Do the Effects of Early Childhood Programs on Academic and Adult Outcomes Vary by Gender? A Meta-Analysis

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Motivation

- Gender difference in educational outcomes favor girls, suggesting that boys are especially at risk of poor educational outcomes
  - Focus on early childhood as boys come to school with lower levels of behavioral regulation and reading/language skills
- Early childhood education (ECE) has proven beneficial for low-income children, in general, but does it play a role in mitigating or exacerbating early gender differences?
Background

- Boys are often considered to be less developmentally advanced than girls in early childhood (Matthews, Ponitz, & Morrison, 2009)
- Boys are thought to be more reactive to psychosocial stressors than girls (Zaslow & Haynes, 1986)
Recent Literature

- Anderson (2008) analyzed data from three “model” ECE programs (Perry Preschool, Abecedarian, and Early Training Project) and found that most long-run benefits accrued to girls.
- Two recent studies found that most benefits accrued to boys:
  - Deming (2009) using Head Start participation from the NLSY
  - Ou & Reynolds (2010) used the Chicago Parent-Child Program
Research Questions

• Do ECE programs have differential effects by gender across different domains?
• What types of programs appear to affect boys and girls differently?
• Our study is the first meta-analysis of differential program impacts by gender
Research Design

- Database inclusion criteria:
  - At least ten participants in each group (treatment and comparison) with <50% attrition
  - Rigorous experimental or quasi-experimental design
- Additional inclusion criteria for this paper:
  - Comparison group that did not receive equivalent services
  - Included ECE treatment for children ages 3-5
  - Results reported separately by gender
What is meta-analysis?

- Method of quantitative research synthesis using prior program results as the unit of observation
- Estimates transformed into common metric—effect size (ES), expressed as a fraction of a standard deviation
- Results from individual studies can then be used to estimate the average ES across programs
- Additionally, meta-analysis can be used to test whether average ES differs by characteristics of programs
Database

• Nested structure of data
  • For primary analyses, 688 effect sizes within 20 programs
  • Program: Collection of comparisons in which groups are assigned to distinct treatment and control groups

• Dependent measure: Effect size
  • Standard deviation unit difference in outcome between children who experienced ECE and those who did not
  • Hedges’ g estimated by CMA software
  • Range: -.92 to 2.27
Domains of Interest

Three outcomes of interest in this paper:

1. Cognitive skills (e.g. IQ, vocabulary) and achievement (e.g. letter recognition, math) (n=419)

2. Other school outcomes (e.g. expectations, grade repetition, special ed placement) (n=92)

3. Adult outcomes (e.g. behavior, health, completed schooling, earnings, welfare receipt) (n=80)
Statistical Analysis

We use a multivariate, multilevel approach

- Level 1: $ES_{ij} = \beta_{0j} + \beta_{1j}x_{1ij} + \beta_{2j}x_{2ij} + e_{ij}$ (models effect sizes within programs as function of dummy variable for male and other covariates)

- Level 2: $\beta_{0j} = \beta_{00} + u_{0j}$ (intercept modeled as function of average program effect size and between-program error)

- Regressions are weighted by the inverse variance of each effect size multiplied by the inverse of the number of effect sizes within a program
Limitations of the Dataset

- Studies which meet our inclusion criteria are not representative of broader body of ECE studies (older, longer programs, fewer services received by comparison group)
  - But n=20 programs still broader than other analyses!
- Have missing data on 97 (of 688) effect sizes
- Small sample sizes in certain domains
Bivariate Results

* represents p<.05, ** represents p<.01 between female and male effect sizes
Vertical axis represents effect size

- Female effect size
- Male effect size
Interaction Effects by Program Characteristic--Other School Outcomes

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Other Interaction Effects

• Cognitive and achievement outcomes
  • >12 months elapsed .09 sd in favor of boys
  • Other interactions not significant

• Other school outcomes
  • All interactions large and significant (> .40 sd)
  • Boys benefit more from programs designed to improve behavior or those that began after 1973
  • Girls benefit more from programs with intensive home visits, random assignment, and outcomes >12 months past end of treatment
Combined Interaction Model

- All of the interactions from the previous slide were combined into one regression for each domain
- Cognitive/achievement outcomes: Less fadeout for boys
- Other school outcomes: Intensive home visits and programs with random assignment accrue more benefits to girls
Conclusions

• Overall, ECE programs positively affect children
• We find gender differentials depend on the outcome under consideration
  • Achievement & cognition: Girls have very slight advantage
  • Other school outcomes: Boys have advantage, especially for special education and grade retention
  • For adult outcomes: Girls have advantage
More Conclusions

• Program characteristics generally do not seem to moderate gender effects for achievement and cognition outcomes

• For other school related outcomes...
  • Girls benefit more than boys from programs that provide intensive home visiting
  • Some indication that boys may benefit more from programs that have behavior improvement as a goal

• Still trying to understand puzzle of home visit results
Future Work

- Estimate plausible effect sizes for the 97 effect sizes with missing data
- Consider separately estimating differential gender impacts for programs serving children ages 0-3
Acknowledgements

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• Norlien Foundation
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<th>Study Name</th>
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Intensive home visits
After 1973
Random assignment
>12 months elapsed

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