Creating the Skills of the Next Generation

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Seminar on
The Importance of Early Childhood Development in the Construction of a Better Society
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CENTER FOR THE ECONOMICS OF HUMAN DEVELOPMENT
THE UNIVERSITY OF CHICAGO
HUMAN CAPITAL AND ECONOMIC OPPORTUNITY
GLOBAL WORKING GROUP
Inequality and Child Poverty in Brazil
Figure 1: Poverty and Income Inequality Over Time: 1995-2013

Note: Poverty is defined as the percentage of the population with per capita income below a poverty line. Absolute poverty refers the poverty line of USD 2 a day, as set out in the Millennium Development Goals of the United Nations. The absolute poverty number for 2013 is estimated based on IPEA data. Relative poverty refers the line at 50% of the median income. The Gini coefficient measures the inequality of income distribution on a scale between 0 and 1 with higher values representing more income inequality.

Source: OECD Economic Surveys: Brazil 2015
Figure 2: Percentage of Individuals Younger than 18 Years of Age who are in the Bottom Income Quintile

Source: IADB Social Indicators
Figure 3: Intergenerational Mobility and Inequality

Source: Corak (2011), *Inequality from Generation to Generation: The United States in Comparison.*
Lecture Today

- Consider effective policies to foster social inclusion, to reduce economic and social inequality, and to promote economic and social opportunity for all Brazilians.
Alms to the Poor?

- The traditional approach to reducing inequality is to transfer income to the poor.
- To create social safety nets that respect dignity and yet give incentives for the poor to help themselves out of poverty.
- Such policies are in place around the world and are important components of the modern welfare state.
• Bolsa Familia attempts to do just this.

• The U.S. tried this to similar effect in its War on Poverty in the 1960s.

• Substantially reduced poverty through transfers.

• At issue: do such policies reduce long-run inequality?

• Do they promote social mobility and reduce economic inequality in the next generation?

• There, the evidence is not so strong.

• In the U.S., the failure of income transfer policies to promote intergenerational social mobility led to Clinton’s welfare reforms of the 1990s.

• Recent evidence suggests that the policy reforms of the Clinton administration also failed to produce the desired intergenerational mobility out of welfare.
Figure 4: Trends in the Intergenerational Correlation of Welfare Participation

Early Targeting Populations At Risk Can Be An Economically and Socially Efficient Strategy
Childhood Forecasting of a Small Segment of the Population with Large Economic Burden

Caspi, Moffitt, et al. (2017)

*Nature Human Behaviour*
The Pareto Principle

20% of the Actors Account for 80% of the Results.

Vilfredo Pareto, 1848-1923
Social Welfare Benefit Months

20% of Cohort Members = 80% of Total Social Welfare Benefit Months
Absent-Father Parenting

20% of Cohort Members = 82% of Total Fatherless Child-Years
The High-need/High-cost Group in 3 or more sectors: How many health/social services do they use?

- Cohort: 22%
- Social Welfare: 66%
- Fatherless Children: 77%
- Smoking: 54%
- Excess Weight: 40%
- Hospital Stays: 57%
- Prescription Fills: 78%
- Injury Claims: 36%
- Crime: 81%
Small Footprint of cohort members never in any high-cost group:

- Cohort: 30%
- Social Welfare: 6%
- Fatherless Children: 3%
- Smoking: 7%
- Excess Weight: 1%
- Hospital Stays: 7%
- Prescription Fills: 3%
- Injury Claims: 15%
- Crime: 0%
Childhood Risk Factors to Describe High-cost Actor Groups: Composites across ages 3, 5, 7, 9, 11

- IQ
- Self-control
- SES (socio-economic status)
- Maltreatment
Age-3 Brain Health:
45-minute standardized assessment of Dunedin cohort 3-year-olds in 1975

- Neurologist’s examination of soft signs
- Peabody Picture IQ test
- Reynell Receptive Language test
- Bayley Motor Skills test
- Examiner-rated poor behavior control
Link to Additional Pareto et. al Slides
Summary of findings

• 20% of people contribute 80% of social/health problems.

• A high-need/high-cost population segment uses ~half of resources in multiple sectors.

• Most high-need/high-cost people in this segment share risk factors in the first decade of life;

• Prediction is stronger than thought; AUC approaches .90.

• Brain integrity in the first years of life is important.

Seen in this way, early-life risks seem important enough to warrant investment in early-years preventions.
Predistribution, Not Just Redistribution
Skills to function and create further skills are central to producing social and economic opportunity.
Skills are the capacities to function in a variety of aspects of economic and social life.
• **Predistribution builds skills** as an effective way to foster economic and social mobility.

• An effective strategy for reducing long-run poverty and promoting social mobility built on research on human development in neuroscience, developmental psychology and economics.

• Strategy based on hard empirical analysis and rigorous, long-term evaluations of numerous interventions, and studies of family influence.
A Comprehensive Approach to Skill Formation
To foster the skills of its people, Brazil should implement this knowledge and take a comprehensive approach to understanding the economics of skill development.

- Formulate policies that clearly recognize what skills matter, how they are produced and how to prioritize public policy for producing skills.

- Doing so avoids a fragmented and often ineffective approach to public policy that misses the pervasive importance of skills in shaping life outcomes.
Fragmented Solutions

- Current policy discussions often have a fragmented quality.
Examples of Fragmented Solutions

- For crime, have more police.
- To promote skills, build more schools, hire better teachers, and raise test scores.
- For health, have more doctors and medical facilities. Promote nutrition: micro and macronutrients.
- For teenage pregnancy, conduct pregnancy prevention programs.
- To reduce inequality, give cash transfers and promote housing programs for the poor.
Policy Synergies

- Current research suggests a **unified approach** to policy that addresses these problems and others using a strategy of human development to promote social mobility and productivity, and to reduce inequality.
- It is a policy that promotes skills at the stages of the life cycle where they are most effectively produced.
- It is a policy of prevention and empowerment, not just remediation.
The Ingredients of an Effective Skill Formation Strategy

- Any effective strategy for promoting human development has to recognize **three key ingredients**:
  - The powerful role of family life and the early years in shaping adult skills.
  - **Multiple** skills shape the ability of agents to function in society. A core set of skills promotes success in many aspects of life.
  - The technology of skill formation: skills beget skills.
    - There are fundamental synergies associated with skill formation.
    - Different skills interact dynamically to shape the evolution of future skills.
    - There are different periods of effective investment for the development of different skills.
The Importance of Cognition, Character, and Health

(a) Major advances have occurred in understanding which skills matter for success in life.

(b) Cognitive skills measured by achievement tests are important. Hard empirical evidence on their importance.

(c) So are the **socioemotional skills** – sometimes called character traits or personality traits:

- Motivation
- Sociability; ability to work with others
- Attention
- Self Regulation
- Self Esteem
- Ability to defer gratification
- Health and Mental Health

(d) **Health and basic biological architecture** play crucial roles – not only in promoting adult health, but in promoting cognition and character.
• Beyond PISA scores
Fostering and Measuring Skills:
Improving Cognitive and Non-Cognitive Skills to Promote Lifetime Success

Tim Kautz, James J. Heckman, Ron Diris, Bas ter Weel, Lex Borghans
Link to Report PDF
Link to Appendix
Cognitive and Socioemotional Skills Affect Life Cycle:

(a) Crime
(b) Earnings
(c) Health and healthy behaviors
(d) Civic participation
(e) Educational attainment
(f) Teenage pregnancy
(g) Trust
(h) Human agency and self-esteem
Skill Gaps Open Up Early

- Gaps in skills across socioeconomic groups open up very early:
  - Persist strongly for cognitive skills
  - Less strongly for noncognitive skills
  - Widen by age for many biological skills
- Skills are not set in stone at birth—but they solidify as people age. They have genetic components.
- Skills evolve and can be shaped in substantial part by investments and environments.
Figure 5: Trend in Mean by Age for Cognitive Score by Maternal Education

Note: Each score standardized within observed sample. Using all observations and assuming data missing at random. Source: Brooks-Gunn et al. (2006).
Figure 6: Average Percentile Rank on Anti-Social Behavior Score, by Income Quartile
Figure 1: Gaps throughout life, by mother’s level of education, Denmark

Figure 7: Gaps throughout life, by mother’s level of education, Denmark

<table>
<thead>
<tr>
<th>Age</th>
<th>Outcome</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 yrs</td>
<td>Birth weight</td>
<td>Gram</td>
</tr>
<tr>
<td>0 yrs</td>
<td>Not admitted to</td>
<td>Fraction</td>
</tr>
<tr>
<td>3–5 yrs</td>
<td>Score for self-regulation</td>
<td></td>
</tr>
</tbody>
</table>

Note: Figure shows average outcomes by mother’s highest completed education. In the figures with three levels, mother’s education is defined as: BLUE, only compulsory schooling; RED, high school; GREEN, college. In the figures with five levels, mother’s education is defined as: BLUE, only compulsory schooling; PINK, vocational; GREEN, high school; RED, college; YELLOW, master or PhD degree.
Figure 7: Gaps throughout life, by mother's level of education, Denmark,
Cont’d
Figure 7: Gaps throughout life, by mother’s level of education, Denmark, Cont’d
Mothers’ Speech and Child Vocabulary: Hart & Risley, 1995

Children enter school with “meaningful differences” in vocabulary knowledge.

1. Emergence of the Problem
In a typical hour, the average child hears:

<table>
<thead>
<tr>
<th>Family Status</th>
<th>Actual Differences in Quantity of Words Heard</th>
<th>Actual Differences in Quality of Words Heard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare</td>
<td>616 words</td>
<td>5 affirmatives, 11 prohibitions</td>
</tr>
<tr>
<td>Working Class</td>
<td>1,251 words</td>
<td>12 affirmatives, 7 prohibitions</td>
</tr>
<tr>
<td>Professional</td>
<td>2,153 words</td>
<td>32 affirmatives, 5 prohibitions</td>
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</table>

2. Cumulative Vocabulary at Age 3

<table>
<thead>
<tr>
<th>Cumulative Vocabulary at Age 3</th>
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</thead>
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<tr>
<td>Children from welfare families:</td>
</tr>
<tr>
<td>500 words</td>
</tr>
<tr>
<td>Children from working class families:</td>
</tr>
<tr>
<td>700 words</td>
</tr>
<tr>
<td>Children from professional families:</td>
</tr>
</tbody>
</table>
| 1,100 words-------------
Figure 8: Mean number of spoken words reported on the MacArthur/Bates CDI by age and SES (HI). Error bars represent SE of the mean over participants.

Source: Fernald et al. (2013)
How to Interpret This Evidence

- Evidence on the early emergence of gaps leaves open the question of which aspects of families are responsible for producing these gaps.
- Genes? Eugenic policies?
- Family environments? Neighborhood and community effects?
- Parenting and family investment decisions?
- The evidence from a large body of research demonstrates an important role for investments and family and community environments in determining adult capacities above and beyond the role of the family in transmitting genes.
- The quality of home environments by family type is highly predictive of child success.
- What should we take from this evidence in devising policy?
Figure 9: Children Under 18 Living in Single Parent Households by Marital Status of Parent

Note: Parents are defined as the head of the household. Children are defined as individuals under 18, living in the household, and the child of the head of household. Children who have been married or are not living with their parents are excluded from the calculation. Separated parents are included in “Married, Spouse Absent” Category.
Figure 10: Share of Single Parent Families with Children out of All Families with Children, Brazil

Share of Single Parent Families with Children out of All Families with Children, Brazil

Source: IBGE
Figure 11: Percentage of couples per type of marital union Brazil – 1960-2010

Source: IBGE (2013a).
Figure 12: Predicted Probabilities of Cohabiting by Women’s Education

Source: Covre-Sussai and Matthijs (2010)
Outcomes: Cohabitation versus Marriage
Figure 13: Geometry By Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 14: Numbers by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 15: Self-Regulation and Cooperation by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 16: Vocabulary by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 17: Print Concepts by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 18: Rhyme by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
Figure 19: Language Comprehension by Family Status

Figure 20: Empathy by Family Status

Source: 'Daycare of the Future', Bleses and Jensen (2017)
**Table 1**: Estimated coefficients from regressions of child outcomes on family status, controlling for age and mothers education. Sample of 3-5 year old children from Denmark.

<table>
<thead>
<tr>
<th></th>
<th>TEAM Geometry</th>
<th>TEAM Numbers</th>
<th>SEAM Empathy</th>
<th>SEAM Self-Regulation &amp; Cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohabitating couple</td>
<td>-0.064</td>
<td>-0.332***</td>
<td>-0.445***</td>
<td>-0.252**</td>
</tr>
<tr>
<td>Single</td>
<td>-0.125*</td>
<td>-0.405***</td>
<td>-0.712***</td>
<td>-0.649***</td>
</tr>
<tr>
<td></td>
<td>(0.072)</td>
<td>(0.130)</td>
<td>(0.166)</td>
<td>(0.116)</td>
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**Controls**

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<th>X</th>
<th>X</th>
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<tr>
<td>Age intervals</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Mother’s education</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>5218</td>
<td>5196</td>
<td>5571</td>
<td>5572</td>
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</table>

Notes: Child outcomes: mathematical skills and socio-emotional skills. Married couple is reference category. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: ‘Daycare of the Future,’ Bleses and Jensen (2017).
Table 2: Estimated coefficients from regressions of child outcomes on family status, controlling for age and mothers education. Sample of 3-5 year old children from Denmark.

<table>
<thead>
<tr>
<th></th>
<th>Language Rhyme</th>
<th>Language Print Concepts</th>
<th>Language Vocabulary</th>
<th>Language Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohabitating couple</td>
<td>0.003</td>
<td>-0.466***</td>
<td>-0.333**</td>
<td>-0.098</td>
</tr>
<tr>
<td>(0.107)</td>
<td>(0.151)</td>
<td>(0.163)</td>
<td>(0.088)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>-0.350***</td>
<td>-0.209</td>
<td>-0.206</td>
<td>-0.100</td>
</tr>
<tr>
<td>(0.124)</td>
<td>(0.169)</td>
<td>(0.187)</td>
<td>(0.102)</td>
<td></td>
</tr>
</tbody>
</table>

Controls

<table>
<thead>
<tr>
<th></th>
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<th>X</th>
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</thead>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Mother’s education</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>4284</td>
<td>3003</td>
<td>4803</td>
<td>4933</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Child outcomes: language skills (four subscales). Married couple is reference category. Standard errors in parentheses * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: ‘Daycare of the Future,’ Bleses and Jensen (2017).
Genes, Biological Embedding of Experience, and Gene-Environment Interactions
Link to Image of DNA Methylation
The Dynamics of Skill Formation: Two Notions of Complementarity
Static Complementarity

- The productivity of investment greater for the more skilled.
  - High returns for more skilled people: Matthew Effect
  - Does this justify social Darwinism?
  - On grounds of economic efficiency, should we invest primarily in the most skilled?
  - Answer: It depends on where in the stage of the life cycle we consider the investment.
Dynamic Complementarity

- If we invest today in the base skills of disadvantaged young children, there is a huge return.
- Makes downstream investment more productive.
- **No necessary tradeoff between equality and efficiency goals.**
- Augmenting this investment by public infrastructure and schools gives agency to people and enhances economic and social functioning.
Both processes at work.

No necessary contradiction.

Investing early creates the skill base that makes later investment productive.
### Skills Beget Skills

<table>
<thead>
<tr>
<th>Social-emotional Skills</th>
<th>Cognitive Skills, Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>(sit still; pay attention; engage in learning; open to experience)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health</th>
<th>Cognitive Skills, Noncognitive Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>(fewer lost school days; ability to concentrate)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cognitive Skills</th>
<th>Produce better health practices; produce more motivation; greater perception of rewards.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(child better understands and controls its environment)</td>
<td></td>
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</tbody>
</table>

**Outcomes:** increased productivity, higher income, better health, more family investment, upward mobility, reduced social costs.
Powerful Evidence For Effectiveness of Targeted Interventions
Returns to a Unit Hong Kong Dollar Invested

Rate Of Return To Investment In Human Capital

- Programs Targeted Towards The Earliest Years
- Preschool Programs
- Schooling
- Job Training

Source: Heckman (2008)
Beyond Treatment Effects
Understanding Mechanisms is the Key to Devising Effective Policy
Long-Run Evidence on the Effects of Quality Early Interventions

- Many successful early childhood interventions followed over the life cycle operate primarily through boosting non-cognitive skills. IQ is often barely budged for interventions past age 3.
- Long term evaluations of interventions often provide a different assessment of the effectiveness of interventions than do short run evaluations.
Long-term evaluations are essential

- Literature filled with large even miraculous short-term evaluation results that fade out when evaluated long-term.
- Filled with “curricula” rather than a deep understanding of the family and how successful programs replicate beneficial family environments.
Perry Preschool Project
The Perry Preschool program targeted 3- and 4-year old low income black children with initial IQ below 85 at age 3.

Selection into the program was based on random assignment.

Children attended 2.5 hours of center-based preschool five days a week for two years.

Teachers were also involved in home visits during which they interacted, played and talked with the child.
The Perry preschool program enriched the lives of low income black children with initial IQs below 85 at age 3.

- 2½ hours per day
- 5 days per week
- 2 years during each school year (mid-October to May)
- home visits
- program stops after two years
• Implemented years: 1962–1967
• 5 cohorts of 3–4 year-olds; 123 participants
• Treatment lasted 1–2 years and included center-based care and home visits & parenting instruction
- Evaluated by the method of random assignment.
- Contrary to recent claims, strong effects are found for both boys and girls, although different effects at different ages for different outcomes.
- Did not lead to sustained gains in IQ for males.
The program focused on building organizational and social skills and was designed to cultivate independence and a sense of responsibility in the children.

The daily routine was understood as a key component of teaching children temporal relations.
• Children first planned an activity to execute and then would go to the art, large motor, doll or quiet center to complete their planned activity.

• The program ended after two years of enrollment and then children from both treatment and control group attended the same school.
Figure 22: Male Cognitive Dynamics

The graph shows the IQ scores of males in the treatment and control groups across different ages. The IQ scores are presented for each year (3-year intervals) from entry to age 10.

- **Treatment Group:**
  - Entry: 79.2
  - Age 4: 94.9
  - Age 5: 95.4
  - Age 6: 91.5
  - Age 7: 91.1
  - Age 8: 88.3
  - Age 9: 88.4
  - Age 10: 83.7

- **Control Group:**
  - Entry: 77.8
  - Age 4: 83.1
  - Age 5: 84.8
  - Age 6: 85.8
  - Age 7: 87.7
  - Age 8: 89.1
  - Age 9: 89.0
  - Age 10: 86.0

The graph indicates that the treatment group generally has higher IQ scores compared to the control group, especially from age 4 onwards.
The Perry Program has a statistically significant annual rate of return of around 7%-10% per annum for both boys and girls in the range of the post-World War II stock market returns to equity in the U.S. labor market, estimated to be 6.9%.
• Worked primarily through noncognitive channels.
• Early interventions reducing problem behavior lower the probability of engaging in unhealthy behaviors in adulthood.
Our demonstration of the powerful role of personality skills is in agreement with the results of Borghans et al. (2010a) showing that achievement test scores are explained, in part, by both personality skills and IQ. See also Heckman and Kautz (2012) for evidence that 30–40 percent of the explained variance in achievement test scores across students is due to personality skills and not IQ.12

Figure 23: Perry Preschool Program: Histograms of Indices of Personality Skills and CAT Scores

Panel A. Externalizing behavior, control
(Higher is better), control

Panel B. Externalizing behavior, treatment
(Higher is better), treatment

Panel C. Academic motivation, control

Panel D. Academic motivation, treatment

Notes:
- Percentile tiles of the general population distribution of the scores. See online Appendix B.4 for descriptions of the measures listed in Table 2. “CAT” is the California Achievement Test score expressed in percentiles.

Sources: Heckman et al. (2013).
Our demonstration of the powerful role of personality skills is in agreement with Heckman and Kautz (2012). This paper contributes to an emerging literature on the economics of personality. Borghans et al. (2011a, 2011b) show that achievement test scores are explained, in part, by both personality skills and IQ. See also Heckman and Kautz (2012). See Cunha and Heckman (2008, 2010) for evidence that personality skills boost acquisition of cognition as measured by achievement tests. Enhanced personality skills promote learning, which, in turn, boosts achievement in reading, mathematics, and science. This finding is consistent with recent evidence that 30–40 percent of the explained variance in achievement test scores across students is due to person-skill factors. Knowledge, which is enhanced for children with better cognitive and personality skills, promotes learning in reading, arithmetic, and science. 

Panel A. Externalizing behavior, control
Panel B. Externalizing behavior, treatment
Panel C. Academic motivation, control
Panel D. Academic motivation, treatment
Panel E. CAT total at age 14, control
Panel F. CAT total at age 14, treatment

Notes:
- IQ. See also Heckman and Kautz (2012).
- See Cunha and Heckman (2008, 2010) for evidence that personality skills boost acquisition of cognition as measured by achievement tests.
- Enhanced personality skills promote learning, which, in turn, boosts achievement in reading, mathematics, and science.
- This finding is consistent with recent evidence that 30–40 percent of the explained variance in achievement test scores across students is due to person-skill factors.
- Knowledge, which is enhanced for children with better cognitive and personality skills, promotes learning in reading, arithmetic, and science.

Source: Heckman et al. (2013).
Creating Skills

Notes: Indices for externalizing behavior and academic motivation are unweighted averages of measures listed in Table 2. "CAT" is the California Achievement Test score expressed in percentiles of the general population distribution of the scores. See online Appendix B.4 for descript...
Mechanisms
Parental response to Perry Preschool Program after 1 year experience of treatment:
Parental Warmth, Perry Preschool

![Graph showing differences in parental warmth between control and treatment groups.](image)
Parental Authoritarianism, Perry Preschool

![Graph showing the relationship between parental authority and some outcome measure, with two lines representing control and treatment groups.](image-url)
Intergenerational Effects of Perry Program
Selected Outcomes for All Children of the Perry Participants

- Completed high school: P = 0.0849
- In good health: P = 0.0624
- Employed full-time: P = 0.0548
- Never suspended: P = 0.0347
- Never arrested: P = 0.0792

- Control group's mean
- Treatment effect (difference-in-means)

P: Worst-case randomization test-based exact p-value
Selected Outcomes for All Children of the Male Participants

- Never suspended: Control group's mean vs. Treatment effect (difference-in-means)
  - P: Worst-case randomization test-based exact p-value

- Never arrested: Control group's mean vs. Treatment effect (difference-in-means)
  - P: Worst-case randomization test-based exact p-value
Selected Outcomes for Male Children of the Perry Participants

- Attended college: Control group's mean of 0.3, Treatment effect (difference-in-means) of 0.1, P: 0.0085
- In good health: Control group's mean of 0.8, Treatment effect (difference-in-means) of 0.5, P: 0.0464
- Never suspended: Control group's mean of 0.6, Treatment effect (difference-in-means) of 0.4, P: 0.0546
- Never arrested: Control group's mean of 0.5, Treatment effect (difference-in-means) of 0.4, P: 0.0887

P: Worst-case randomization test-based exact p-value
Selected Outcomes for Male Children of the Male Participants

- Completed college: Control group's mean, Treatment effect (difference-in-means) P.0454
- In good health: Control group's mean, Treatment effect (difference-in-means) P.0207
- Never arrested: Control group's mean, Treatment effect (difference-in-means) P.0558

P: Worst-case randomization test-based exact p-value

Diagram showing the participant-level average of children's outcomes.
Selected Outcomes for Male Children of the Female Participants

- Attended college: P = 0.0205
- Never suspended: P = 0.0593

Control group's mean, Treatment effect (difference-in-means), P: Worst-case randomization test-based exact p-value

Heckman Creating Skills
The Carolina Abecedarian-CARE Project
ABC Project

- **Where:** Conducted in Chapel Hill, North Carolina.
- **When:** The mid-1970s through the early 1980s.
- **Who:** Children born to high risk mothers, mostly African-American (with some White mothers), recruited during pregnancy.
Carolina Abecedarian Study: Overview

- **What:**
  1. Full-time Daycare (8 hours/day, 5 days/wk, 50 weeks/yr) for 5 years at age 0–5. Gave cognitive stimulation and training in self-control and social skills.
  2. Full-day need-based, individualized tutoring + bi-weekly home visits for 3 years at age 6–8, but not during early childhood.
  3. Gave health checkups to the children in the program.
Intervention Started at 8 Weeks of Birth Continues Through Age 8
Carolina Abecedarian Study: Results

- Lasting IQ effect
- Improved parenting practices and child attachment
- Positive effect on female behavior and mental health
- Higher educational attainment
- Higher employment rate
- Reduced criminal activity
- Better child and adult health
Figure 24: Abecedarian Project, Health Effects at Age 35 (Males)

<table>
<thead>
<tr>
<th></th>
<th>Treatment Mean</th>
<th>Control Mean</th>
<th>Treatment p-value</th>
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<tr>
<td>Systolic Blood Pressure</td>
<td>125.79</td>
<td>143.33</td>
<td>0.018</td>
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<tr>
<td>Diastolic Blood Pressure</td>
<td>78.53</td>
<td>92.00</td>
<td>0.024</td>
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<tr>
<td>Pre-Hypertension</td>
<td>0.68</td>
<td>0.78</td>
<td>0.235</td>
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<tr>
<td>Hypertension</td>
<td>0.10</td>
<td>0.44</td>
<td>0.011</td>
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<tr>
<td>HDL Cholesterol</td>
<td>53.21</td>
<td>42.00</td>
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<td>Cholesterol/HDL-C</td>
<td>3.89</td>
<td>4.69</td>
<td>0.057</td>
</tr>
<tr>
<td>Abdominal Obesity</td>
<td>0.65</td>
<td>0.87</td>
<td>0.136</td>
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<tr>
<td>Metabolic Syndrome</td>
<td>0.00</td>
<td>0.25</td>
<td>0.009</td>
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</table>

Source: Campbell, Conti, Heckman, Moon, Pinto, Pungello, and Pan (2014)
The Carolina Abecedarian Project: Early Start Boosts IQ
Figure 25: Treatment Effects on IQ, Females

Note: This figure displays the mean difference in IQ at different ages between the treatment and control group. The line with circles represents the raw difference. The line with squares represents the difference when controlling for IQ at age 3 by linear regression. All measures are age-standardized to a nationally representative sample of the US with mean 100 and standard deviation 15.
Figure 26: Treatment Effects on IQ, Males

Note: This figure displays the mean difference in IQ at different ages between the treatment and control group. The line with circles represents the raw difference. The line with squares represents the difference when controlling for IQ at age 3 by linear regression. All measures are age-standardized to a nationally representative sample of the US with mean 100 and standard deviation 15.
Figure 27: Net Present Value of Main Components of the Cost/Benefit Analysis Over the Life Cycle per Program Participant, Treatment vs. Next Best

Per–annum Rate of Return: 13% (s.e. 5%). Benefit–cost Ratio: 5.6 (s.e. 2.39)
Rate of Return:

- Overall: 13.7% per annum
- Males: 14% per annum
- Females: 10% per annum
Figure 28: Benefit/Cost Ratio and Internal Rate of Return when Accounting for Different Combinations of the Main Benefits

Note: This figure presents all possible combinations of accounting for the benefits from the four major categories in our analysis. The non-overlapping areas present estimates accounting for a single category as the benefit. When two categories overlap, these are the benefits that we account for. And so on for the rest of the plot. The costs remain constant across all calculations and are the same as in Figure 27. Inference is based on non-parametric, one-sided $p$-values from the empirical bootstrap distribution. We bold point estimates significant at the 10% level.
<table>
<thead>
<tr>
<th>Removed Component</th>
<th>Females</th>
<th></th>
<th></th>
<th></th>
<th>Males</th>
<th></th>
<th></th>
<th></th>
<th>Pooled</th>
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<td>NOPV</td>
<td>IRR</td>
<td>B/C</td>
<td>NOPV</td>
<td>IRR</td>
<td>B/C</td>
<td>NOPV</td>
<td>IRR</td>
<td>B/C</td>
<td>NOPV</td>
<td>IRR</td>
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<td>10.19</td>
<td>636,674</td>
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<tr>
<td></td>
<td></td>
<td>(6%)</td>
<td>(0.73)</td>
<td></td>
<td>(4%)</td>
<td>(2.93)</td>
<td></td>
<td>(3%)</td>
<td>(1.84)</td>
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<tr>
<td>Parental Income</td>
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<td>148,854</td>
<td>4%</td>
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<td>107,907</td>
<td>11%</td>
<td>9.10</td>
<td>116,953</td>
<td>9%</td>
<td>6.17</td>
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<tr>
<td></td>
<td></td>
<td>(2%)</td>
<td>(0.65)</td>
<td></td>
<td>(3%)</td>
<td>(2.92)</td>
<td></td>
<td>(3%)</td>
<td>(1.87)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Subject Labor Income</td>
<td></td>
<td>41,908</td>
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<td>2.21</td>
<td>238,105</td>
<td>13%</td>
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<td>133,032</td>
<td>13%</td>
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<tr>
<td></td>
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<td>(6%)</td>
<td>(0.66)</td>
<td></td>
<td>(5%)</td>
<td>(2.23)</td>
<td></td>
<td>(4%)</td>
<td>(1.77)</td>
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<td>419</td>
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<td>-7,265</td>
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<td>-4,372</td>
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<tr>
<td></td>
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<td>(6%)</td>
<td>(0.73)</td>
<td></td>
<td>(4%)</td>
<td>(2.93)</td>
<td></td>
<td>(3%)</td>
<td>(1.84)</td>
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<td>3.78</td>
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<td>(0.32)</td>
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<td>(0.59)</td>
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## More Rigorous and Reliable Estimates of Benefit/Cost Ratios

### Outcomes Analyzed

<table>
<thead>
<tr>
<th>Approach</th>
<th>Outcome</th>
<th>Benefit/Cost Ratio</th>
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<tbody>
<tr>
<td>Standard Approach</td>
<td>Labor Income at Age 27</td>
<td>0.09 (.04)</td>
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<tr>
<td>(Kline and Walters; Chetty et al.)</td>
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<td></td>
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<tr>
<td>Our Approach</td>
<td>Lifetime Labor Income</td>
<td>1.55 (.76)</td>
</tr>
<tr>
<td></td>
<td>All Sources</td>
<td>7.33 (1.84)</td>
</tr>
</tbody>
</table>

Heckman Creating Skills

THE UNIVERSITY OF CHICAGO
Gender Differences
Figure 29: Percentage of Outcomes with a Positive Treatment Effect
Figure 30: Percentage of Outcomes with Positive and Significant Treatment Effects (at 10%)
Life-cycle Net Present Value of Main Components of the CBA: Males
Life-cycle Net Present Value of Main Components of the CBA: Females
Response of Parents to Interventions
Figure 31: Number of people whom one can confide at 21 (sign of factor); gets emotional support from dad; close to parents at 21

Average Treatment Effect, Pooled: .44 (p-value: .02)
Average Treatment Effect, Females: .72 (p-value: .01)
Average Treatment Effect, Males: .23 (p-value: .21)
Figure 32: Incarcerated at 21; ever cited for breaking the law at 30 (sign of factor)

Average Treatment Effect, Pooled: −.11 (p−value: .29)
Average Treatment Effect, Females: .07 (p−value: .34)
Average Treatment Effect, Males: −.48 (p−value: .08)
Figure 33: Education plans at 12 (sign of factor); high school at 30

Average Treatment Effect, Pooled: .43 (p−value: .02)
Average Treatment Effect, Females: .52 (p−value: .04)
Average Treatment Effect, Males: .34 (p−value: .12)
Figure 34: Child is sick at 7 and 10 (sign of factor)

Average Treatment Effect, Pooled: $-0.19$ (p-value: 0.19)
Average Treatment Effect, Females: $0.36$ (p-value: 0.12)
Average Treatment Effect, Males: $-0.75$ (p-value: 0)
Note: This plot densities by treatment status of a (factor) measure of parent authoritativeness based on the Parental Attitude Research Instrument (PARI).
Democratic Parenting

Note: This plot densities by treatment status of a (factor) measure of parent-child democratic relationship based on the Parental Attitude Research Instrument (PARI).
Isolating Components of Program Effectiveness
The Jamaica Study: Grantham-McGregor et al.

- Parenting intervention at ages 18-34 months of the child
- Teaches mother to interact with child
- Cheap and easily replicated
- Long-term effectiveness
The Jamaican Intervention

- Randomized intervention, sample of 129 children
- Stunted children between 9 and 24 months
- Designed to individualize the different effects of nutritional and cognitive stimulation
- Follow up to age 22
- Four groups:
  1. No intervention
  2. Nutritional intervention only
  3. Cognitive stimulation intervention only
  4. Both cognitive and non-cognitive interventions
- Plus, a matched non-stunted group as a reference
- **The long-lasting effects were found for the cognitive/socio-emotional components of interventions**
### Impact of Stimulation Treatment on Log Earnings, Observed Sample

<table>
<thead>
<tr>
<th>Outcomes Analyzed</th>
<th>Stepdown $p$-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. First Job</td>
<td>0.27 0.11</td>
</tr>
<tr>
<td>All Full Time Non-Temporary</td>
<td>0.35 0.01</td>
</tr>
<tr>
<td></td>
<td>0.53 0.03</td>
</tr>
<tr>
<td>B. Last Job</td>
<td>0.27 0.06</td>
</tr>
<tr>
<td>All Full Time Non-Temporary</td>
<td>0.40 0.01</td>
</tr>
<tr>
<td></td>
<td>0.050 0.00</td>
</tr>
<tr>
<td>C. Current Job</td>
<td>0.27 0.09</td>
</tr>
<tr>
<td>All Full Time Non-Temporary</td>
<td>0.43 0.02</td>
</tr>
<tr>
<td></td>
<td>0.44 0.02</td>
</tr>
<tr>
<td>D. Average Earnings</td>
<td>0.40 0.01</td>
</tr>
<tr>
<td>All Full Time Non-Temporary</td>
<td>0.34 0.01</td>
</tr>
<tr>
<td></td>
<td>0.47 0.01</td>
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*Adjusts for multiple hypothesis testing
### Impact of Treatment on Education and Skills

<table>
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<th>A. Schooling</th>
<th>Sample Size</th>
<th>Control Mean</th>
<th>Treatment Effect</th>
<th>Stepdown p-value*</th>
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</thead>
<tbody>
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<td>In school</td>
<td>97</td>
<td>0.15</td>
<td>0.17</td>
<td>0.04</td>
</tr>
<tr>
<td>In school full-time</td>
<td>97</td>
<td>0.07</td>
<td>0.18</td>
<td>0.01</td>
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</table>

### B. Skills

<table>
<thead>
<tr>
<th></th>
<th>Sample Size</th>
<th>Control Mean</th>
<th>Treatment Effect</th>
<th>Stepdown p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive factor</td>
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<td>-0.46</td>
<td>0.59</td>
<td>0.01</td>
</tr>
<tr>
<td>Externalizing behavior factor</td>
<td>102</td>
<td>-0.23</td>
<td>0.22</td>
<td>0.30</td>
</tr>
<tr>
<td>Internalizing behavior factor</td>
<td>102</td>
<td>-0.32</td>
<td>0.39</td>
<td>0.05</td>
</tr>
<tr>
<td>Ever expelled from school</td>
<td>105</td>
<td>0.17</td>
<td>-0.12</td>
<td>0.02</td>
</tr>
</tbody>
</table>

*Adjusts for multiple hypothesis testing
Preparing For Life (PFL, 2016)
Home Visiting in Ireland – Orla Doyle

1. PFL provides support and education to parents from pregnancy/birth onwards.
2. Based on theories of attachment, social learning, & ecological development.
3. PFL: *Fortnightly home-visits* from trained mentor - pregnancy to school entry.
4. Mentors came from different professional backgrounds.
5. Mentor’s role: support parents about child development & parenting using role play, modelling, demonstration, discussion, encouragement, and feedback.
6. Low intensity — one hour per month.
Cognitive Development
Understanding information, thinking logically, familiarity with numbers, seeing patterns, and solving puzzles

Language Development
Understanding what others are saying, being able to talk to others, and starting to read words

Approaches to Learning
Being excited and interested in learning, able to focus on and complete tasks

Social & Emotional Development
Behaving well, following rules, getting along with others, sharing, and helping

Physical Wellbeing & Motor Development
Being healthy, free from illness, able to run, and hold objects such as pencils in their hands
Link to additional Doyle et al. Figures
Education Promotes Skills
But Different Levels of Education Promote Different Skills
### Beneficial Causal Outcomes of Education at Different Stages of the Life Cycle
(Heckman, Humphries, and Veramendi, 2016)

<table>
<thead>
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<td>1</td>
<td>Self-reported health</td>
</tr>
<tr>
<td>2</td>
<td>Voting</td>
</tr>
<tr>
<td>3</td>
<td>Trust</td>
</tr>
<tr>
<td>4</td>
<td>Employment</td>
</tr>
<tr>
<td>5</td>
<td>Wages</td>
</tr>
<tr>
<td>6</td>
<td>Participation in welfare</td>
</tr>
<tr>
<td>7</td>
<td>Depression</td>
</tr>
<tr>
<td>8</td>
<td>Self-esteem</td>
</tr>
<tr>
<td>9</td>
<td>Incarceration</td>
</tr>
<tr>
<td>10</td>
<td>Health related work limitations</td>
</tr>
<tr>
<td>11</td>
<td>Smoking</td>
</tr>
<tr>
<td>12</td>
<td>White-collar employment</td>
</tr>
</tbody>
</table>
What should we do for the disadvantaged adolescents who do not receive skill-enhancing enriched early environments and have cognitive deficits?
Work Experience and On-the-Job Training

- Learning-by-doing (and sometimes failing) is a major source of learning
- Also learning by imitation
Later Remediation Targeted to the Less Able Is Costly and Often Ineffective
As **currently implemented**, most adolescent remediation efforts to boost skills, especially those targeted toward promoting the adolescent cognitive abilities of the disadvantaged have low returns.

- For example:
  1. Public job training programs
  2. Adult literacy programs

- General pattern: strong returns on later-life programs are higher for the more able.

- Lower returns for the less able adolescents (those with lower cognitive/personality/health traits).

- There are some effective interventions – giving advice, providing information.

- Mentoring, however, can be effective (information/supervision).
What should we do for the disadvantaged adolescents who do not receive skill-enhancing enriched early environments and have cognitive deficits?
(i) Recognize that the skill base has been compromised.

(ii) Social and personality skills are more malleable until later ages than cognitive skills (IQ). This accords with our knowledge of the slowly maturing prefrontal cortex.

(iii) Work-place–based education that emphasizes discipline, self-control, and social engagement shows promise.

(iv) But also recognize that current remediation programs are much less effective than early intervention programs.

(v) Building the skill base makes it easier (less costly) to attain any given level of adult attainment.
Skill formation is a dynamic, synergistic process. Skills beget skills. Motivation begets motivation and promotes learning.

Dynamic complementarity is a key concept – returns to investment are higher for those with greater skills.

Dynamic complementarity explains why prevention is so productive and remediation is not. Why it is productive to invest in the cognitive skills of disadvantaged young children, but why the payoffs are so low for cognitive investments in disadvantaged older children, and are even lower for disadvantaged adults.

This evidence strongly suggests the need to prioritize.

Early investments create a base for enhancing the productivity of later investment.
• Children from advantaged environments by and large receive substantial early investment.
• Children from disadvantaged environments typically do not.
• The role of the family in producing the skills that matter is fundamental.
• Family life is under challenge in Brazil and around the world.
• The true measure of disadvantage is the quality of parenting, not income per se.
• The components most important in this regard are attachment, mentoring, and guidance.
• Effective targeting of child disadvantage recognizes this.
• Parental stimulation, engagement, and attachment are crucial.
• These parental resources promote resilience to adversity and promote investment.
• Successful early childhood programs supplement early family life and respect the sanctity of the family.
• It is also important to understand what the recent literature does not say.
• All of the evidence points to *investment* and not redistribution as the most effective anti-poverty policy that promotes long-run social mobility.
• It has been suggested that policies that redistribute income toward disadvantaged families might be highly effective in producing greater opportunity for disadvantaged children.

• **But income transfers alone do not solve the problem of intergenerational mobility.**

• The U.S. tried a policy of redistribution some 50 years ago, and it failed.

• Brazil should not emulate failed American policies.

• Fostering abilities, motivations, and health in childhood is an effective strategy.
• **Predistribution** – fixing early life initial conditions – and not redistribution.

• If society helps early enough in the lives of children and in a sustained way, it can improve cognitive and character skills and the health of disadvantaged children.

• This promotes economic productivity of the workplace, social opportunity, and human flourishing.
Need to evaluate to prioritize.

Need to foster a culture of evaluation and measurement.

To look at long-run outcomes.

To understand the mechanisms of skill formation that underly all intervention and family influence studies.

To move beyond studies of treatment effects to understand how interventions interact with and supplement families.

Need to measure the true sources of poverty and disadvantage to make wise policies.
Appendix
Figure 35: Ever Been in Jail by Age 30, by Ability (Males)

Note: This figure plots the probability of a given behavior associated with moving up in one ability distribution for someone after integrating out the other distribution. For example, the lines with markers show the effect of increasing non-cognitive ability after integrating the cognitive ability.  
Figure 36: Cognitive and Socio-Emotional Factors: Physical Health, Males
Figure 37: The Effect of Cognitive and Socio-Emotional Endowments on Mental Health at Age 40
**Figure 38: Probability of Being Single with Children (Females)**

Note: This figure plots the probability of a given behavior associated with moving up in one ability distribution for someone after integrating out the other distribution. For example, the lines with markers show the effect of increasing non-cognitive ability after integrating the cognitive ability.

Figure 39: Cognitive and Socio-Emotional Factors: Probability of Graduating from Secondary School, Males
Figure 40: Probability of Being a Four-Year College Graduate by Age 30

Notes: The data are simulated from the estimates of the model and our NLSY79 sample. We use the standard convention that higher deciles are associated with higher values of the variable. The confidence intervals are computed using bootstrapping (200 draws).
Figure 41: Mean Log Wages by Age 30 (males)

Notes: The data are simulated from the estimates of the model and our NLSY79 sample. We use the standard convention that higher deciles are associated with higher values of the variable. The confidence intervals are computed using bootstrapping (50 draws).
Notes: The data are simulated from the estimates of the model and our NLSY79 sample. We use the standard convention that higher deciles are associated with higher values of the variable. The confidence intervals are computed using bootstrapping (200 draws).
Figure 43: The Effect of Cognitive and Socio-Emotional Endowments on Probability of White-Collar Occupation
Figure 44: The Effect of Cognitive and Socio-Emotional Endowments on Heavy Drinking During Adulthood
Figure 45: The Effect of Cognitive and Socio-Emotional Endowments on Pearlin’s “Personal Mastery Scale”: Sense of Self-Mastery
Figure 46: The Effect of Cognitive and Socio-Emotional Endowments on Trusting People (2008)
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Age-3 Brain Health predicts high-need/high-cost group

- 0 vs. 3+ High-Cost Groups* (AUC = 0.79)
- 0 vs. 2 High-Cost Groups* (AUC = 0.68)
- 0 vs. 1 High-Cost Group* (AUC = 0.62)
ROC-Curve Discriminating Individuals in 0 vs. 1, 0 vs. 2, and 0 vs. 3+ User Groups

- 1 group Area Under the Curve = 0.60
- 2 groups Area Under the Curve = 0.73
- 3+ groups Area Under the Curve = 0.87
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Modern Understanding of Human Development

1. A core, low-dimensional set of skills – capacities that promote functioning in society and personal growth in those capacities – explains a variety of diverse socio-economic outcomes.

2. The performance of any society is based on the skills – the functionings – of its people.

3. Low levels of these skills cause major social problems (dropping out of school, crime, teenage pregnancy, obesity, and poor health).
Skills are multiple in nature.

Current public policy discussions focus on measuring, enhancing, and rewarding cognitive ability using achievement tests. For example, PISA scores are used to judge the performance of schools, students in those schools, and entire school systems.

An important lesson from recent research is that cognitive skills are only part of what is required for success in life.

Personality traits, “soft skills,” physical and mental health, perseverance, attention, motivation, and self confidence are also important and are often neglected aspects of human flourishing.

Cognitive and non-cognitive skills are both important causal determinants of life cycle outcomes with equal strength for many outcomes.
Gaps in skills across socio-economic groups open up very early:

- Persist strongly for cognitive skills
- Less strongly for non-cognitive skills
- Widen with age for many biological skills

Skills are not set in stone at birth, but they solidify as people age. They have genetic components. However, skills evolve and can be shaped in substantial part by investments and environments.
The family lives of young children are major influences on cognitive and socio-emotional skills. Adverse early family lives of children create adult crime, health problems, obesity, and a variety of other social problems.

Family influence extends well beyond the transmission of genes.

Cognitive and social skills are not fixed at birth, they are not solely genetically determined, and they can be enhanced.

The powerful role of early family influence is a concern because family environments in Brazil have deteriorated in many dimensions in recent years.
Supplementing the family and its resources, engaging it in enriching the early life of the child, in supporting the child in school, and in giving sound advice to children, are effective policies. So are policies that enhance the skills of parents to be parents.

i If society intervenes early enough and in a consistent fashion over the life cycle of a child, it can promote cognitive and socio-emotional skills, as well as the health and well-being of children born into disadvantage.

ii Through multiple channels, these effects percolate across the life cycle and across generations.

iii For example, high-quality early interventions reduce inequality by promoting schooling, reducing crime, and reducing teenage pregnancy.

iv They promote health and healthy behaviors.
They also foster workforce productivity.

These interventions have high benefit-cost ratios and rates of return. They pass efficiency criteria that any social program should be asked to pass.

Quality early childhood policies are among the rare social policies that face no equality-efficiency tradeoff.

**What is fair is also economically efficient.**

Early interventions that build the skill base of children have much higher economic returns than later remediation and prevention programs, such as public job training, convict rehabilitation programs, adult literacy programs, tuition subsidies, or expenditure on police to reduce crime.
This greater return arises because of the dynamics of skill formation.

Life cycle skill formation is a dynamic, synergistic process. Skills beget capabilities; motivation begets motivation. If a child is not motivated and stimulated to learn and engage early enough in life, the more likely it is that when the child becomes an adult, it will fail in social and economic life.

The longer society waits to intervene in the life cycle of a disadvantaged child, the more costly it is to remediate disadvantage.

Similar dynamics are at work in creating child health and mental health.

Brazil needs to implement more nuanced skill formation policies that recognize recent knowledge about what interventions at which stages of the life cycle are the most effective for producing skills.
There are critical and sensitive periods in the development of skills.

- **a** Sensitive periods are those where investment is most productive.
- **b** Critical periods are those where it is essential.
- **c** These periods:
  - **i** Come earlier for cognitive skills
  - **ii** Early years also important for non-cognitive skills, but there is more malleability to later ages
  - **iii** Vary depending on the particular biological (health) skill being studied
Many successful early childhood interventions followed over the life cycle operate primarily through boosting non-cognitive skills. IQ is often barely budged.

Long-term evaluations of interventions often provide a different assessment of the effectiveness of interventions than do short-run evaluations.

Adolescent remediation as currently implemented is largely ineffective, especially for cognitive interventions.
Remediation is less effective than prevention when there are good detection strategies for identifying risk factors for later life.

There is growing recognition of which early conditions and environments create risk factors.

A major refocus of public policy is required to incorporate modern understanding of the life cycle dynamics of skill formation.

Although schools and schooling are important, effective social policy targets and strengthens the family.

Many studies have shown that inequality in families – far more than inequality in the resources applied to schools – produces inequality in schooling outcomes among social and economic classes.
Figure 47: DNA Methylation and Histone Acetylation Patterns in Young and Old Twins

Methylation patterns in young and old twins

*Source:* Fraga, Ballestar et al. (2005)
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Figure 48: Distribution of BAS GCA Cognitive Scores
By school entry, the PFL programme had a significant and large impact on children’s overall verbal ability, their expressive and receptive language skills, and their communication and emerging literacy skills. This means that the children who received the high treatment supports were better able to use and understand language and had better skills for reading and writing. The programme did not improve children’s basic or advanced literacy skills.

Figure 49: Percentage of Children Scoring Above and Below Average in Verbal Ability At School Entry

**Executive Summary**

At school entry?

By school entry, the PFL programme had a significant and large impact on children’s overall verbal ability, their expressive and receptive language skills, and their communication and emerging literacy skills. This means that the children who received the high treatment supports were better able to use and understand language and had better skills for reading and writing. The programme did not improve children’s basic or advanced literacy skills.

During the programme?

Did PFL improve children’s language development…?

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**Source:** PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).
Preparing for Life: Early Childhood Intervention

Did Preparing for Life Improve Children’s School Readiness?

By school entry, the PFL programme had some impact on how children approached learning. Children who received the high treatment supports were better able to manage their attention, yet the programme did not change their general approaches to learning, interest in school subjects, keenness to explore new things, or their ability to control impulsive behaviour.

**Figure 50: Mean Scores of Children on Ability to Manage Attention Task At School Entry**

![Bar chart](image)

**Mean Score**

- **High Treatment**: 21
- **Low Treatment**: 19

*Figure E5.6 - Mean Scores of Children on Ability to Manage Attention Task*

*Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).*
Preparing for Life (Doyle et al., 2016).
*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.
The PFL programme reduced children's internalising and externalising behaviour problems from 24 months onwards. This means that the children who received the high treatment supports were less likely to feel negative emotions such as sadness or act out in negative ways like throwing tantrums. From 36 months onwards, the programme improved children's positive prosocial behaviours such as sharing with others. At school entry?

Hyperactivity & Inattention
- High Treatment: 16%
- Low Treatment: 31%

Social Competence with Peers
- High Treatment: 25%
- Low Treatment: 43%

Autonomy
- High Treatment: 27%
- Low Treatment: 51%

Executive Summary

By school entry, the PFL programme had a significant impact on reducing children's hyperactivity and inattentive behaviours and improving their social competencies and autonomy. This means that the children who received the high treatment supports were less likely to be distractible in the classroom, got on better with their classmates, and had the skills needed to be independent in the school day. The programme had no impact on children's aggression, oppositional-defiance, anxious behaviour, or on their prosocial, respectful behaviours according to the teacher reports.

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).
Preparing for Life (Doyle et al., 2016).
*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.
Preparing for Life (Doyle et al., 2016).
*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.
The programme had a significant impact on reducing the amount of hospital services the children used and improved how families used these services. There was a limited impact on the diagnoses children received in hospital, but children who received the high treatment supports were less likely to have to visit the hospital for urgent reasons, and were less likely to experience fractures. They were also less likely to have visited the Orthopaedics, Physiotherapy, Paediatrics, Occular, and Plastic Surgery Outpatient departments.

**Figure 55:** Percentage of Outpatient Children who ever visited Outpatient Departments At School Entry

The PFL programme had an impact on the children’s physical wellbeing and motor development from birth onwards. Children who received the high treatment supports were more likely to be born naturally, to be immunised, were healthier, had better diets and motor skills, were less likely to be overweight, and more likely to be toilet trained.

**Figure ES.8 - Percentage of Outpatient Children who ever visited Outpatient Departments**

*Source:* PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).
By school entry, the PFL programme had a significant impact on children’s gross and fine motor skills and their physical independence. The programme had no impact on children’s physical readiness for the school day.

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).
Preparing for Life (Doyle et al., 2016).

*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.
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