Prevention and Cost-Effectiveness in Early Intervention: A 20-year Follow-up of a Child-Parent Center Cohort

Arthur J. Reynolds & Judy A. Temple
University of Minnesota

January 20, 2006
McEvoy Lecture Series on Early Childhood and Public Policy
Humphrey Institute of Public Affairs
Growing Support for Early Childhood Education

- General public wants state and local government involvement
- Higher enrollments in early education and care programs
- Increased funding and political support for early education across the country
- Growing evidence of beneficial effects
Major Questions in Early Education Field

- Do Effects of ECI Persist Over Time?
- Which Outcomes are Impacted Most?
- Do some Children Benefit More?
- What are the Key Program Elements?
- Is ECI More Cost-Effective than other Programs?
- What are Key Sources of Later Effects?
- Does Evidence Support Universal Access?
# Age at Follow-up for Well-known Early Childhood Interventions

<table>
<thead>
<tr>
<th>Program</th>
<th>Type</th>
<th>Age at Last Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>High/Scope Perry Preschool Program</td>
<td>Model</td>
<td>40</td>
</tr>
<tr>
<td>Carolina Abecedarian Project</td>
<td>Model</td>
<td>21</td>
</tr>
<tr>
<td>Houston Parent-Child Development Center</td>
<td>Model</td>
<td>11</td>
</tr>
<tr>
<td>Yale Child Welfare Research Program</td>
<td>Model</td>
<td>15</td>
</tr>
<tr>
<td>Chicago Child-Parent Centers</td>
<td>Large Scale</td>
<td>21</td>
</tr>
<tr>
<td>Milwaukee Project</td>
<td>Model</td>
<td>14</td>
</tr>
<tr>
<td>Syracuse Family Development Program</td>
<td>Model</td>
<td>15</td>
</tr>
<tr>
<td>Consortium for Longitudinal Studies</td>
<td>Model</td>
<td>22</td>
</tr>
<tr>
<td>Infant and Health Development Program</td>
<td>Model</td>
<td>8</td>
</tr>
<tr>
<td>Educational Testing Service Head Start Study</td>
<td>Large Scale</td>
<td>8</td>
</tr>
<tr>
<td>Elmira Prenatal/Early Infancy Project</td>
<td>Model</td>
<td>15</td>
</tr>
<tr>
<td>PSID Head Start Longitudinal Study</td>
<td>Large Scale</td>
<td>25</td>
</tr>
</tbody>
</table>
## Key Features and Findings for 3 Programs

<table>
<thead>
<tr>
<th>Feature</th>
<th>High/Scope Perry Preschool</th>
<th>Chicago Child-Parent Centers</th>
<th>Abecedarian Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages of participation</td>
<td>3-4</td>
<td>3-4, 5-8</td>
<td>0-5, 6-8</td>
</tr>
<tr>
<td>Program type</td>
<td>Model</td>
<td>Large-scale</td>
<td>Model</td>
</tr>
<tr>
<td>Age 5 cognitive skills (ES)</td>
<td>.75</td>
<td>.61</td>
<td>.72</td>
</tr>
<tr>
<td>Major effects by age 18</td>
<td>HS comp, achiev, spec ed, delinquency</td>
<td>HS comp, achiev, CAN remediation, delinquency</td>
<td>Achiev, IQ, remediation</td>
</tr>
<tr>
<td>Adult Educational effects</td>
<td>HS comp, yrs of ed</td>
<td>HS comp, yrs of ed</td>
<td>College attend</td>
</tr>
<tr>
<td>Economic well being</td>
<td>Income</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Social services</td>
<td>Receipt</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Health &amp; mental health</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Crime &amp; social behavior</td>
<td>Arrests</td>
<td>N/A</td>
<td>None</td>
</tr>
<tr>
<td>Parent outcomes</td>
<td>N/A</td>
<td>Involvement</td>
<td>Employment</td>
</tr>
</tbody>
</table>
Limitations of the Evidence Base

- Scant Evidence of Adulthood Effects, especially for Large-scale Programs
- Outcomes restricted to Primarily Education and Economic Well Being
- Lack of Attention to Subgroup Effects
- Impacts of Program Timing and Length Unknown
- Outcomes for Parents Rarely Tested, especially for Center-based Programs
Questions for the CPC Follow-up Study

- Is Participation in the Child-Parent Center (CPC) Program Associated with Greater Adult Well-Being for Children and Parents?
- Do Effects Extend Beyond Education Outcomes?
- Do Timing and Length of Intervention Matter?
- Do Effects Vary by Child & Family Attributes?
- How Cost-Effective is the Intervention?
Brief Description

- 989 complete cohort of children graduating from Child-Parent Centers in kindergarten; they participated from 2 to 6 years. Centers are located in the highest poverty areas of Chicago.

- 550 children enrolled in an alternative early childhood program in kindergarten in five randomly selected schools serving low-income families. They matched on socioeconomic status.
## Characteristics of Study Groups

<table>
<thead>
<tr>
<th></th>
<th>CPC Intervention</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample</td>
<td>Complete cohort</td>
<td>Random sample of K sites</td>
</tr>
<tr>
<td>Recovery, by age 24</td>
<td>902 of 989 (91%)</td>
<td>487 of 550 (89%)</td>
</tr>
<tr>
<td>Key attributes</td>
<td>Reside in highest poverty areas</td>
<td>Reside in high poverty areas</td>
</tr>
<tr>
<td></td>
<td>Over 80% of children enroll</td>
<td>Had school-based enrichment</td>
</tr>
<tr>
<td></td>
<td>Mean no. of risks = 4.5; 73% with 4 or more risks</td>
<td>Mean no. of risks = 4.5; 71% with 4 or more risks</td>
</tr>
<tr>
<td></td>
<td>Parent ed &gt; than in c-group</td>
<td>Area poverty &gt; than in p-group</td>
</tr>
</tbody>
</table>

### Intervention levels

<table>
<thead>
<tr>
<th></th>
<th>CPC Intervention</th>
<th>Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool</td>
<td>100% 1 or 2 years</td>
<td>15% in Head Start</td>
</tr>
<tr>
<td>Kindergarten</td>
<td>60% full day</td>
<td>100% full day</td>
</tr>
<tr>
<td>School age</td>
<td>69% 1 year, 56% 2-3 years</td>
<td>30% 1 year, 0% 2-3 years</td>
</tr>
</tbody>
</table>
Sample Characteristics

- Lived in highest poverty neighborhoods: Mean child poverty rate was 41%.
- 93% African American, 50.2% female.
- 75% from single-parent families.
- Over 60% were receiving public aid.
- Mean risk index was 4.5 of 8; 73% 4 or more.
- Recovery rate of 90% by age 24.
Two Major Foci

Basic skills: Language, Numeracy, Listening
- Structured Learning Activities
- Language and literacy emphasis
- Field Trips: Zoos, Museums, Libraries

Parent Involvement:
- Classroom volunteering
- Parent room activities
- Educational workshops and training
- Home visits and activities
Child-Parent Centers

Child-Parent Center
Preschool/Kindergarten
(Wing or Building)

Head Teacher

Principal

Elementary School
Grades 1 to 3

Curriculum Parent-Resources Teacher

Outreach Services

Parent Component

Curriculum Component

Health Services

Parent Component

Curriculum Component

School-Wide Services

School-Community Representative
Resource Mobilization
Home Visitation
Parent Conferences

Parent Resource Teacher
Parent Room Activities
Classroom Volunteering
School Activities
Home Support

Language Focus
Small Class Sizes
Inservice Training

Health Screening
Nursing Services
Free + Reduced-Price meals

Parent Room Activities
Classroom Volunteering
School Activities
Home Support

Reduced Class Size
Teacher Aides
Instructional Materials
Individualized Instruction
Inservice Training

Health Services
School-Community Representative
Free + Reduced-Price meals
Resource Mobilization

Age 3

To

Age 9
Johnson Child-Parent Center
Parent Resource Room
Major Outcome Measures

Educational Attainment (by age 23)
  High school completion, years of education, college attendance
Economic Well Being (22-24)
  Quarterly income, employment, in school or working, public aid
Criminal Behavior (18-24)
  Arrests, Convictions, Incarceration
Health Status & Behavior (up to 24)
  Substance use, teen parenthood, health insurance, child abuse/neglect, health insurance
  health insurance
Mental health (22-24)
  Depressive symptoms

Outcomes for Parents (by child’s age 17) include Educational Attainment, Economic Well Being, and Health
## Sample Sizes and Recovery Rates for Adult Follow Up

<table>
<thead>
<tr>
<th>Outcome measure assessed at ages 22-24</th>
<th>Number of cases</th>
<th>Recovery rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational attainment</td>
<td>1,368</td>
<td>88.9</td>
</tr>
<tr>
<td>Employment status</td>
<td>1,249</td>
<td>81.2</td>
</tr>
<tr>
<td>Arrest status/Incarceration history</td>
<td>1,418</td>
<td>92.1</td>
</tr>
<tr>
<td>Substance use/Mental health (self report)</td>
<td>1,142</td>
<td>76.4</td>
</tr>
<tr>
<td>Health insurance (self report/admin records)</td>
<td>1,277</td>
<td>85.5</td>
</tr>
<tr>
<td>Public aid history</td>
<td>1,315</td>
<td>88.0</td>
</tr>
<tr>
<td>Parental ed attainment/employment</td>
<td>1,438</td>
<td>93.9</td>
</tr>
<tr>
<td>Parental public aid participation</td>
<td>1,440</td>
<td>94.1</td>
</tr>
</tbody>
</table>
Basic Impact Model

**CPC participation**

Preschool (1-2 yrs. vs all others)
School-age (1-3 yrs. vs all others)
*Or* Extended (4-6 vs 0-3 yrs.)

**Covariates** (age 0 to 3)

A. Sex of child, race/ethnicity, 8 risk indicators, child maltreatment report
B. Risk Index instead of individual indicators
C. With and without program sites.
Design Strengths

- Comparison group enrolled in full-day kindergarten, the usual program for at-risk young children at the time.
- Most of comparison group from randomly selected schools with full-day kindergarten.
- CPCs were in most disadvantaged areas.
- High rates of CPC enrollment across communities given outreach, low availability of programs, and low-SES status of families.
- Robustness testing over a decade shows consistency of measured impacts.
Common Paths from Early Childhood to Adult Well-Being

Early Childhood
Ages 3-9

Exogenous Conditions
- Gender
- Socio-Environmental Risk
- Neighborhood Attributes

Program Participation
- Timing
- Duration
- Intensity

Motivation
- Self-efficacy
- Perceived competence
- Persistence in learning

Developed Abilities
- Cognitive development
- Literacy skills
- Pre-reading/numeracy skills

Social Adjustment
- Classroom adjustment
- Peer relations
- Self-regulating skills

Family Support
- Parent-child interactions
- Home support for learning
- Participation in school
- Parenting skills

School Support
- Quality of school environment
- Classroom environment
- School-level performance

Adolescence to Adulthood

Competence Behaviors
- School Achievement and Performance
- School Remediation
- Delinquency and Crime
- Child Maltreatment
- Participation in Social Services
- Health & Mental Health
- Educational Attainment
- Economic Well-Being
- Family Circumstances

CA = Cognitive Advantage
SA = Social Adjustment
FS = Family Support
SS = School Support

MA = Motivational Advantage
Major Findings
Group Differences for Measures of Well Being

- Arrested by Age 18: Comparison Group 25.1%, Preschool Group 16.9%
- Grade Retention by Age 15: Comparison Group 38.4%, Preschool Group 23%
- Special Education by Age 18: Comparison Group 24.6%, Preschool Group 14.4%
- Child Maltreatment by Age 17: Comparison Group 14.2%, Preschool Group 6.9%
Educational Attainment by Age 23

- High School Completion: Preschool group 71.4%, Comparison group 63.7%
- Any College: Preschool group 29.4%, Comparison group 27.4%
- 4-year College: Preschool group 14.7%, Comparison group 10%
High School Completion Over Time

Percentage of Sample

- CPC preschool
- Non-CPC preschool

Economic Well-Being

- Any quarterly income > $3,000: 37.7% (Preschool group) vs. 33.1% (Comparison group)
- Attended college/Report 4Qs of Income: 54.1% (Preschool group) vs. 48.7% (Comparison group)
- Any Public Aid: 61.6% (Preschool group) vs. 63% (Comparison group)
Health-Related Outcomes

- Substance use-lifetime: Preschool group 12.8%, Comparison group 16.4%
- Daily tobacco use-current: Preschool group 17.9%, Comparison group 22.1%
- No Health Insurance: Preschool group 29.8%, Comparison group 38.5%
- 1+ depressive symptoms: Preschool group 12.8%, Comparison group 17.4%
Child Maltreatment

- Child abuse/neglect: 9.2%
- 2 or more CAN: 1.7%
- Out of home placement: 4.7%

Comparison groups:
- 2 or more CAN: 3.6%
- Out of home placement: 8.8%
Adult Arrest and Incarceration

- **Arrest**: Preschool group 35.8%, Comparison group 40%
- **Guilty Charge**: Preschool group 20.3%, Comparison group 24.7%
- **Incarceration/Jail**: Preschool group 20.6%, Comparison group 25.6%
Parental Well-Being (Selected)

- HS Completion by child's age 17: 70.8% (Preschool group), 61.7% (Comparison group)
- Employment history: 53.7% (Preschool group), 48.8% (Comparison group)
- 5+ yrs of AFDC/TANF: 36.9% (Preschool group), 35.6% (Comparison group)
Extended Intervention Comparisons

- HS completion: 73.9% (4 to 6 years) vs. 65.5% (Less than 4 years)
- Employed full time: 54.9% (4 to 6 years) vs. 49% (Less than 4 years)
- 1+ years of Medicaid: 24.1% (4 to 6 years) vs. 30.8% (Less than 4 years)
- Violent arrest: 11% (4 to 6 years) vs. 15% (Less than 4 years)
Parental Well-Being: Extended Intervention

- **HS completion**
  - 4 to 6 years: 74.1%
  - Less than 4 years: 66.6%

- **Employed by child age 17**
  - 4 to 6 years: 56.8%
  - Less than 4 years: 49.1%

- **5+ years of Public Aid**
  - 4 to 6 years: 55.8%
  - Less than 4 years: 59.4%
Summary of Findings

- Consistent Evidence of Preschool Effects on Educational Attainment
- Parents of Program Participants have greater Educational Attainment and Higher Rates of Employment.
- Extended Intervention Linked to some Adult Outcomes but School-age Intervention did not.
Sources of Long-term Effects from the Consortium for Longitudinal Studies (1983)

Paths of Long-term Preschool Effects in Three Studies

Sources of Long-term Effects from Perry Preschool (Barnett et al., 1998)
Sources of Long-term Effects from the CPC Program

- CPC Preschool program
- ITBS Scores, age 6
- Grade retentions
- Later achievement
- Educational Attainment
- Family Support
  - Parent involvement
  - Abuse/Neglect
- School Support
  - Magnet school
  - School Mobility

Sex
Family Background
Race/Ethnicity
Emerging Evidence of Positive Effects of Early Education

- High Quality Child Care is Linked to School Readiness, Social Skills, and Achievement
- State Funded Preschool Programs have Positive Effects on Children’s Learning --e.g., Georgia and Oklahoma
- Effects of Early Education Exceed Those of Other Programs
Cost-Benefit Analysis
Overview

- Obtain treatment effects and translate them to monetary values
- Discount future benefits and costs to get their Present Value
- Projections of future earnings and crime
The economic focus on worker productivity and crime reduction has wide appeal.

- Numerous reports have been written by child advocacy groups and business councils outlining the economic case for spending on preschool.
- Investments in preschool generate positive externalities, suggesting that public subsidy is needed.
- Investments in preschool are now being described as an economic development policy for states.
Major Benefit Categories

- **School Remedial Services**
  - *Reduced Costs of Special Education Services*
  - *Reduced Expenditures for Extra Schooling for Retained Students*

- **Child Welfare System**
  - *Reduced Treatment and Administrative Costs*
  - *Cost savings to Victims*

- **Justice Systems (Juvenile and Adult)**
  - *Reduced Administrative Costs*
  - *Reduced Costs of Treatment and Incarceration*
  - *Savings to Crime Victims*

- **Economic Well-Being (Ed att. and Income)**
  - *Increased Earnings to Age 65*
  - *Increased Tax Revenues to Governments*

- **Health Status and Behavior**
  - *Reduced Costs of Treatment and Medical Services*
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Cost No discount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sp ed history-K to 12</td>
<td>$42,995</td>
</tr>
<tr>
<td>Maltreatment Victim</td>
<td>$53,313</td>
</tr>
<tr>
<td>Juvenile crime</td>
<td>108,631</td>
</tr>
<tr>
<td>Adult crime</td>
<td>391,645</td>
</tr>
<tr>
<td>HS completion vs No</td>
<td>$426,188</td>
</tr>
</tbody>
</table>
### Summary of Costs and Benefits Per Participant in 2002 Dollars for Three Preschool Programs

<table>
<thead>
<tr>
<th>Costs and Benefits</th>
<th>High/Scope Perry Preschool</th>
<th>Chicago Child-Parent Centers</th>
<th>Abecedarian Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program Costs Per Participant</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average program participant</td>
<td>15,844</td>
<td>7,384</td>
<td>35,894</td>
</tr>
<tr>
<td>For one year of participation</td>
<td>9,759</td>
<td>4,856</td>
<td>13,900</td>
</tr>
<tr>
<td><strong>Summary of Benefits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total benefits</td>
<td>138,486</td>
<td>74,981</td>
<td>135,546</td>
</tr>
<tr>
<td>Net benefits (benefits-costs)</td>
<td>122,642</td>
<td>67,595</td>
<td>99,682</td>
</tr>
<tr>
<td>Total benefit per dollar invested</td>
<td>8.74</td>
<td>10.15</td>
<td>3.78</td>
</tr>
<tr>
<td>Public benefit per dollar invested</td>
<td>7.16</td>
<td>6.87</td>
<td>2.69</td>
</tr>
</tbody>
</table>
Benefit-Cost Ratios for Total Benefit of 4 Programs

- Perry Preschool at Age 27: 8.74
- CPC Preschool Program: 10.15
- Nurse Family Partnership (High Risk): 5.06
- Abecedarian: 3.78
## Economic Returns of Child Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Return per dollar invested</th>
<th>Net Benefit (B minus C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC</td>
<td>$3.07</td>
<td>$1,983</td>
</tr>
<tr>
<td>CPC</td>
<td>$10.15</td>
<td>$70,977</td>
</tr>
<tr>
<td>Perry</td>
<td>$8.74/$17.07</td>
<td>$128,766/$267,347</td>
</tr>
<tr>
<td>Nurse Family P</td>
<td>$5.06</td>
<td>$29,717</td>
</tr>
<tr>
<td>Abecedarian</td>
<td>$3.78</td>
<td>$99,682</td>
</tr>
</tbody>
</table>
## Economic Returns (Continued)

<table>
<thead>
<tr>
<th>Program</th>
<th>Return per dollar invested</th>
<th>Net Benefit (B minus C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced class sizes</td>
<td>$2.83</td>
<td>$15,459</td>
</tr>
<tr>
<td>Grade retention</td>
<td>-$3.32</td>
<td>-$18,475</td>
</tr>
<tr>
<td>Big Brothers/Big Sisters</td>
<td>$1.01</td>
<td>$49</td>
</tr>
<tr>
<td>Job Corps</td>
<td>$1.32</td>
<td>$4,817</td>
</tr>
</tbody>
</table>
Benefit-Cost Ratios for Alternative Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Present Value of Benefits per Dollar Invested ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WIC</td>
<td>3.07</td>
</tr>
<tr>
<td>Infant programs</td>
<td>4.42</td>
</tr>
<tr>
<td>Preschool programs</td>
<td>9.45</td>
</tr>
<tr>
<td>Reduced class size</td>
<td>2.24</td>
</tr>
<tr>
<td>Grade retention</td>
<td>-3.32</td>
</tr>
<tr>
<td>Job Corps</td>
<td>1.32</td>
</tr>
</tbody>
</table>
Some Next Steps

1. Continued Follow Up of Sample to Age 30
2. Identify Early Predictors and Paths of Influence for Adult Health and Well Being
3. Replication of CPC program in Other Settings
4. Joint Analysis of Preschool Programs to Assess Cost-Effectiveness, Key Elements, and Causal Mechanisms
5. Comparative Analysis of Different Childhood Investments
6. Assessing Strengths and Limits of Different Structures of Early Education Programs.
7. Feasibility of Early Education as part of PK-3
Conclusions and Implications

1. Established large-scale programs can impact well-being into adulthood; generalizability of findings on early intervention is strengthened.

2. Although timing and length of intervention matter, preschool participation is associated with a wider range of outcomes over longer periods.

3. Impacts are Similar for Most Children.

4. Early childhood programs are among the most effective and cost-effective interventions. A critical mass of evidence supports the effectiveness and cost-effectiveness of high quality programs.
5. Key elements of effectiveness are timing and length, organizational structure, teacher background and compensation, the enrichment focus on school readiness, and intensive parent program within a comprehensive model.

6. Paths to long-term effects are complex but the largest contributions are from the cognitive advantage, school & family support models.

7. The success of universal programs will depend on (i) following core principles of effectiveness, (ii) recruiting and keeping well-trained staff, and (iii) tailoring services to needs of families.
For more information about the Chicago Longitudinal Study, contact:

Arthur Reynolds, Institute of Child Development

(jjr@umn.edu)

Judy Temple, Humphrey Institute and Dept. of Applied Economics (jtemple@umn.edu)

Suh-Ruu Ou, Institute of Child Development

(sou@umn.edu)

Funding support provided by:

NICHD

Doris Duke Charitable Foundation

Foundation of Child Development

Web Site: www.waisman.wisc.edu/cls/