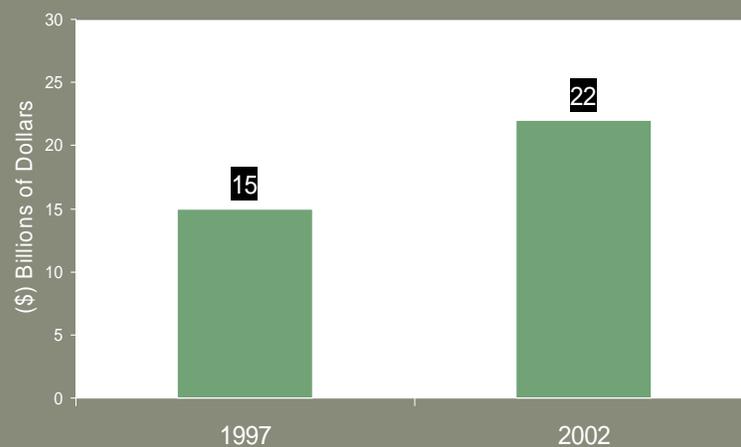
## Head Start Accomplishments in the First 2 Years (OEO Fact Sheet, 1967)

- 98,000 eye defects treated
- 900,000 cases of dental problems—5 cavities per child
- 740,000 without polio vaccinations who received vaccine
- 1,000,000 given measles vaccinations

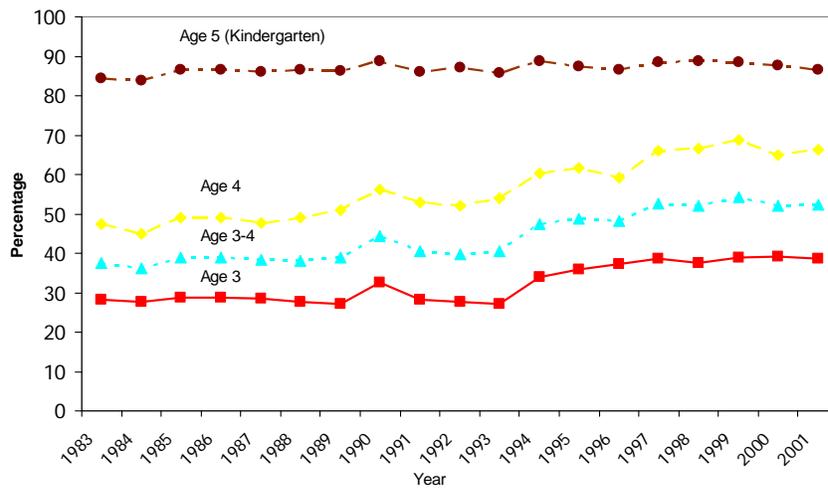
## Emergence of “Social Competence” as the Defining Goal of Head Start

“The child’s everyday effectiveness in dealing with his environment and later responsibilities in school and life. Social competence takes into account the interrelatedness of cognitive and intellectual development, physical and mental health, nutritional needs, and other factors that enable a child to function optimally.”

Public Investments in Early Childhood Programs, Birth-Age 5



## U.S. Children in Early Childhood Programs



Source: National Center for Educational Statistics (2003)

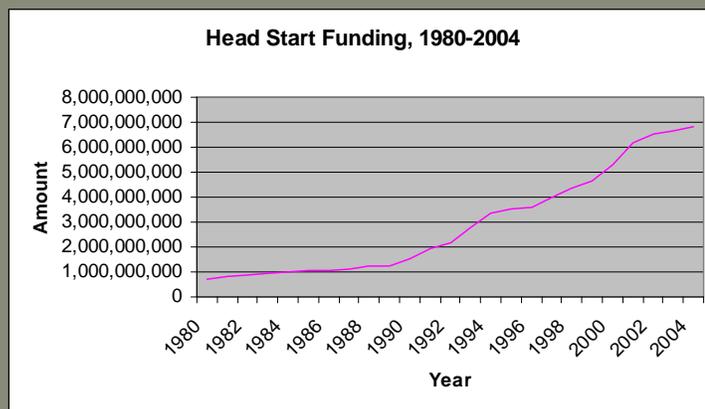
## Questions in Early Education Field

- Generalizability of evidence across program type, time, and context?
- What are primary mechanisms leading to long-term effects?
- What is the optimal timing and duration?
- Which program attributes most associated with longer-term effects?
- Which subgroups benefit most/least?
- What is the variation in effects by outcome?
- Cost-effectiveness of programs compared to alternatives?

### Most Cited Early Education Programs in 15 Published Reviews (Selected)

Program	Type	Age at Last Follow-Up	Number of Citations
High/Scope Perry Preschool Program	Model	27	15
Carolina Abecedarian Project	Model	21	14
Houston Parent-Child Development Center	Model	11	14
Yale Child Welfare Research Program	Model	10	10
Chicago Child-Parent Centers	Large Scale	20	9
Milwaukee Project	Model	14	8
Syracuse Family Development Program	Model	15	8
Consortium for Longitudinal Studies	Model	22	6
Infant and Health Development Program	Model	8	6
Educational Testing Service Head Start Study	Large Scale	8	5
Elmira Prenatal/Early Infancy Project	Model	15	5
PSID Head Start Longitudinal Study	Large Scale	25	3

### Head Start Funding Over Time



## What do we know about Head Start impacts?

### 5 types of evidence:

- Small, intensive programs (aren't Head Start)
- Observational studies
- "Family fixed effects" (sibling comparisons)
- County-poverty regression discontinuity
- Head Start Impact Study

## **Lois-ellin Datta (1972)**

**"Our country is fettered with programs that are dying from indifference: the data aren't unfavorable enough to justify discarding them, aren't clear enough to show how to modify them, or unequivocally favorable enough to justify expansion."**

## Head Start Program Funding Data (1965-80)

1. Info culled from NARA records by searching program titles & program codes
2. Identify pool of grants potentially for Head Start (included string searches on HS grant titles)
3. Most records, Head Start programs are listed by community & funding amounts, & info on "stock" of programs at a particular time allows verification of accuracy of grant "flows"

## Head Start Funding Data Sources

- 1968, '72 Miller/Ludwig (*QJE*, '07)
- 1965-68; '70, '72 Martha Bailey/Bacon
- 1976-80: cnty-level Federal program outlays
- SEERS: # of 4 yr olds by county, 1965-80
- County poverty rate ('60,'70,'80: linearly interpolate)
- Key variable: Head Start spending per poor 4-yr old in cnty, 1965-80

## Head Start Funding Data Sources

- Used only data for years that data from electronic files matched published figures for total federal spending and Head Start spending at national & state levels

## Data

*PSID individuals born between 1956-1976 followed up to 2009*

- General health status in adulthood (1984-2009);
- Data linked to census block in childhood

### Resulting Sample:

- Use all adult person-year observations
  - from 5,771 individuals
  - from 2,085 families
  - from 2,503 neighborhoods, 817 school districts, in 462 counties
- Mean age = 35, range [20,51], 37% black
- Matched to...1965-80 cnty Head Start spending
  - 1960-1990 Census data, case inventory of desegregation court cases
  - 1955-1990 Office of Civil Rights (Logan, American Communities Project)
  - 1962-1982 Census of Governments, and Common Core data (compiled by National Center for Education Statistics.)

## Research Design

- Exploit geographic expansion of Head Start programs & spending increases (1<sup>st</sup> 10-15 yrs)
  - Residentially-immobile fams able to enroll younger but not older children
- Compares children in areas in which Head Start is NOT available with children in those same areas after Head Start became available
  - Changing availability of Head Start beyond control of parents & does not affect kids independently of programs themselves

## Methodology

Diff-in-diff model (expanded):

- Identification comes from variation across childhood counties across birth cohorts in adoption of Head Start & its program spending levels
- Controls for childhood county fixed effects, race-specific birth cohort effects, childhood family/neighborhood factors, age, gender

### Model Specification #1

Adult Outcomes of Interest:  
Educational Attainment,  
Earnings, Crime, Health,  
Generational Mobility

(Pre-Program) Linear Trend

Post-Program  
Linear Trend Break

$$Y_{icb} = \beta_1(\text{HeadStart}) + \beta_2(\text{HeadStart} * \text{spend}_{age4}) + \beta_3(\text{HeadStart} * \text{K12spend}_{age2-17})$$

$$+ \theta_0(t - T_c^*) + \theta_1(t - T_c^*) \cdot D_{cb} \cdot 1(t - T_c^* \geq 0)$$

$$+ \theta_2 \cdot D_{cb} \cdot 1(t - T_c^* \geq 0) + X_{icb} \alpha + \eta_c + \lambda_b + \varepsilon_{icb}$$

Program exists when kid age4

Childhood Family Factors

County Fixed Effects

Birth Cohort Effects

• “Year Age 4 – Year of Cnty’s 1<sup>st</sup> Head Start Program”  $\equiv (t - T_c^*)$

• Key Parameters of Interest:  $B_1, B_2, B_3$

## Methods

- Factors influencing Adult attainments
  - Individual, time, family, neighborhood, school
- Childhood school factors
  - Per-pupil spending
  - Class size
  - School segregation
  - Court-ordered desegregation plans
  - Teacher salary
- Childhood family background factors:
  - Race
  - Family structure
  - Birth weight
  - Health insurance
  - Parental...
    - education
    - family income
    - health behaviors (smoking, alcohol use)
- Childhood neighborhood factors
  - Neighborhood poverty
  - Crime
  - Residential segregation
  - Housing quality
  - Crowding
  - # Neighbors known
  - Informal support

## Other coincident policies controlled for:

- School desegregation exposure, by race (Johnson, 2010)
- School district per-pupil spending, 1962-92
- Timing of Kindergarten intro, state-funded initiatives (Cascio, 2010)
- County-level gov't transfer programs (1959-79: REIS (Hoynes et al., 2010)); avg during childhood ages
  - Medicaid/AFDC/Food Stamps/UI...

**Table 1. Effects of Head Start on the Likelihood of Graduating from High School**

Sample: PSID poor children born 1964-1976 followed to adulthood

	Dependent variable: <b>Prob(HS Graduate)</b>
<i>Cnty Head Start Program exists when kid was 4 :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)>0	0.0259 (0.2001)
Cnty Head Start spending per poor 4 yr old	<b>0.0155**</b> (0.0078)
<i>Linear Trend in Normalized Year (pre-program trend) :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)	-0.0125 (0.0181)
<i>Post-Head Start Implementation Trend break :</i> (Year age 4 - Year of Cnty's 1st Head Start Program) *(normalized year>0)	<b>0.0502***</b> (0.0157)

**Table 2. Effects of Head Start on Educational Attainment**  
 Sample: PSID poor children born 1964-1976 followed to adulthood

	Dependent variable:	
	Years of Education	
<i>Cnty Head Start Program exists when kid was 4 :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)>0	0.0837 (0.7495)	0.1650 (0.7690)
Cnty Head Start spending per poor 4 yr old	0.1014*** (0.0382)	0.1455*** (0.0367)
Head Start spending per poor 4 yr old * school district per-pupil spending <sub>(age 5-17)</sub>		0.0246*** (0.0088)
<i>Linear Trend in Normalized Year (pre-program trend) :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)	-0.1286* (0.0912)	-0.1201* (0.0905)
<i>Post-Head Start Implementation Trend break :</i> (Year age 4 - Year of Cnty's 1st Head Start Program) *(normalized year>0)	0.1740** (0.0796)	0.1476** (0.0783)

**Table 3. Effects of Head Start on Family Income in Adulthood**  
 Sample: PSID poor children born 1964-1976 followed to adulthood

	Dependent variable:	
	Family Income-to-Needs Ratio (age 25-45)	
<i>Cnty Head Start Program exists when kid was 4 :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)>0	0.4144* (0.3061)	
Cnty Head Start spending per poor 4 yr old	-0.0497 (0.0566)	
<i>Linear Trend in Normalized Year (pre-program trend) :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)	-0.2036*** (0.0781)	
<i>Post-Head Start Implementation Trend break :</i> (Year age 4 - Year of Cnty's 1st Head Start Program) *(normalized year>0)	0.2682*** (0.0965)	

**Table 4. Effects of Head Start on the Likelihood of Incarceration**  
 Sample: PSID poor children born 1964-1976 followed to adulthood

	Dependent variable: <u>Prob(Ever Incarcerated)</u>
<i>Cnty Head Start Program exists when kid was 4 :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)>0	-0.0268 (0.0665)
Cnty Head Start spending per poor 4 yr old	-0.0005 (0.0034)
<i>Linear Trend in Normalized Year (pre-program trend) :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)	0.0214* (0.0113)
<i>Post-Head Start Implementation Trend break :</i> (Year age 4 - Year of Cnty's 1st Head Start Program) *(normalized year>0)	-0.0300*** (0.0108)

**Table 5. 2SLS/IV Estimates of Effects of Head Start Participation on Educational Attainment**

	Dependent variable:	
	Head Start Participation <sub>(age 4)</sub>	Years of Education
	First-Stage (1)	Second Stage (2)
Head Start Participation <sub>(age 4)</sub>		1.7871** (0.9408)
<i>Cnty Head Start Program exists when kid was 4 :</i> (Year age 4 - Year of Cnty's 1st Head Start Program)>0	0.0871** (0.0411)	
Cnty Head Start spending per poor 4 yr old	0.0041** (0.0020)	
Number of Individuals	1,880	1,880
Number of School Districts	381	381

Table 6. 2SLS/IV Estimates of Effects of Head Start Participation on Family Income in Adulthood

	Dependent variable:	
	Head Start Participation <sub>(age 4)</sub>	Adult Family Income-to-Needs Ratio
	First-Stage	Second Stage
	(1)	(2)
Head Start Participation <sub>(age 4)</sub>		1.4597** (0.7394)
Cnty Head Start Program exists when kid was 4: (Year age 4 - Year of Cnty's 1st Head Start Program)>0	0.0640* (0.0369)	
Cnty Head Start spending per poor 4 yr old	0.0041** (0.0020)	
Number of Person-year observations	14,049	
Number of School Districts	374	374

## The cup is either

- **½ Empty** – Head Start does not bring attendees up to the level of the average child.
- **½ Full** – Head Start has long lasting positive effects on schooling attainment, adult economic & health status outcomes.

## Benefits on other long-term outcomes for Head Start children of 1960s-1980s

- Educ attainment, earnings, health, criminal activity (despite test score fade out)
  - Garces, Currie & Thomas, 2002 *American Economic Review*
  - Ludwig & Miller, 2007 *Quarterly Journal of Economics*
    - 33-55% lower mortality rates from anemia, meningitis, & respiratory problems
    - More likely to complete high school, by 3-4 % pts
    - Completed ½ year more of school
    - No Diffs in 8<sup>th</sup> grade reading/math
  - Deming, 2009 *American Economic Journal*
    - Finds Head Start's effect on summary index of young adult outcomes is ~80% as large as Perry Preschool's (yet Head Start costs ~50% as much per participant)

## What have we learned so far?

- Estimated long-term benefits for previous cohorts *despite* test score fade out
  - From 3 separate research designs, three independent datasets (sibling difference, regression discontinuity, diff-in-diff)
  - How does this compare to contemporary policy?

## Conclusions about early intervention:

- Quality child care/early education programs are one of the most effective known interventions for disadvantaged students.
- While Head Start has positive effects, it is not of the same quality as model preschool programs, and more spending might help.

## Next Steps

- Already Matched CDS/TA (1997-2009) to:
  - court-order release of desegregation plans (1988-'08)
  - cnty-level Head Start Program Expenditures by type, 1988-00 (Head Start data from Currie/Neidell '07)
- Analyses of more recent cohorts (next generation); child achievement, behavior problems & other kid outcomes