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
Sao Paulo, Brazil
September 25th, 2017

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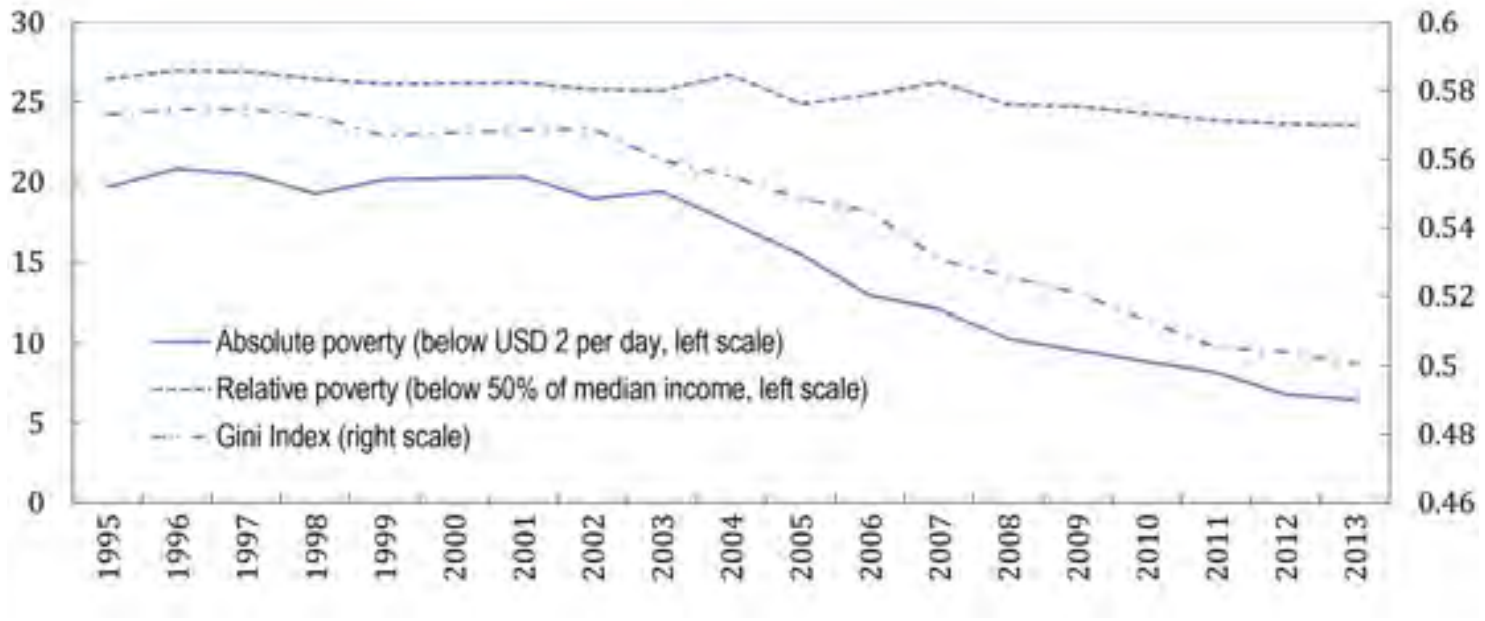
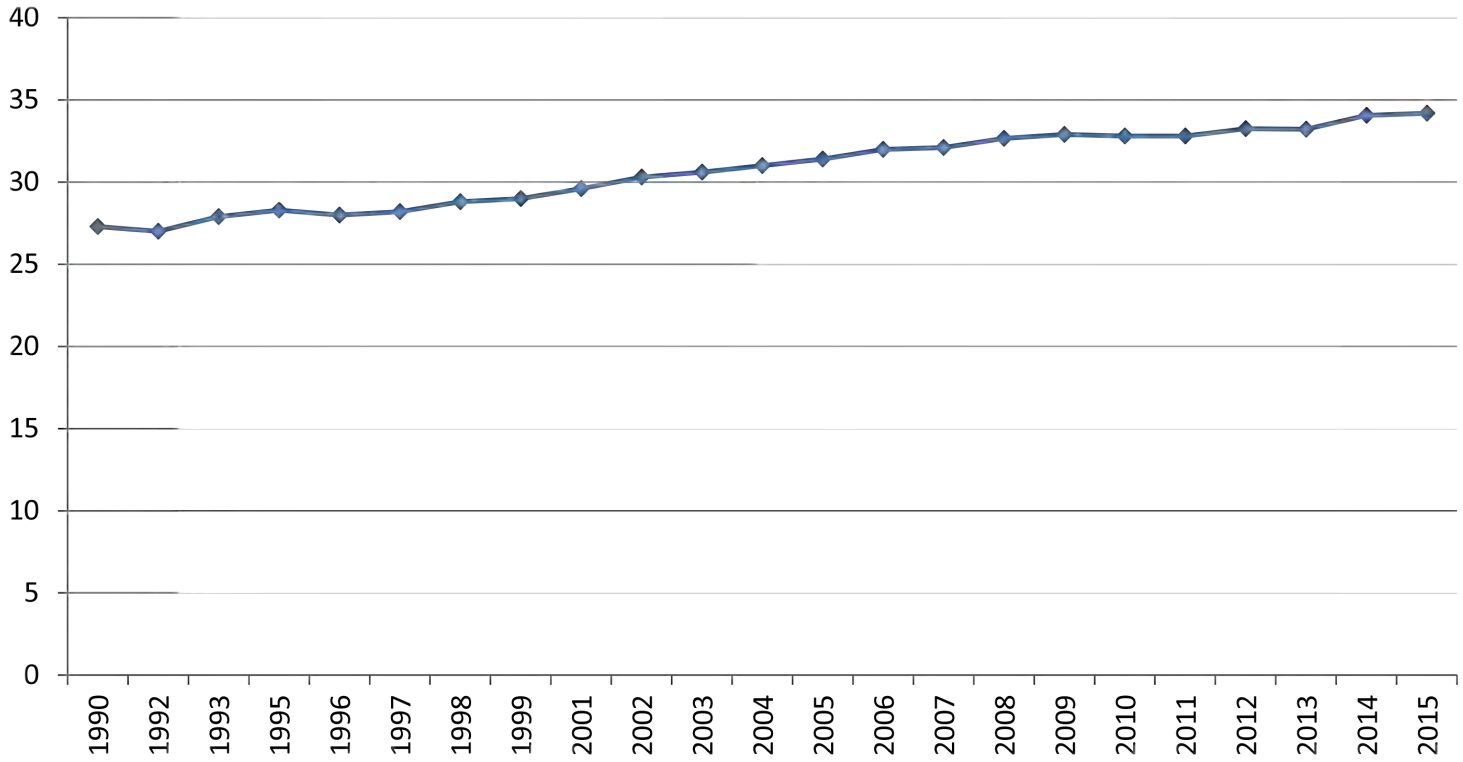
Inequality and Child Poverty in Brazil

Figure 1: Poverty and Income Inequality Over Time: 1995-2013



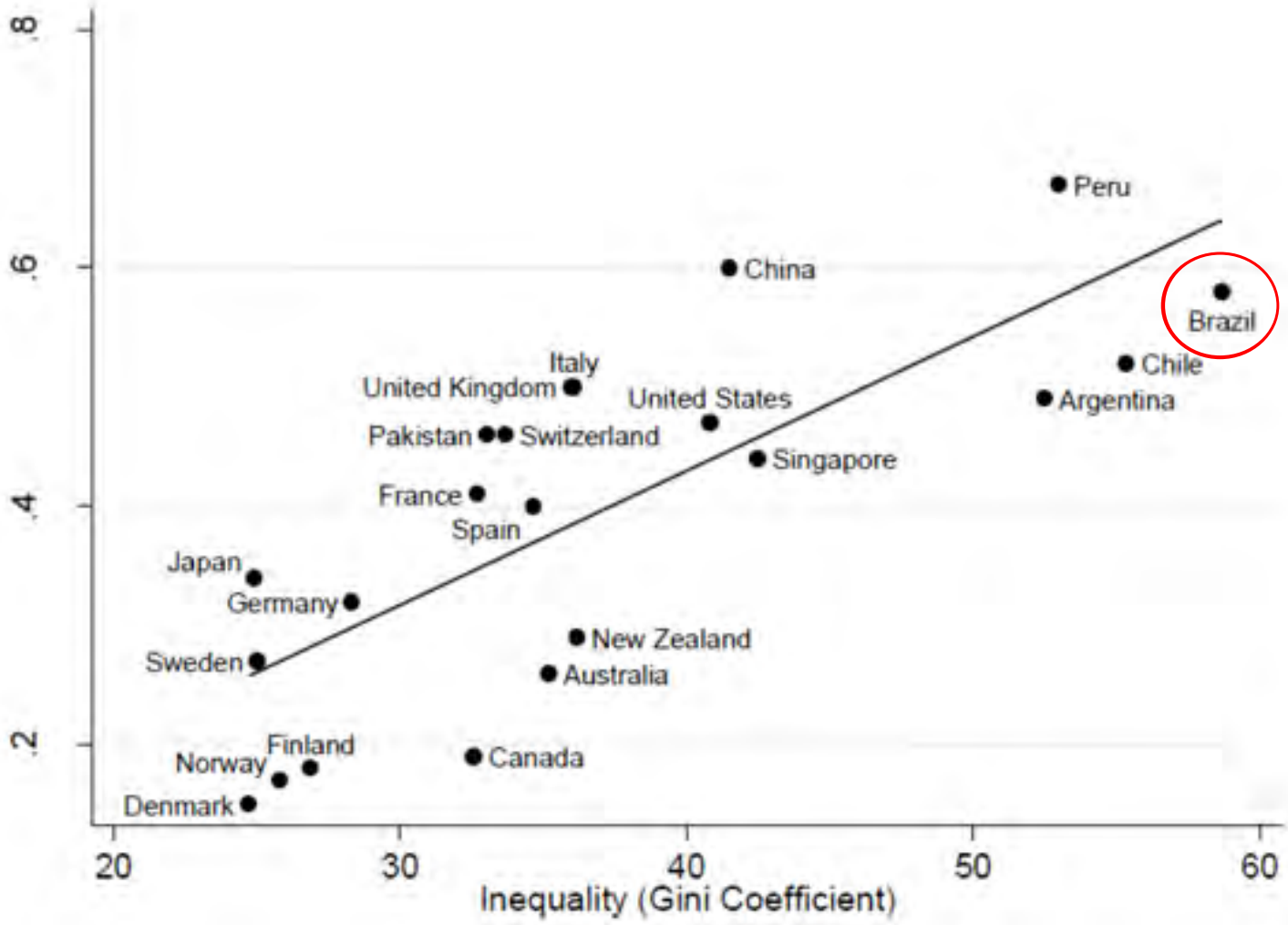
Note: Poverty is defined as the percentage of the population with per capita income below a poverty line. Absolute poverty refers the poverty line of USD 2 a day, as set out in the Millennium Development Goals of the United Nations. The absolute poverty number for 2013 is estimated based on IPEA data. 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

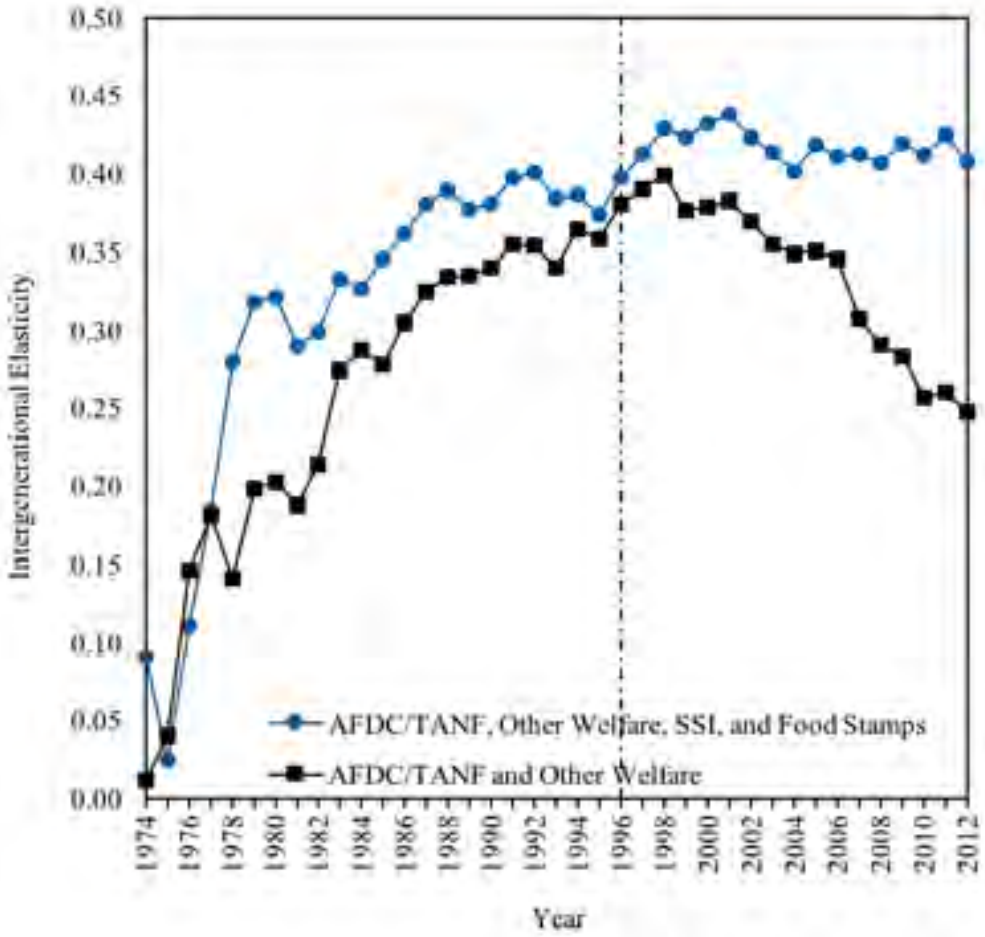
- Consider effective policies to foster social inclusion, to reduce economic and social inequality, and to promote economic and social opportunity for all Brazilians.

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



Source: Hartley et al. 2016

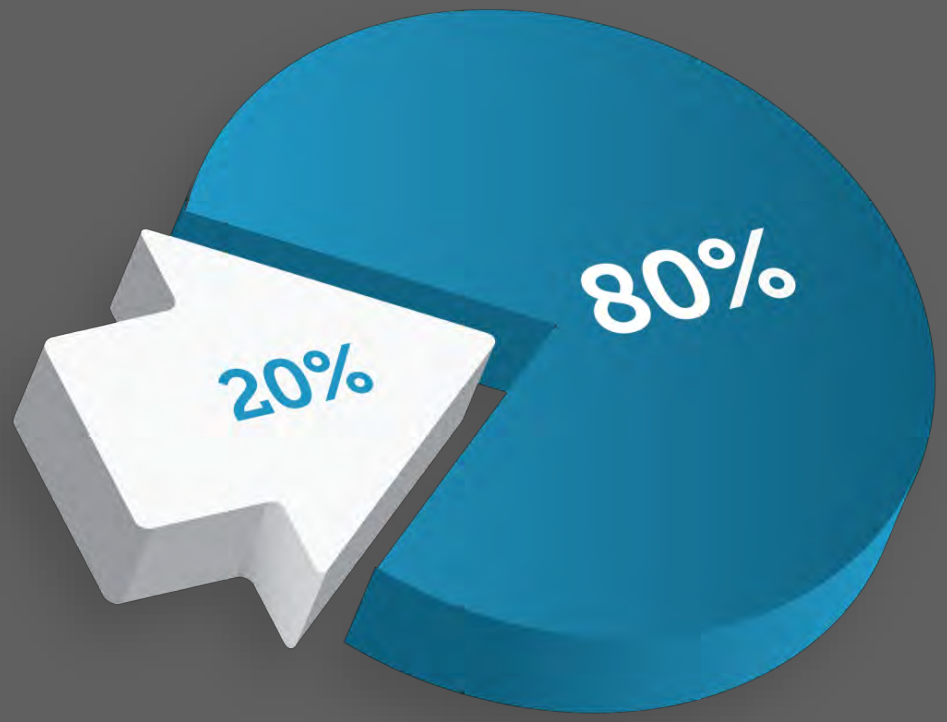
Early Targeting Populations At Risk Can Be An Economically and Socially Efficient Strategy

Childhood Forecasting of a Small Segment of the Population with Large Economic Burden

Caspi, Moffitt, et al. (2017)

Nature Human Behaviour

The Pareto Principle

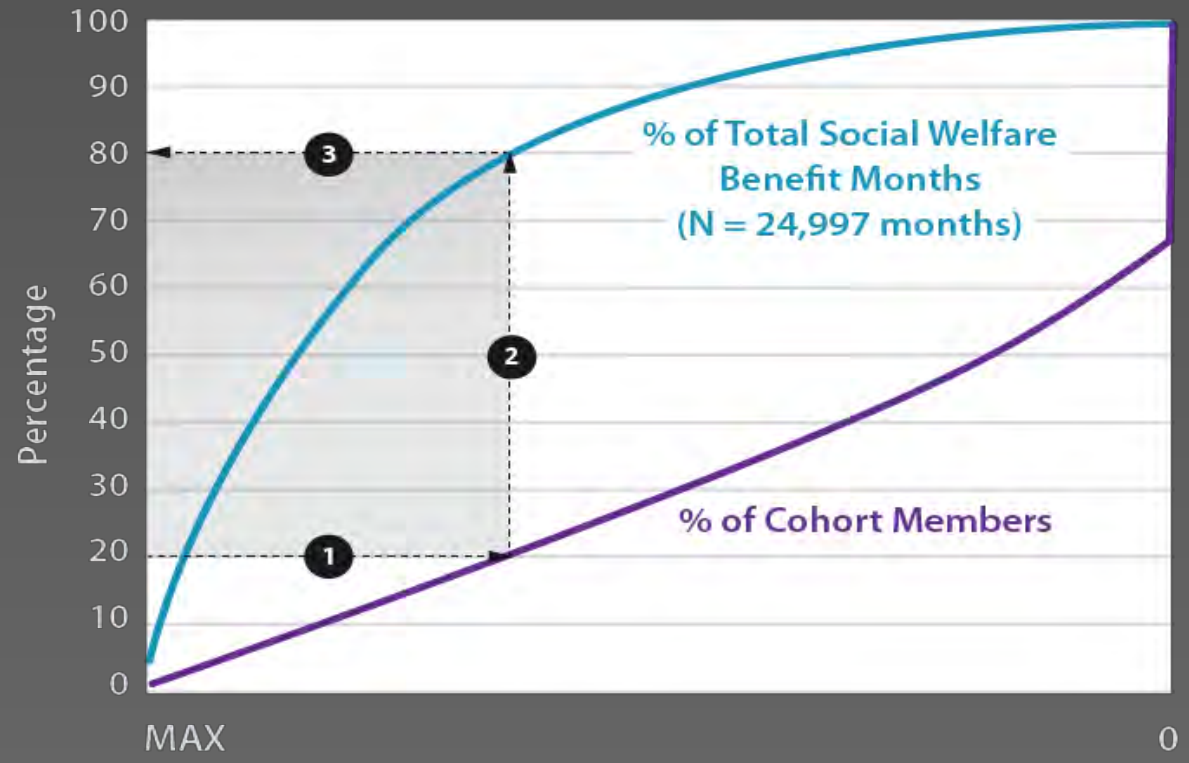


20% of the Actors Account for **80%** of the Results.

Vilfredo Pareto, 1848-1923

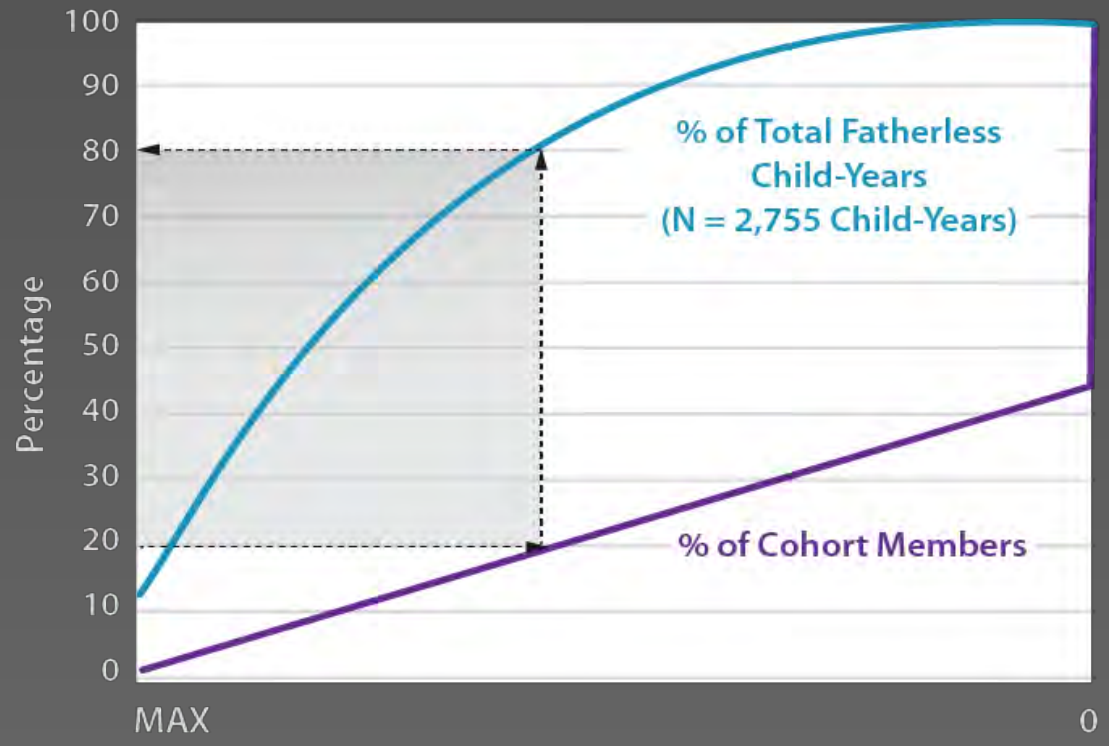
Social Welfare Benefit Months

20% of Cohort Members = 80% of Total Social Welfare Benefit Months

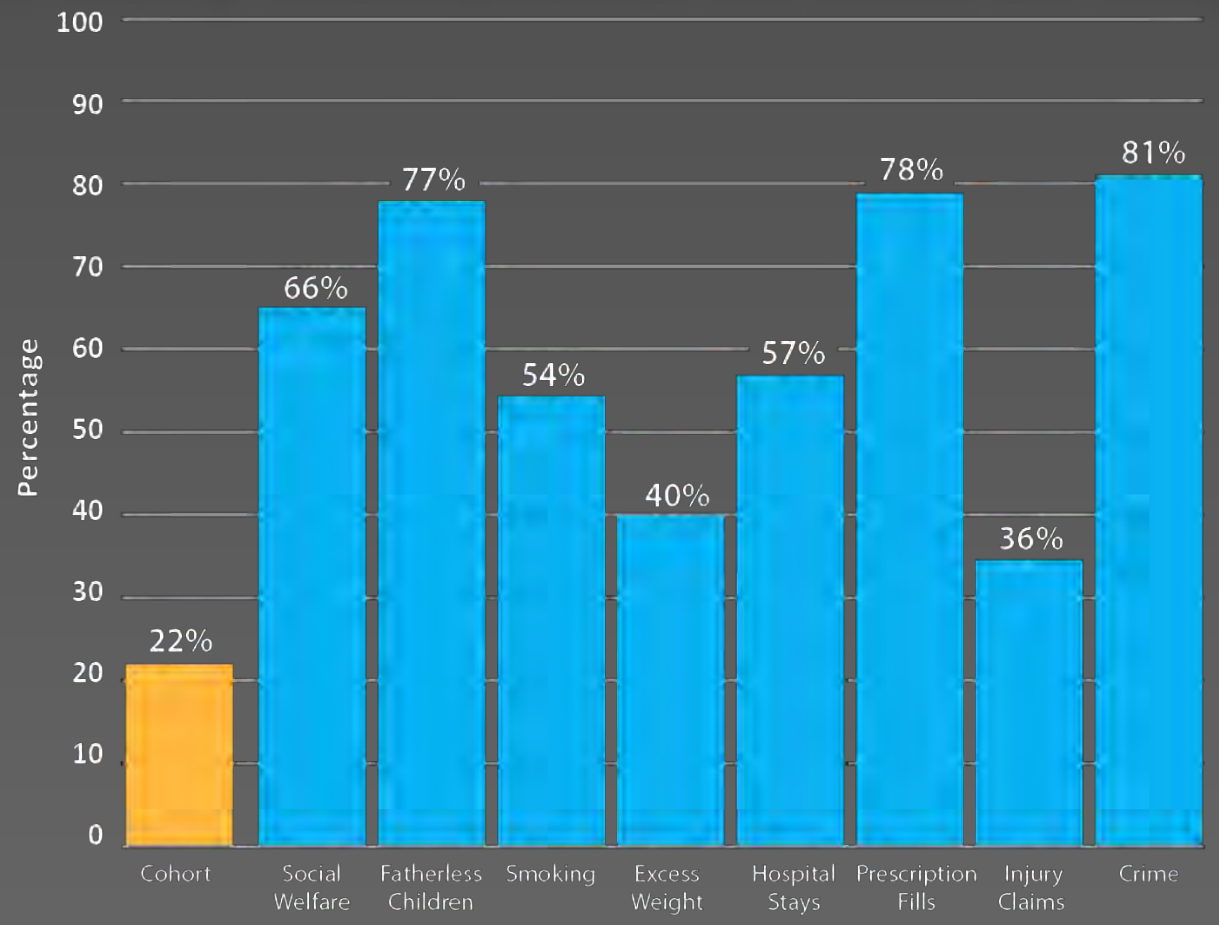


Absent-Father Parenting

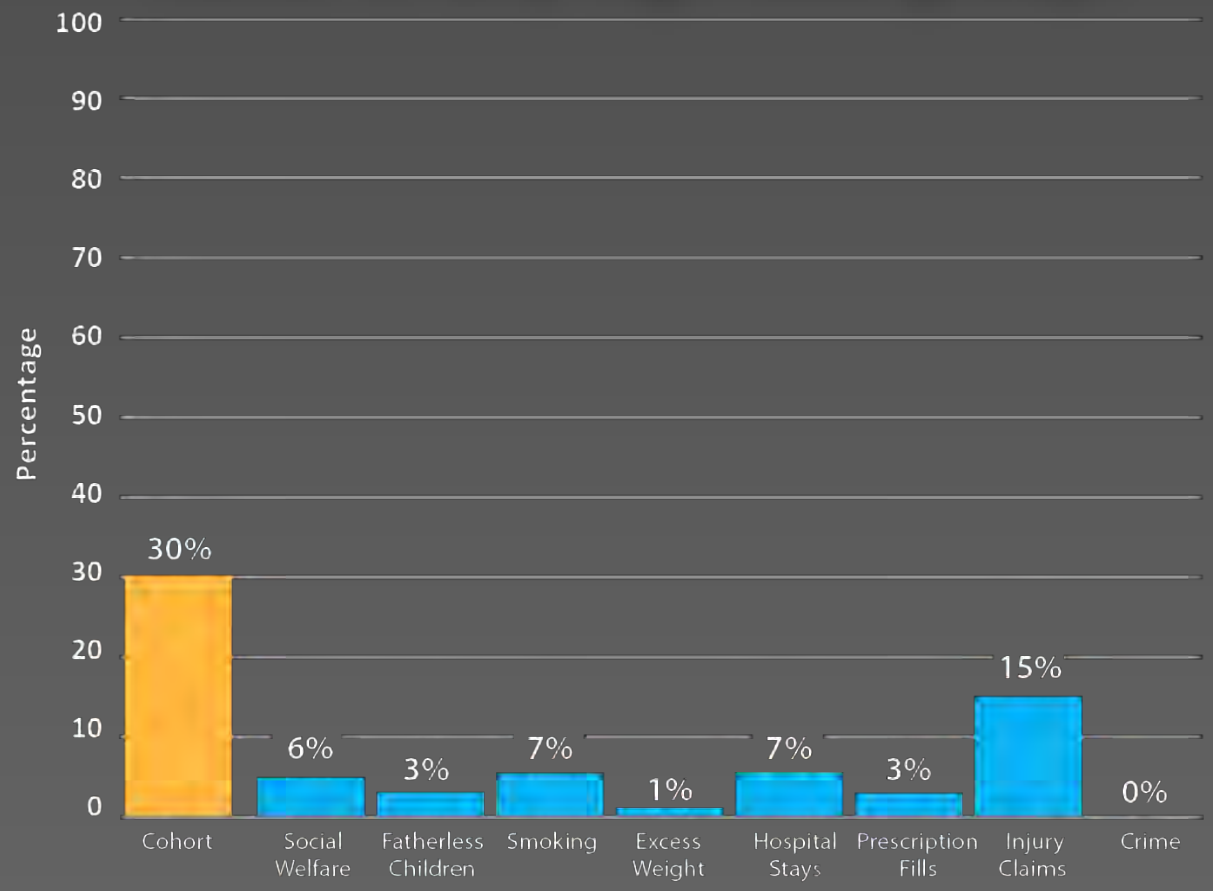
20% of Cohort Members = 82% of Total Fatherless Child-Years



The High-need/High-cost Group in 3 or more sectors: How many health/social services do they use?



Small Footprint of cohort members never in any high-cost group:



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.

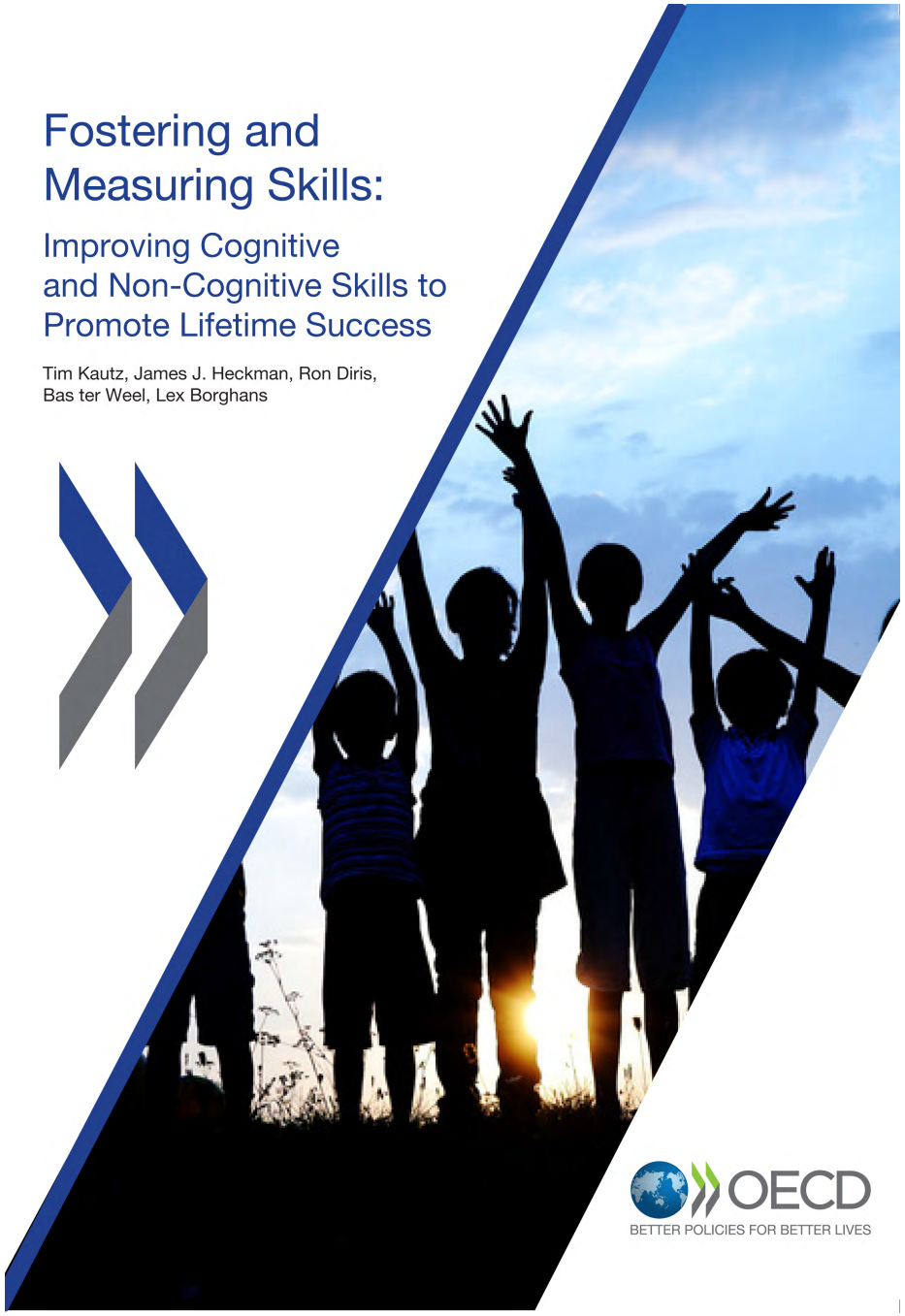
(b) Cognitive skills measured by achievement tests are important. Hard empirical evidence on their importance.

(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**



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Link to Report PDF
http://tinyurl.com/OECD-Report-2014

Link to Appendix

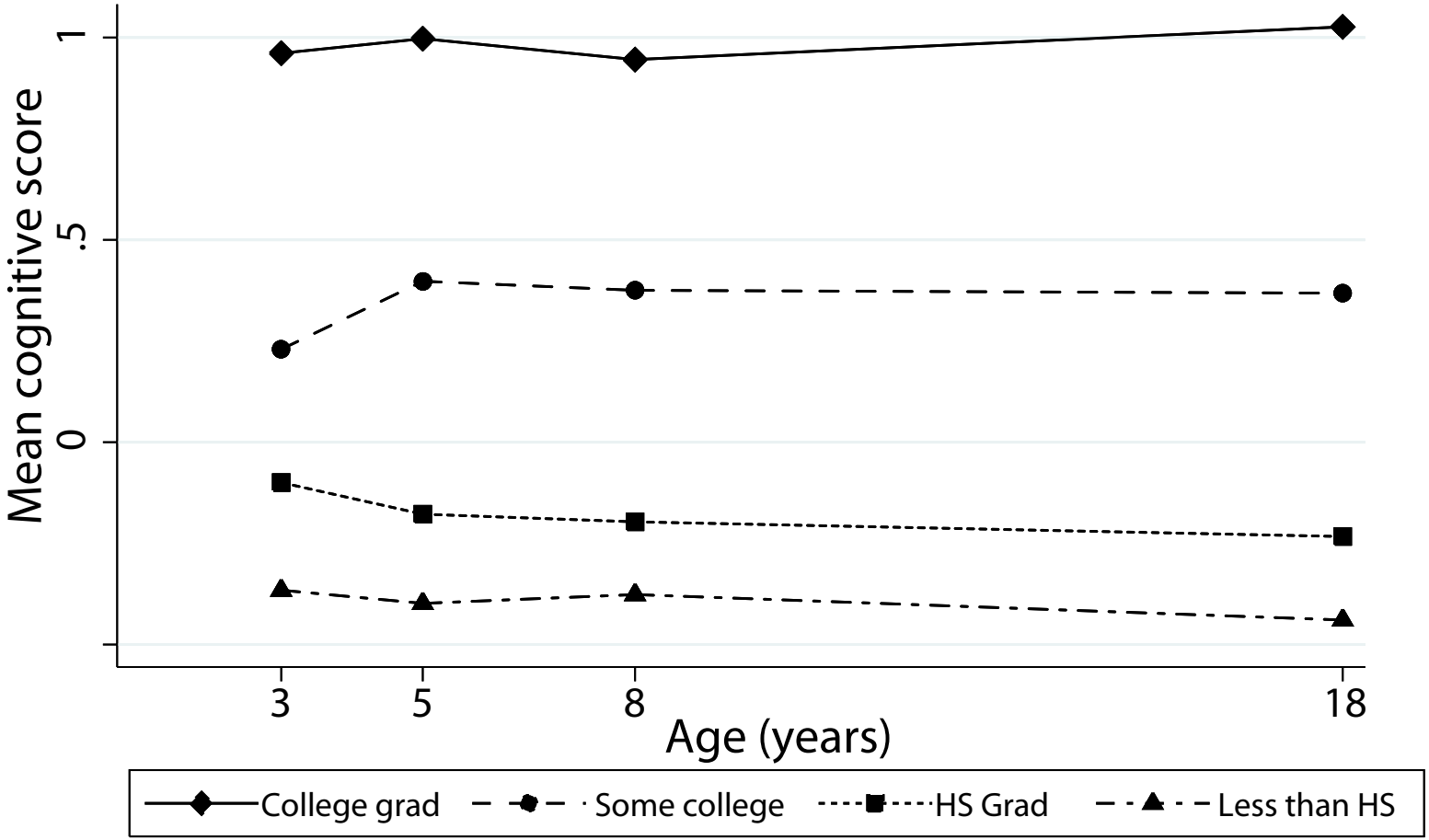
Cognitive and Socioemotional Skills Affect Life Cycle:

(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).

Average Percentile Rank on Anti-Social Behavior Score, by Income Quartile

Figure 6. Average Percentile Rank on Anti-Social Behavior Score, by Income Quartile

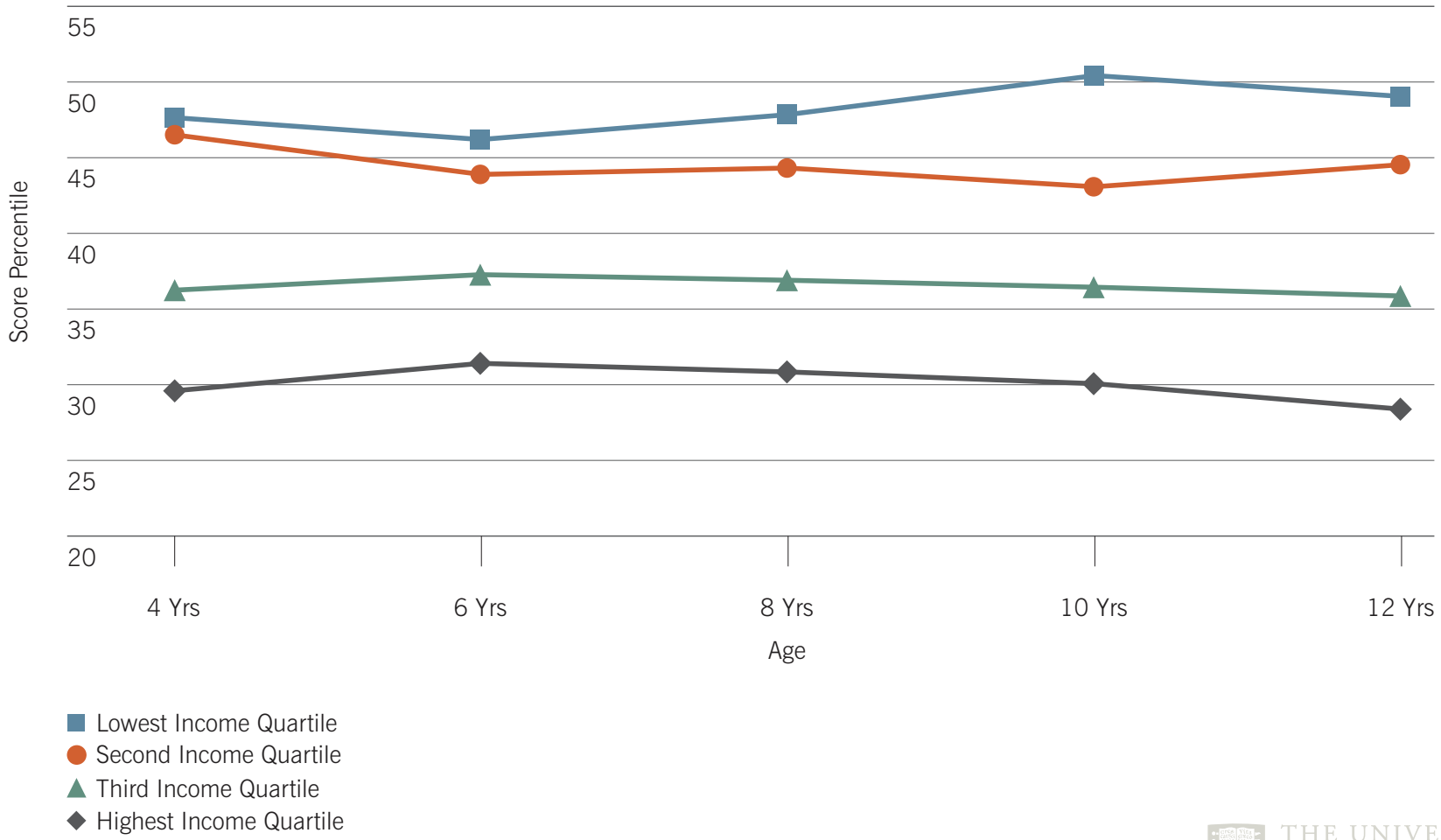


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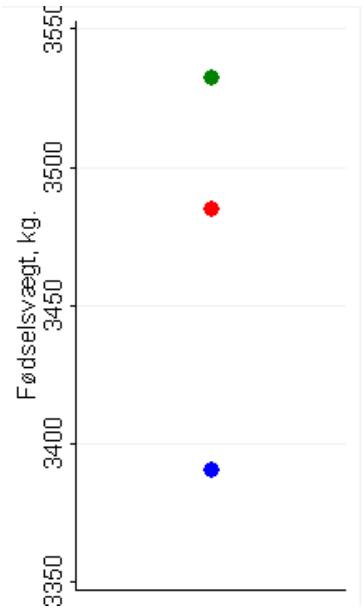
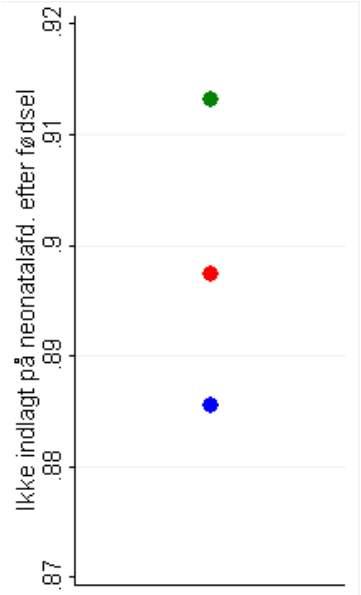
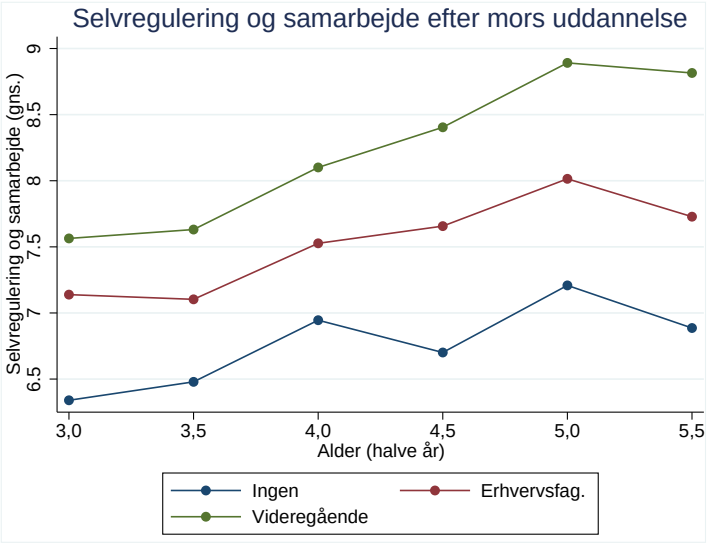
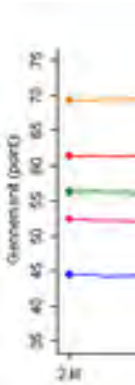
Figure 1: Gaps throughout

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





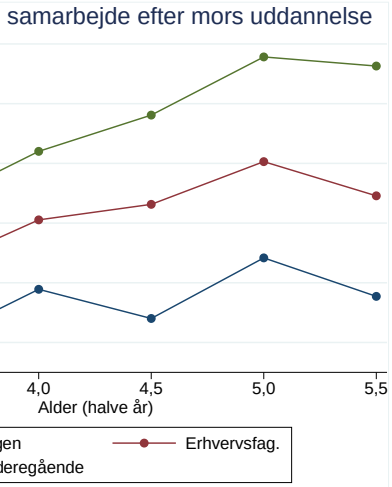


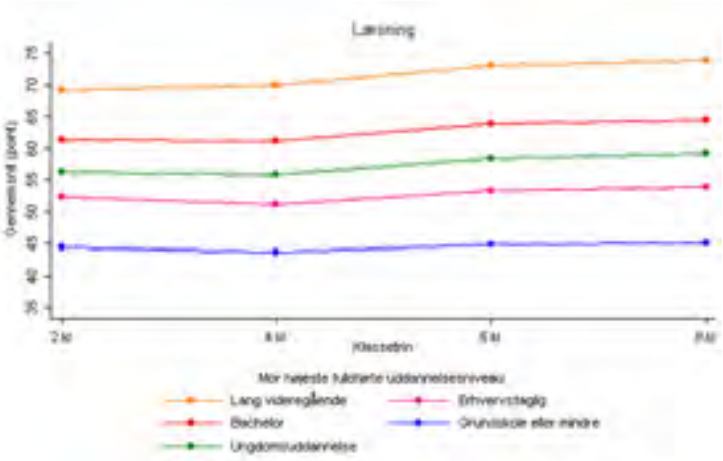


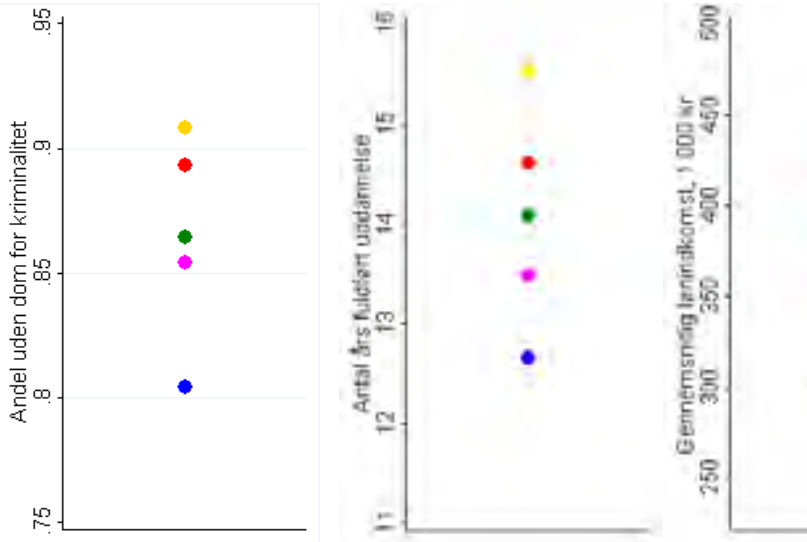
Age:	0 yrs	0 yrs	3–5 yrs
Age:	0 ys	0 ys	3-5 ys
Outcome:	Birth weight	Not admitted to neo-natal ward	Score for self-regulation
Unit:	Gram	Fraction	Rating
Outcome:	Birth weight	Not admitted	Score for selfregulation

throughout life, by mother's level of ed

Figure 7. Gaps throughout life, by mother's level of education, Denmark, Cont'd



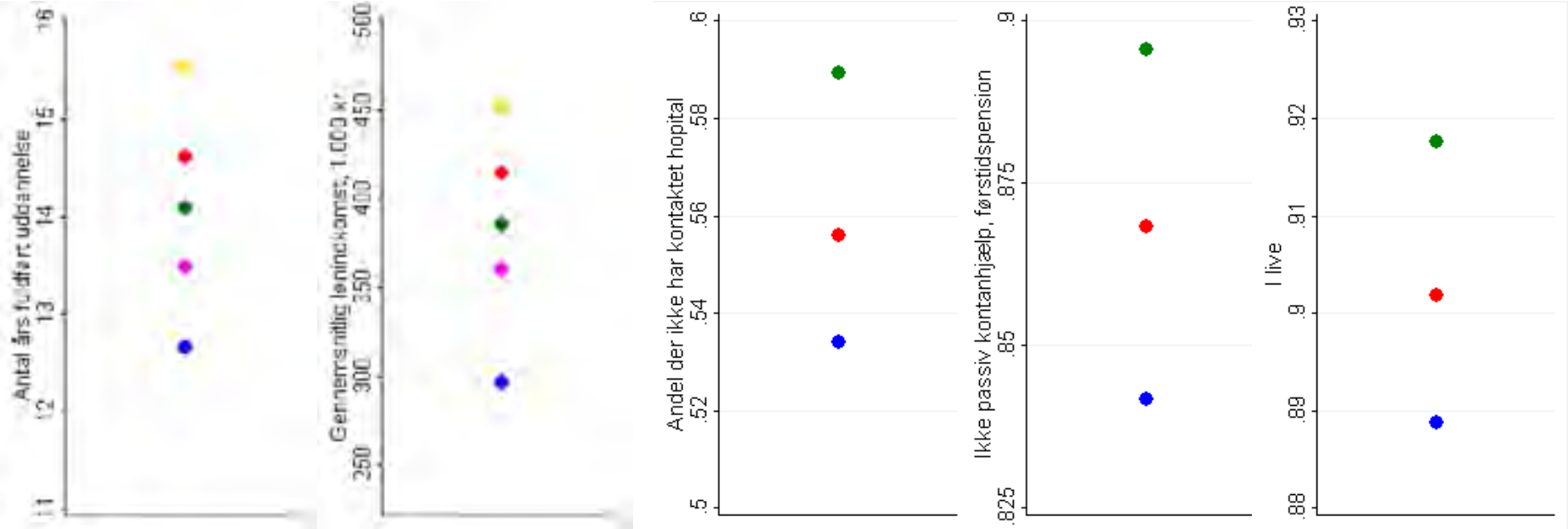




Age:	8–14 yrs	25 yrs	30 yrs			
3-5 ys	8-14 ys	25 ys	30 ys	40		
Outcome:	Test scores, Danish in national tests	No criminal conviction	Years of schooling			
Unit:	Test score	Fraction	Years			
core for regulation	Test scores Danish	No criminal	Years of	W ea		

evel of education

Figure 7: Gaps throughout life, by mother's level of education, Denmark, Cont'd



Age:	40 yrs	40–50 yrs	54 yrs	60 yrs
~~30 yrs~~	~~40 yrs~~	~~40-50 yrs~~	~~54 yrs~~	~~60 yrs~~
Outcome:	Wage earnings	Not contacted a hospital	In the labor force	Alive
Unit:	1.000DKK	Fraction	Fraction	Fraction
Years	Wage	Not	In the	Alive

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:

Family Status	Actual Differences in Quantity of Words Heard	Actual Differences in Quality of Words Heard
Welfare	616 words	5 affirmatives, 11 prohibitions
Working Class	1,251 words	12 affirmatives, 7 prohibitions
Professional	2,153 words	32 affirmatives, 5 prohibitions

2. Cumulative Vocabulary at Age 3

Cumulative Vocabulary at Age 3	
Children from welfare families:	500 words
Children from working class families:	700 words
Children from professional families:	1,100 words

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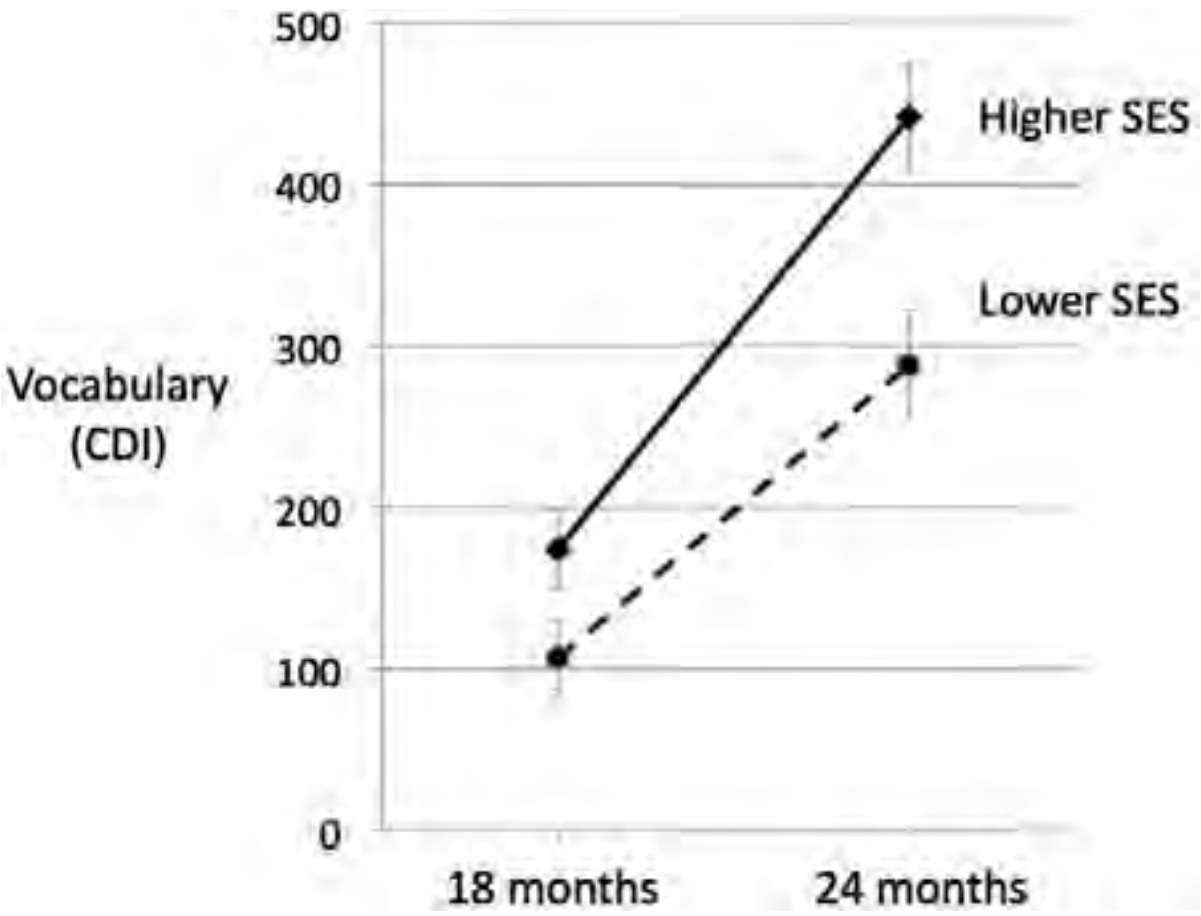
Figure 8: Mean number of spoken words reported on the MacArthur/Bates CDI by age and SES (HI). Error bars represent SE of the mean over participants.

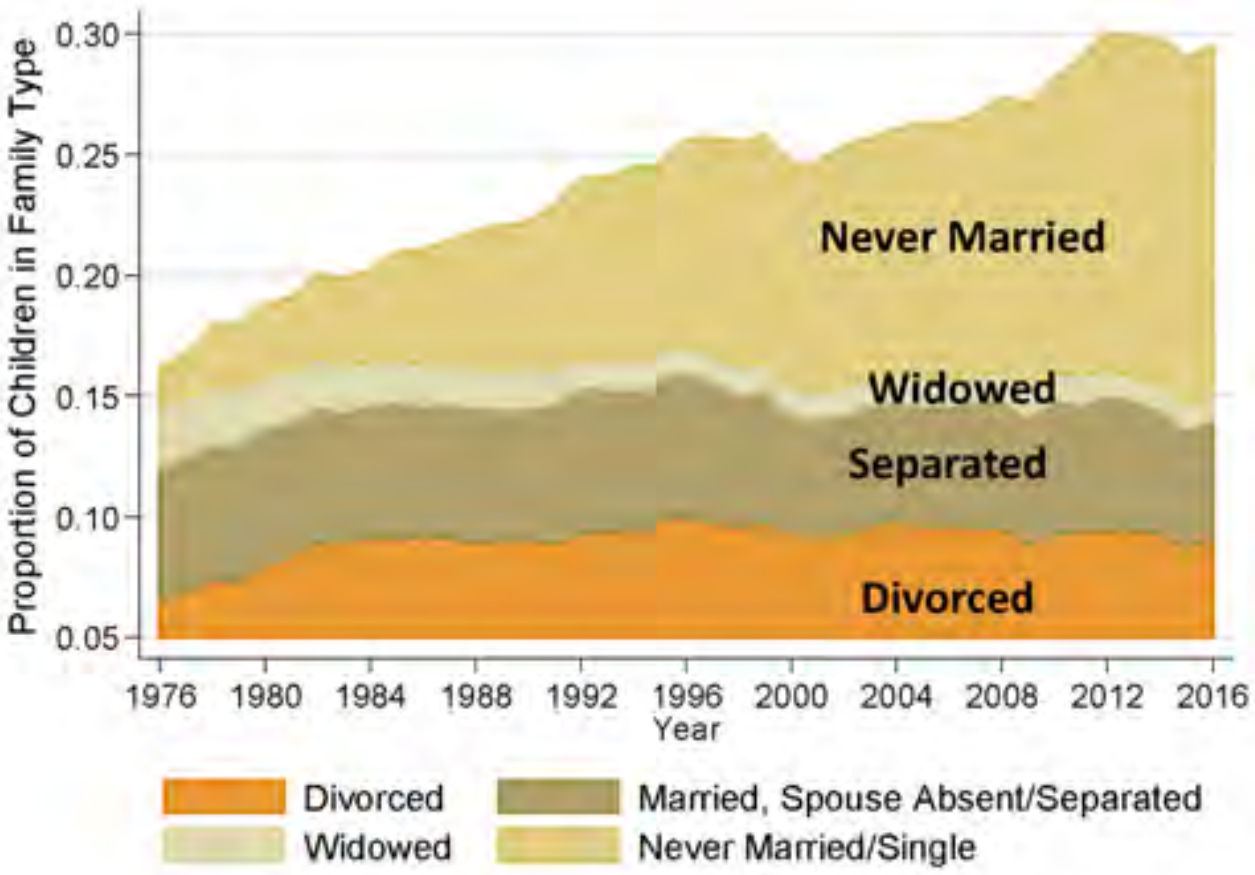


Source: Fernald et al. (2013)

How to Interpret This Evidence

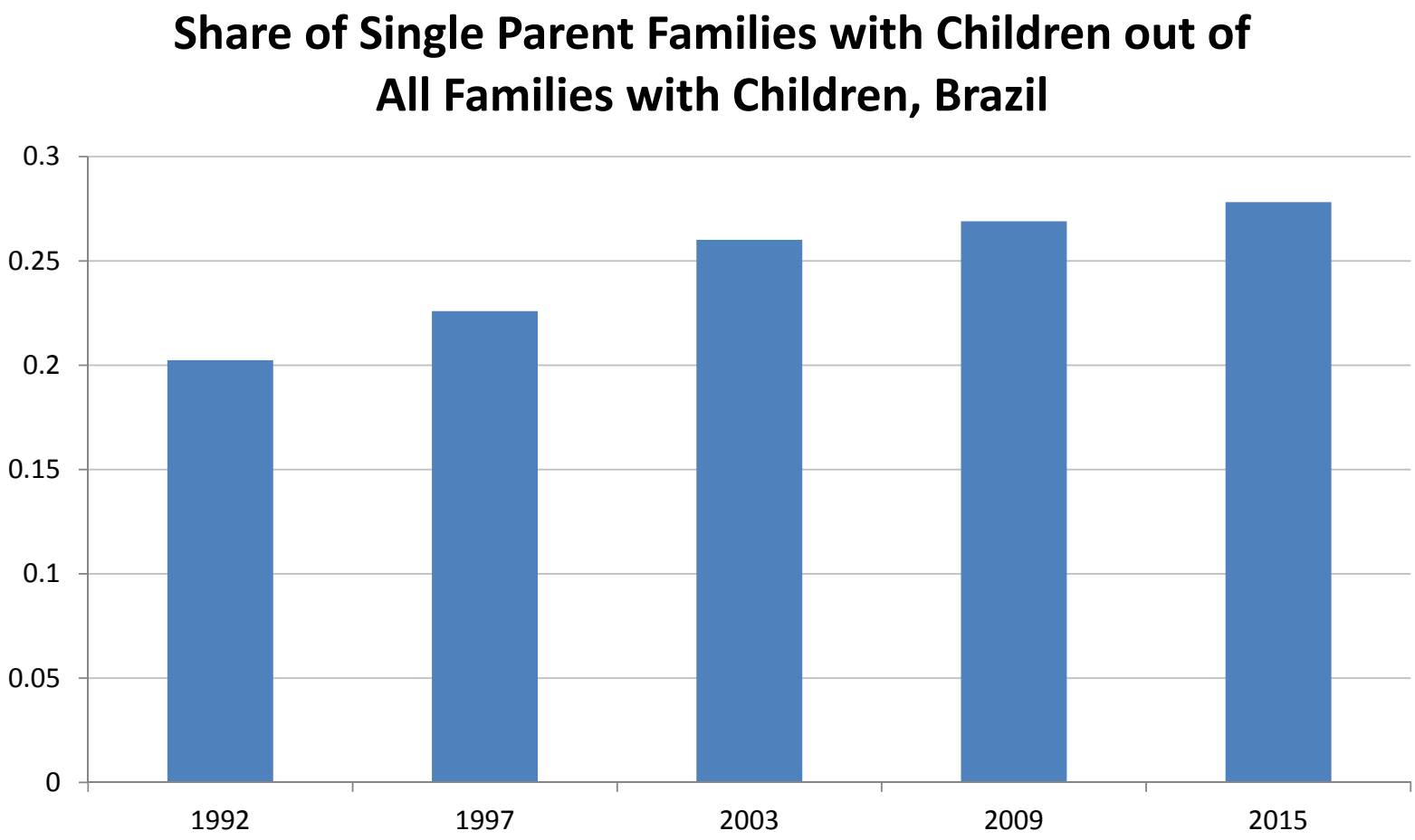
- Evidence on the early emergence of gaps leaves open the question of which aspects of families are responsible for producing these gaps.
- Genes? Eugenic policies?
- Family environments? Neighborhood and community effects?
- Parenting and family investment decisions?
- The evidence from a large body 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.
Source: IPUMS March CPS 1976-2016.

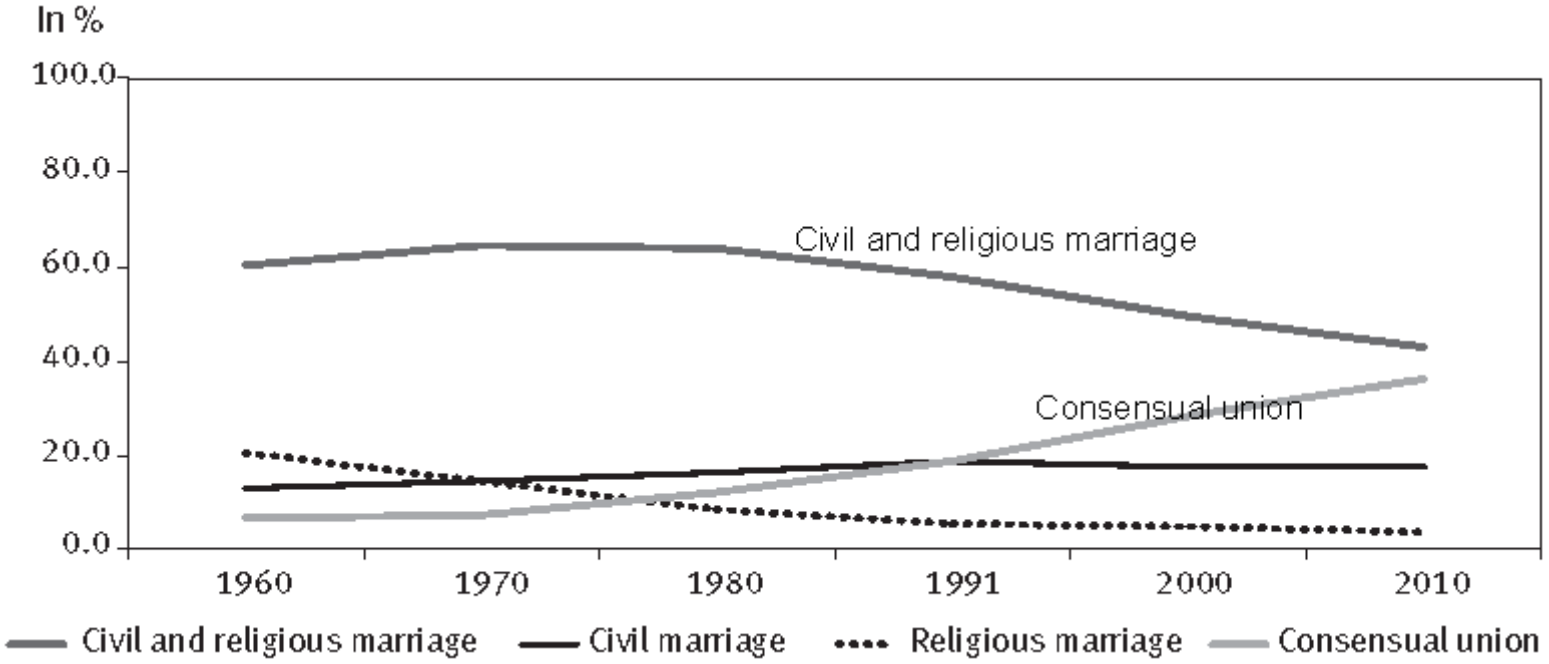
Figure 10: Share of Single Parent Families with Children out of All Families with Children, Brazil



Source: IBGE.

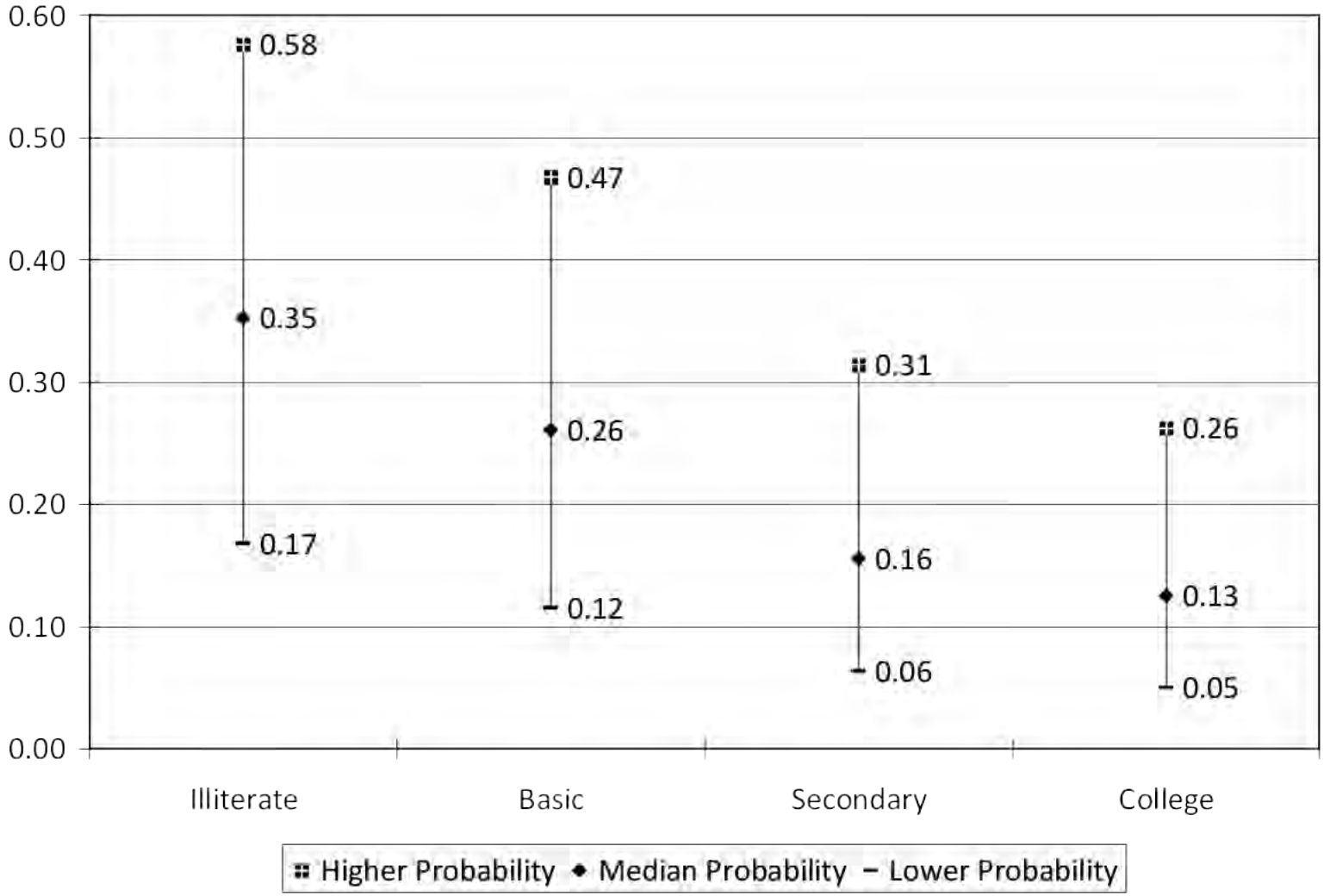
Source: IBGE

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



Source: IBGE (2013a).

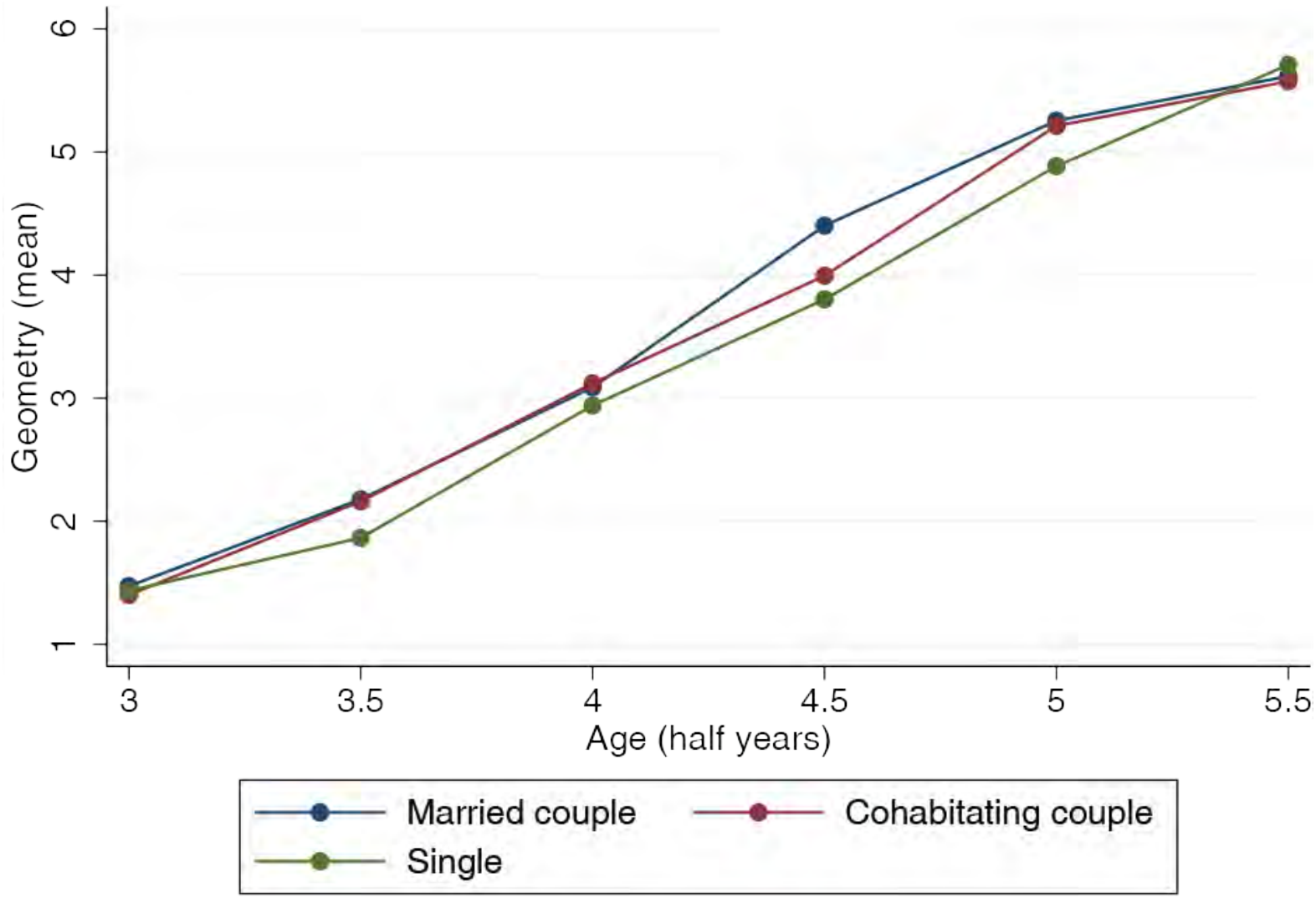
Figure 12: Predicted Probabilities of Cohabiting by Women's Education



Source: Covre-Sussai and Matthijs (2010)

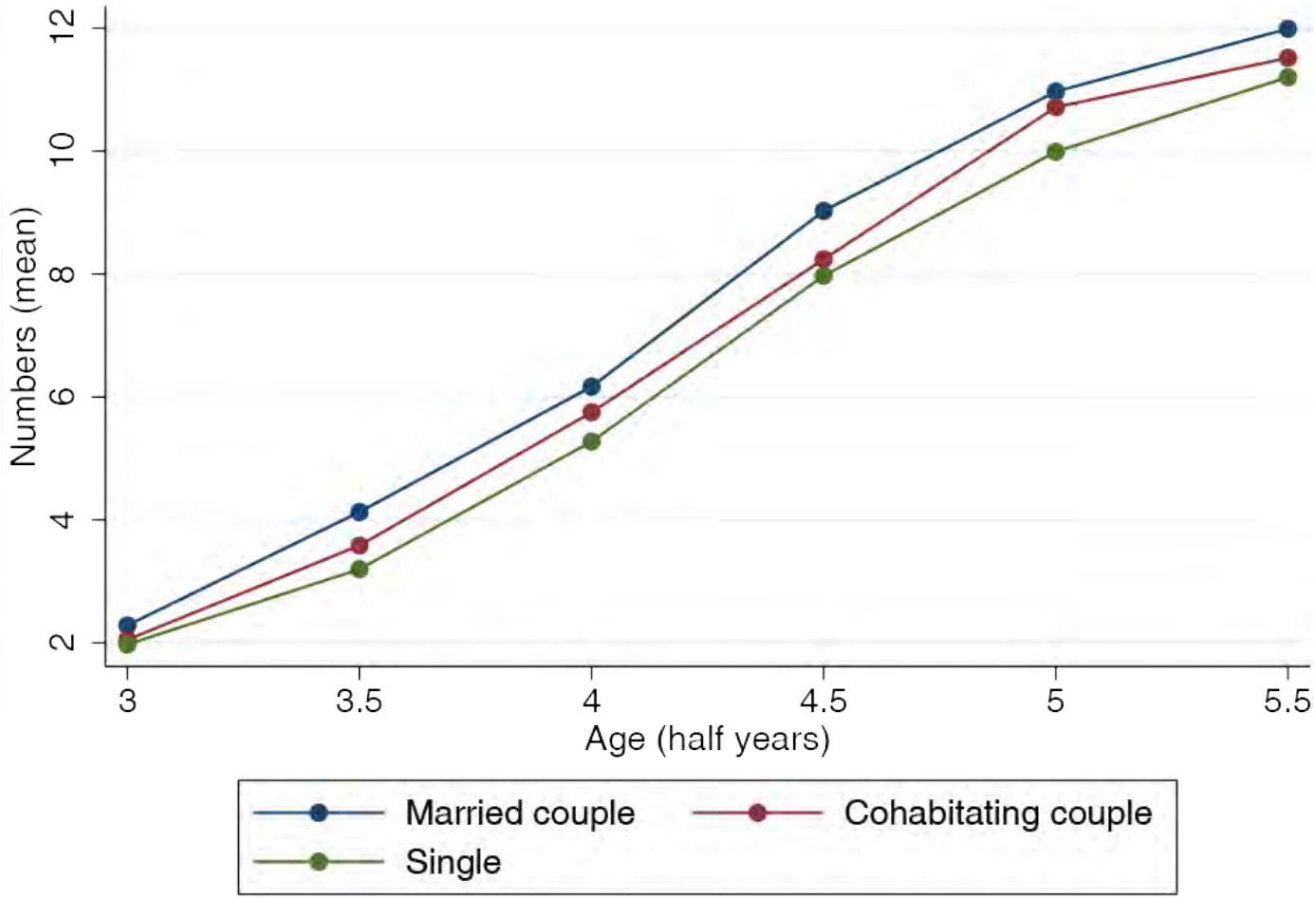
Outcomes: Cohabitation versus Marriage

Figure 13: Geometry By Family Status



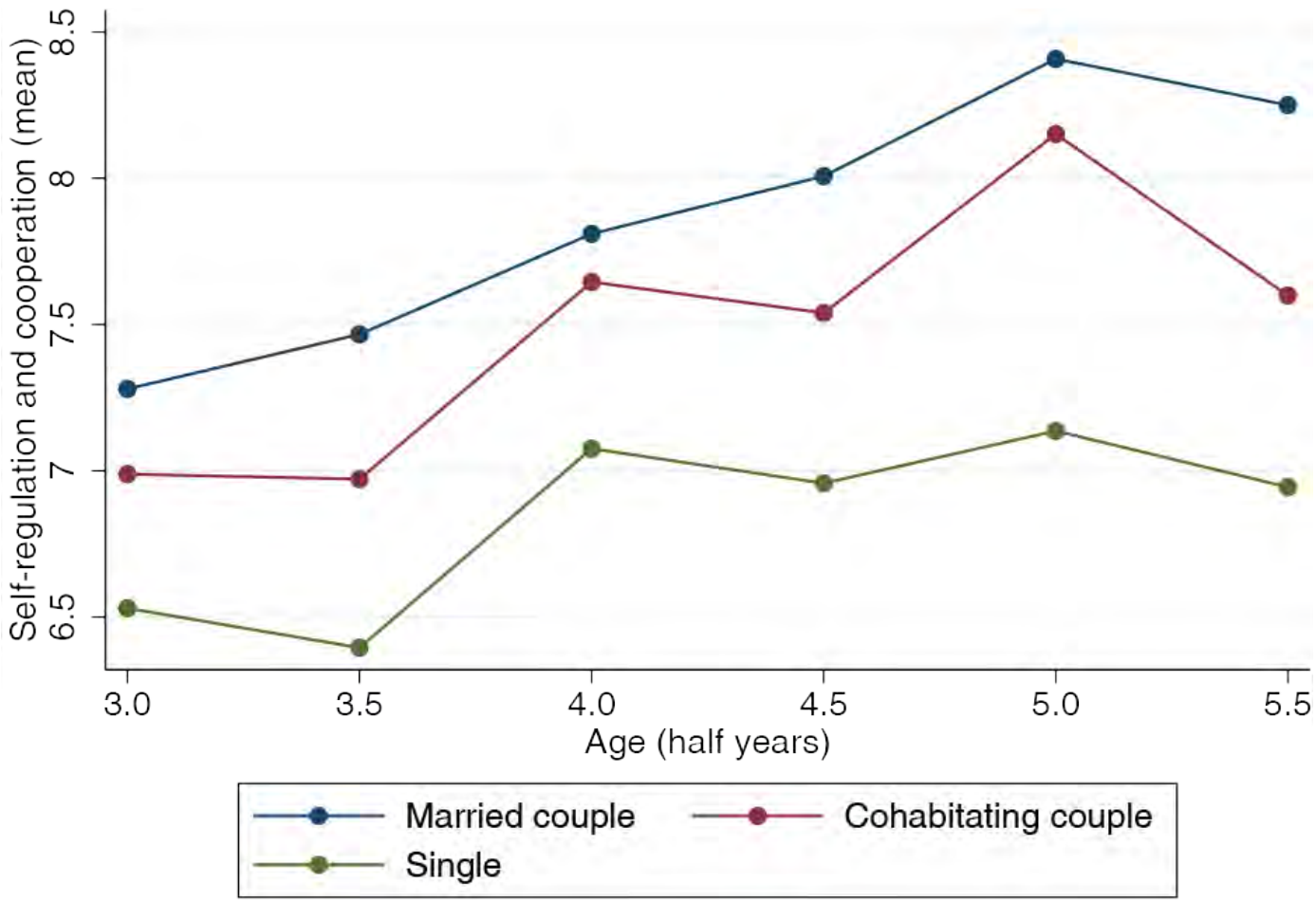
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 14: Numbers by Family Status



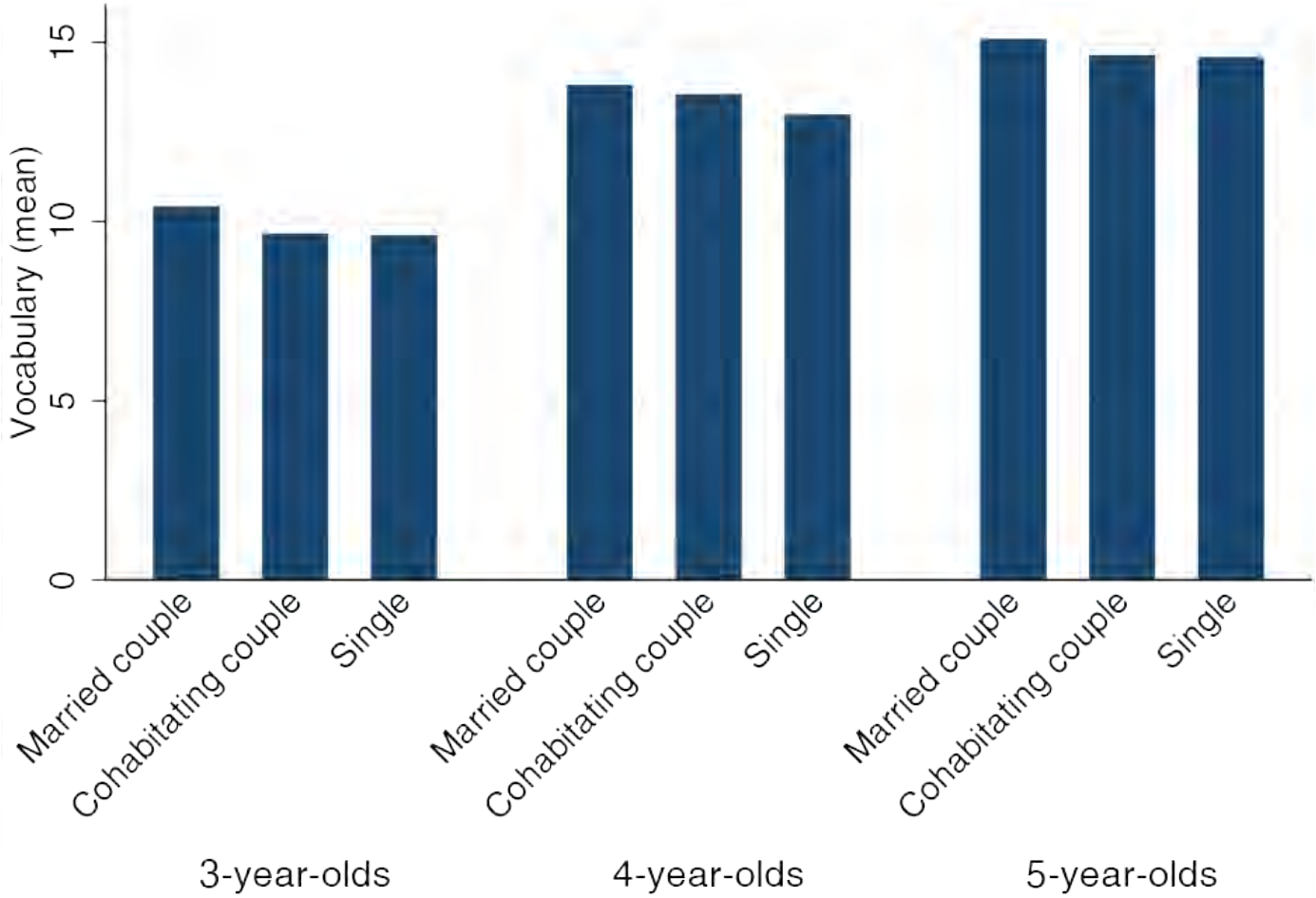
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 15: Self-Regulation and Cooperation by Family Status



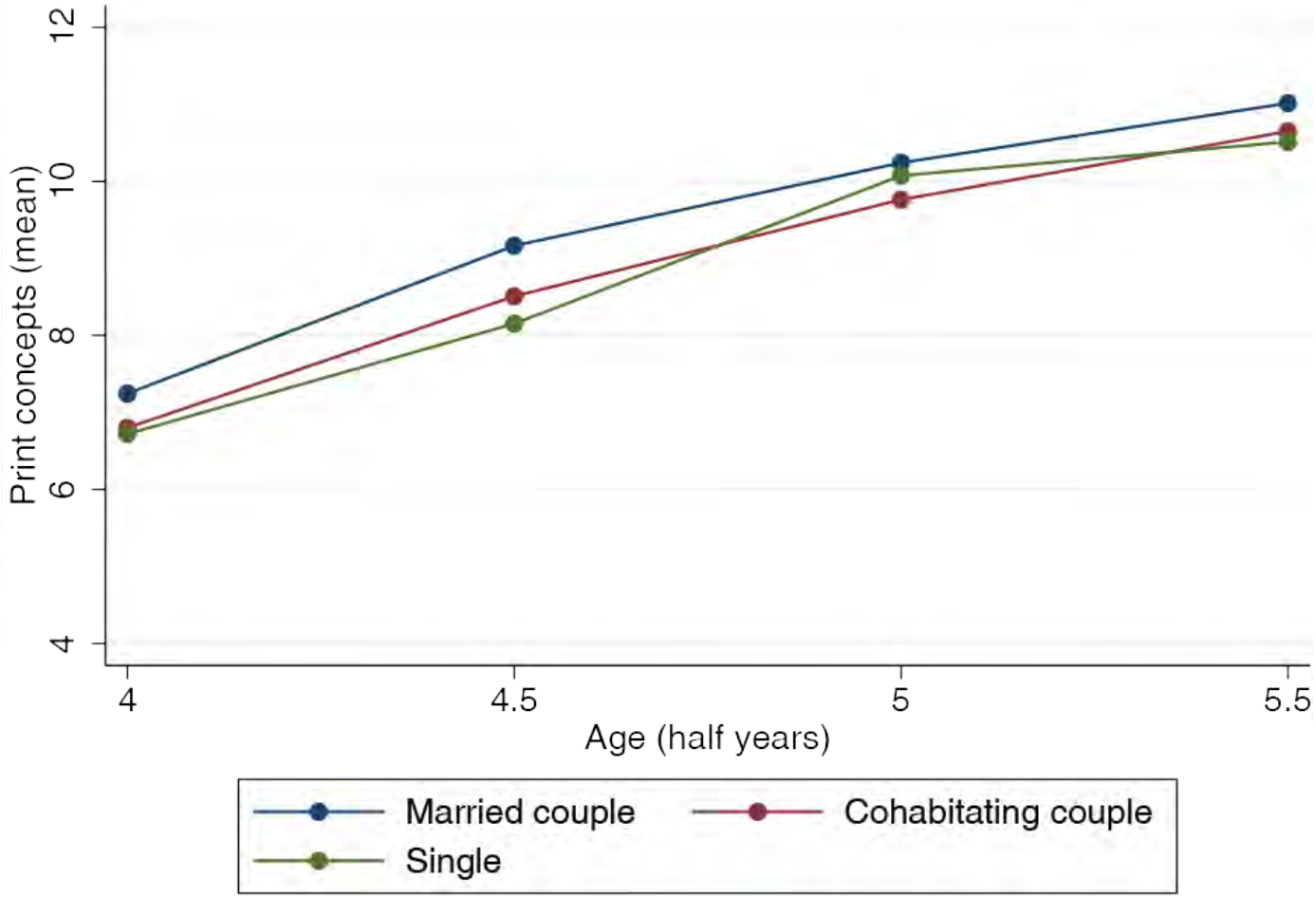
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 16: Vocabulary by Family Status



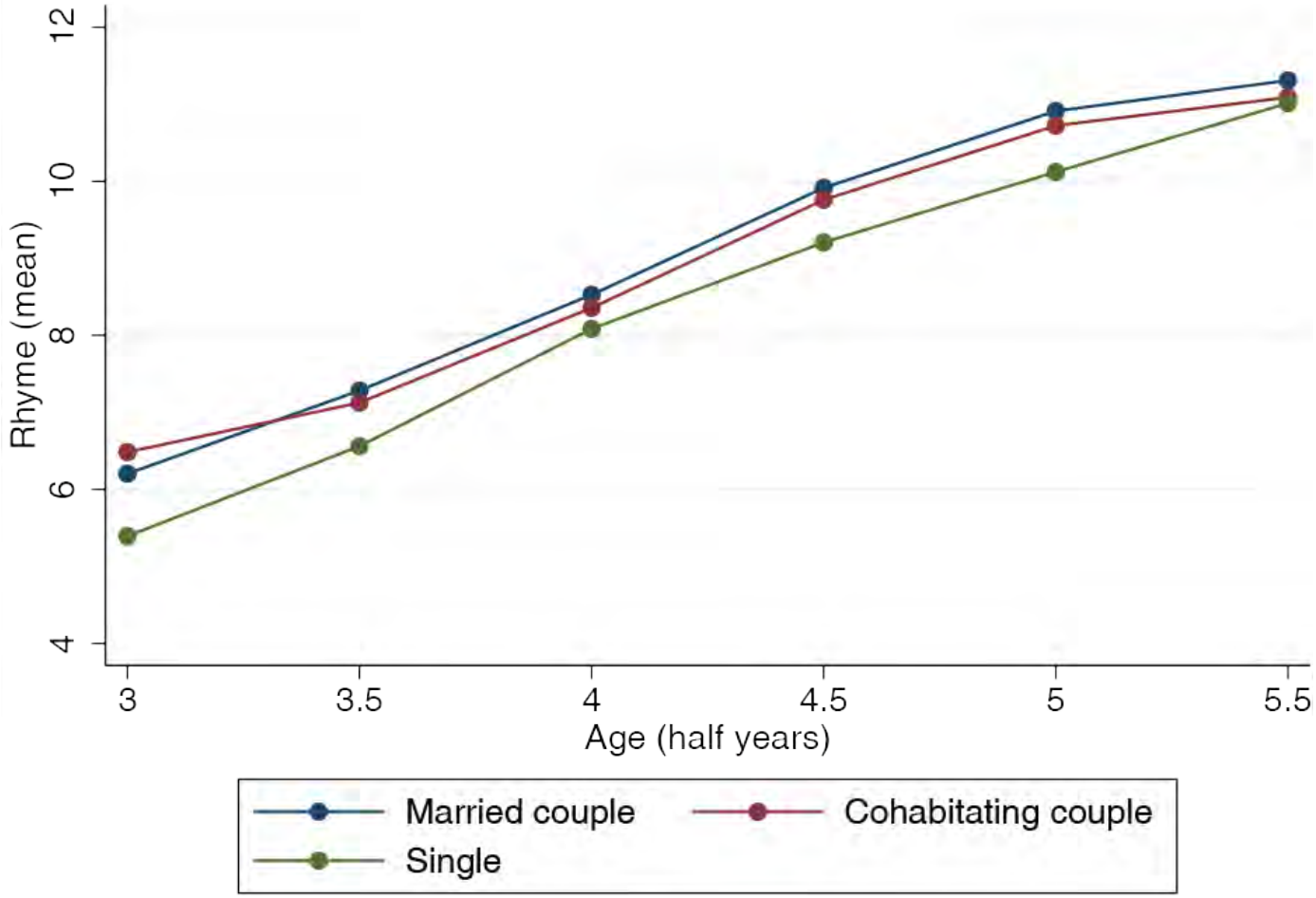
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 17: Print Concepts by Family Status



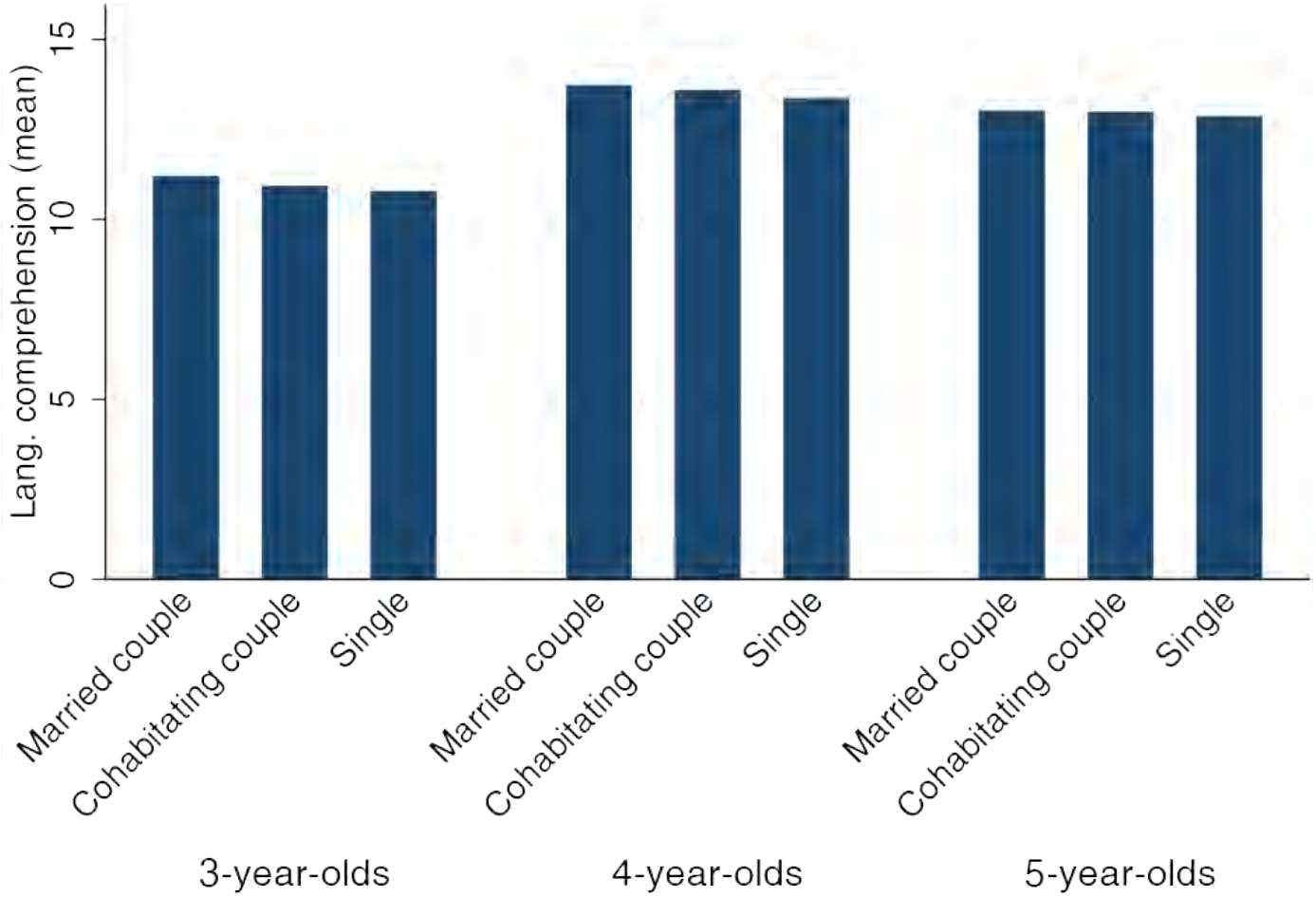
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 18: Rhyme by Family Status



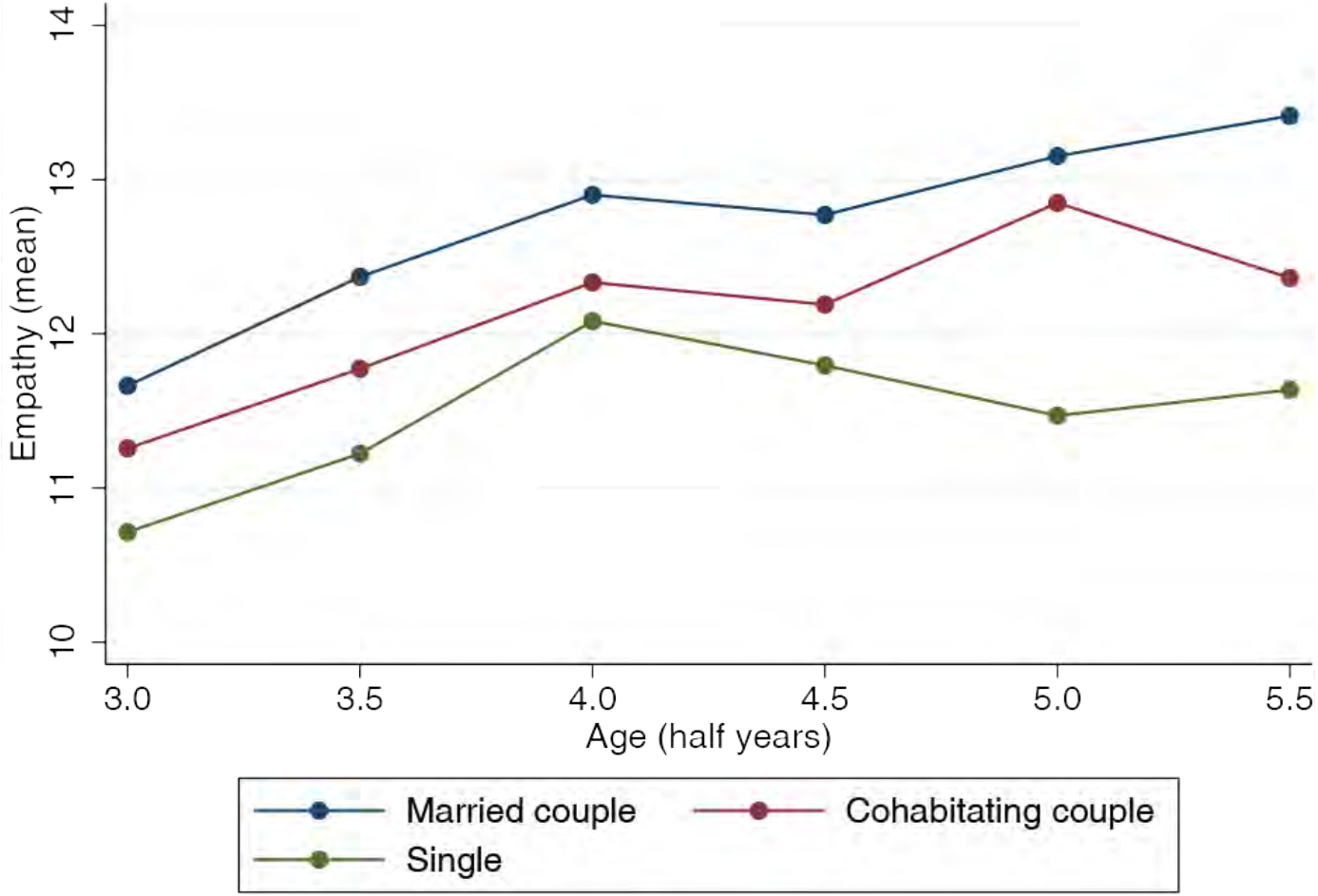
Source: 'Daycare of the Future', Bleses and Jensen (2017)

Figure 19: Language Comprehension by Family Status



Source: 'Daycare of the Future', Bleses and Jensen (2017)

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.

	TEAM Geometry	**TEAM Numbers**	**SEAM Empathy**	**SEAM Self-Regulation & Cooperation**
Cohabitating couple	-0.064	-0.332***	-0.445***	-0.252**
Single	-0.125*	-0.405***	-0.712***	-0.649***
	(0.072)	(0.130)	(0.166)	(0.116)
		Controls		
Age intervals	X	X	X	X
Mother's education	X	X	X	X
Observations	5218	5196	5571	5572

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.

	Language Rhyme	**Language Print Concepts**	**Language Vocabulary**	**Language Comprehension**
Cohabitating couple	0.003	-0.466***	-0.333**	-0.098
(0.107)	(0.151)	(0.163)	(0.088)	
Single	-0.350***	-0.209	-0.206	-0.100
	(0.124)	(0.169)	(0.187)	(0.102)
		Controls		
Age intervals	X	X	X	X
Mother's education	X	X	X	X
Observations	4284	3003	4803	4933

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

THE UNIVERSITY OF CHICAGO

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

Social-emotional Skills → **Cognitive Skills, Health**

(sit still; pay attention; engage in learning; open to experience)

Health → **Cognitive Skills, Noncognitive Skills**

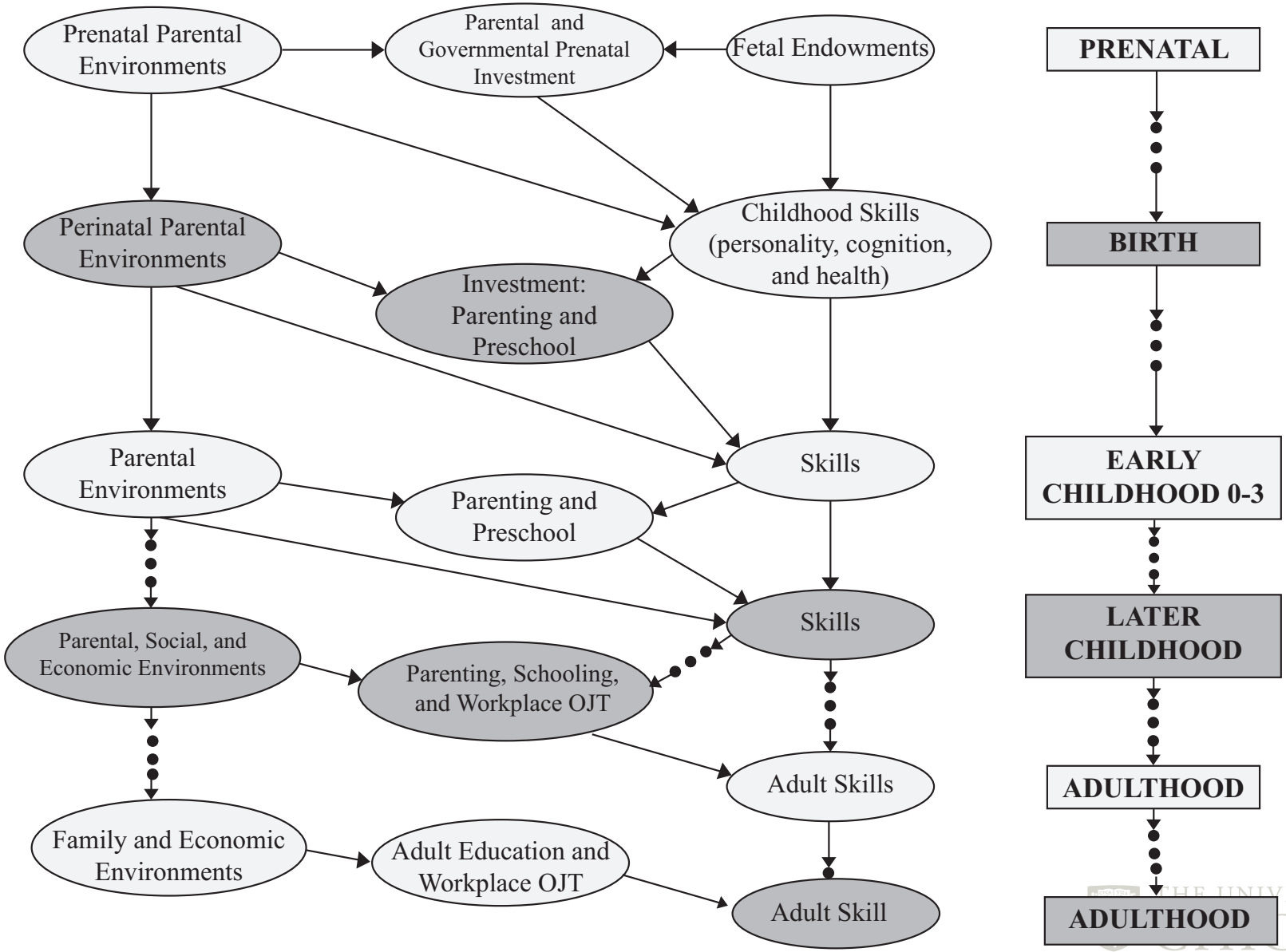
(fewer lost school days; ability to concentrate)

Cognitive Skills → **Produce better health practices; produce more motivation; greater perception of rewards.**

(child better understands and controls its environment)

Outcomes: increased productivity, higher income, better health, more family investment, upward mobility, reduced social costs.

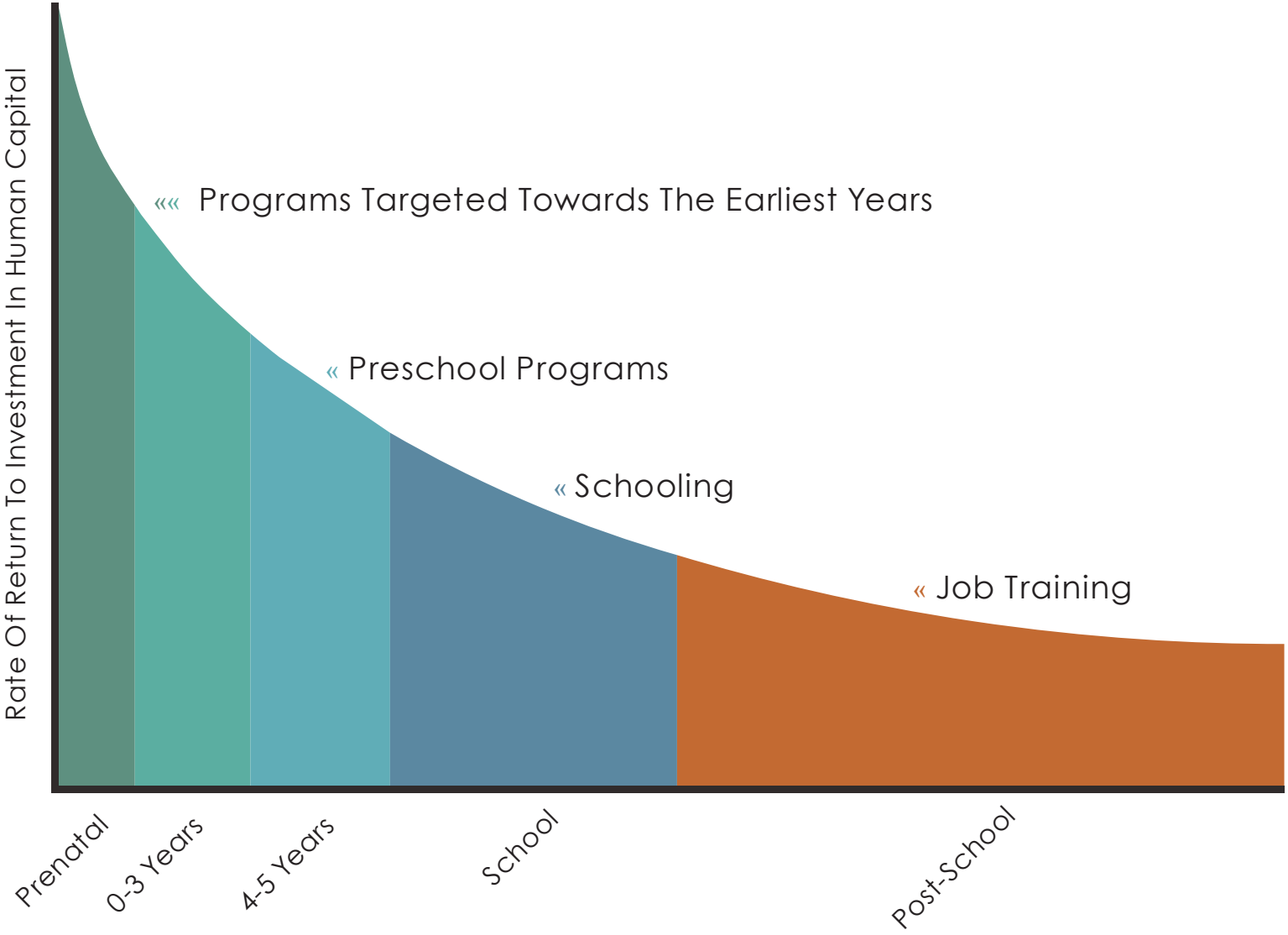
Figure 21: Life Cycle Developmental Framework



Powerful Evidence For Effectiveness of Targeted Interventions

Returns to Human Capital

Returns to 1 Unit Hong Kong Dollar Invested



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.
  - $2\frac{1}{2}$ 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

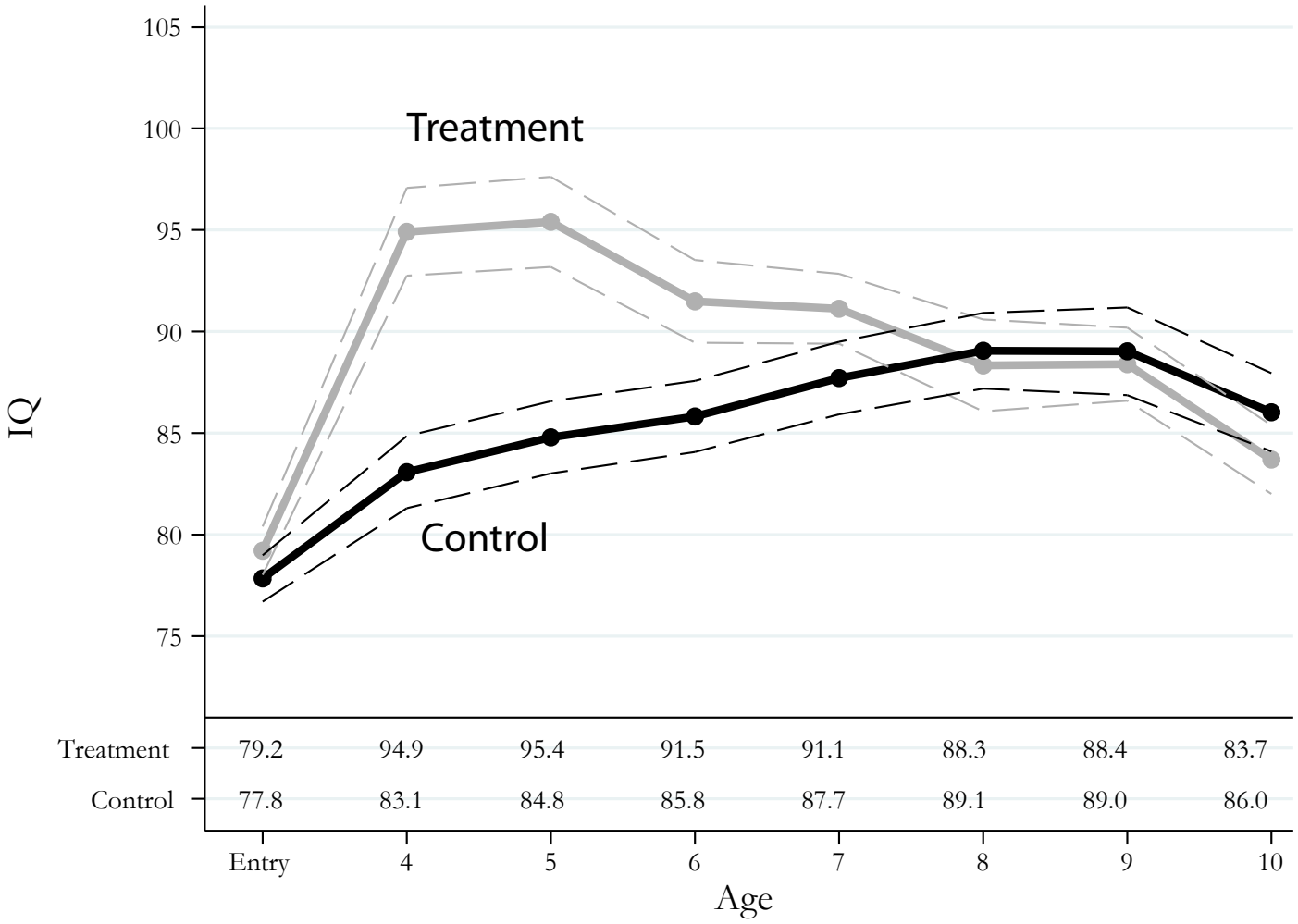
- Evaluated by the method of random assignment.
- Contrary to recent claims, strong effects are found for both boys and girls, although different effects at different ages for different outcomes.
- Did not lead to sustained gains in IQ for males.

- 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.

Cognitive Evolution Through Time, Perry Males

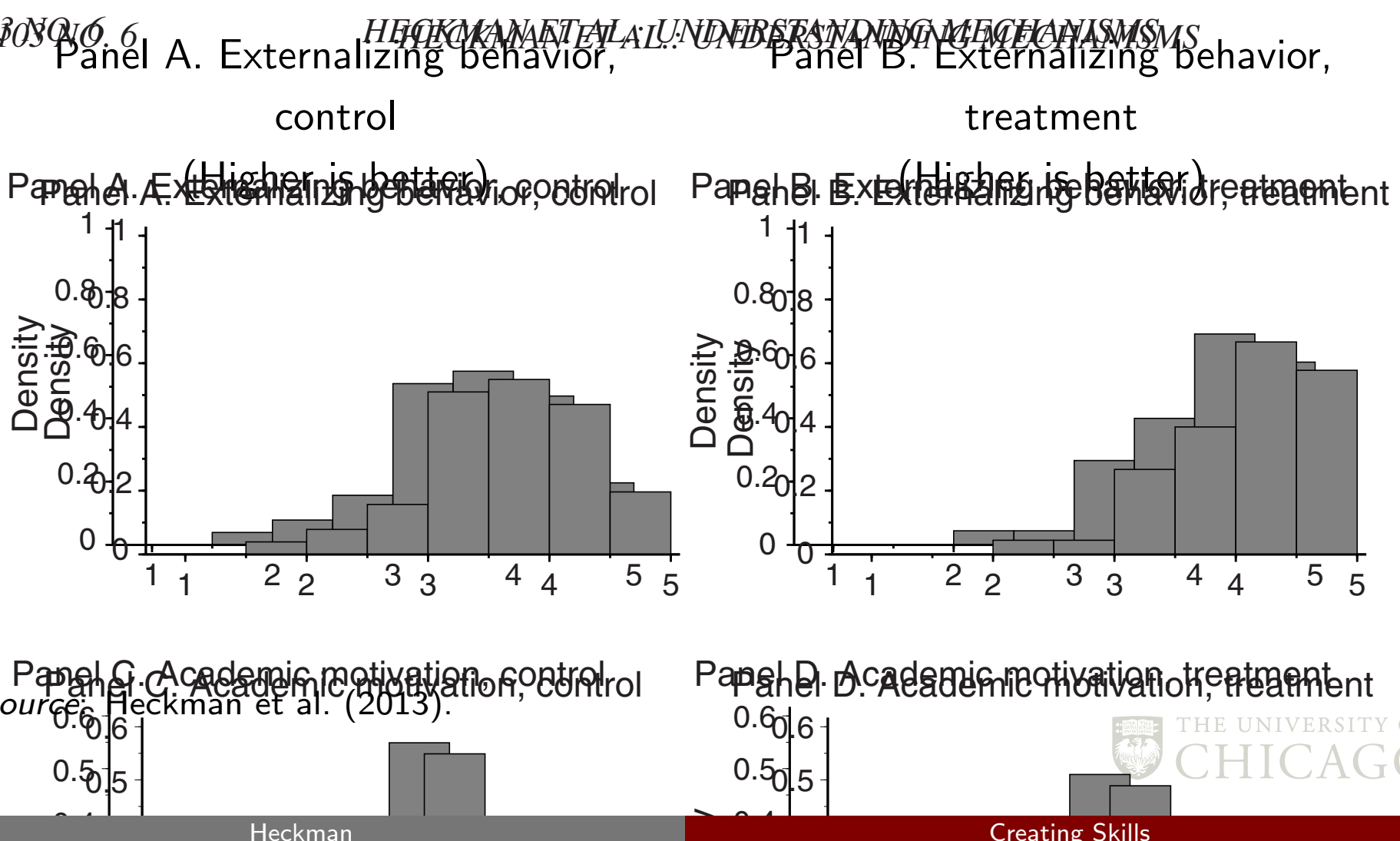
Figure 22: Male Cognitive Dynamics



- 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%.

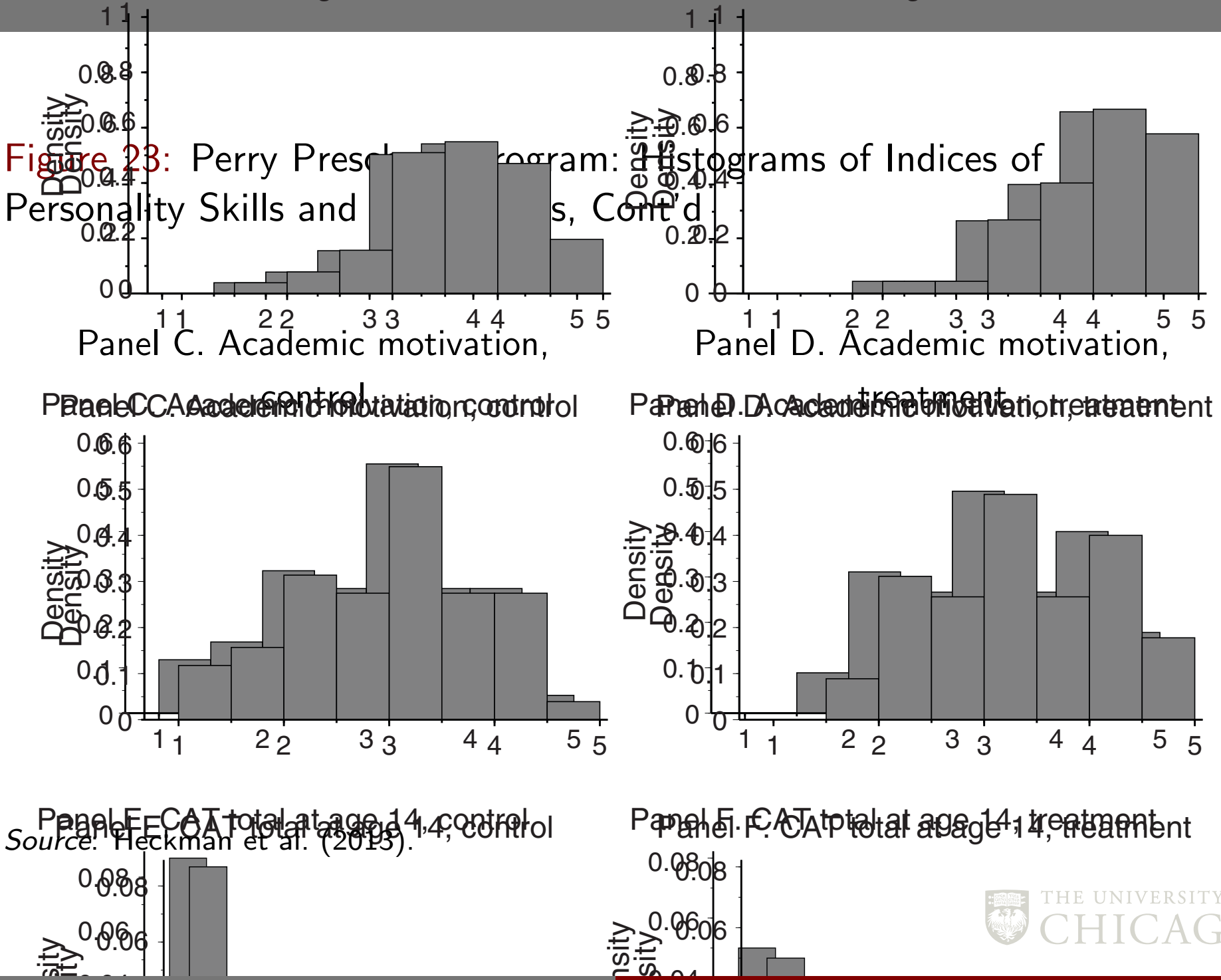
- Worked primarily through noncognitive channels.
- Early interventions reducing problem behavior lower the probability of engaging in unhealthy behaviors in adulthood.

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



Source: Heckman et al. (2013).

Figure 23: Perry Preschool Program: Histograms of Indices of Personality Skills and Motivations, Cont'd



Source: Heckman et al. (2013).

Figure 23: Perry Preschool Program: Histograms of Indices of Personality Skills, Cont'd.

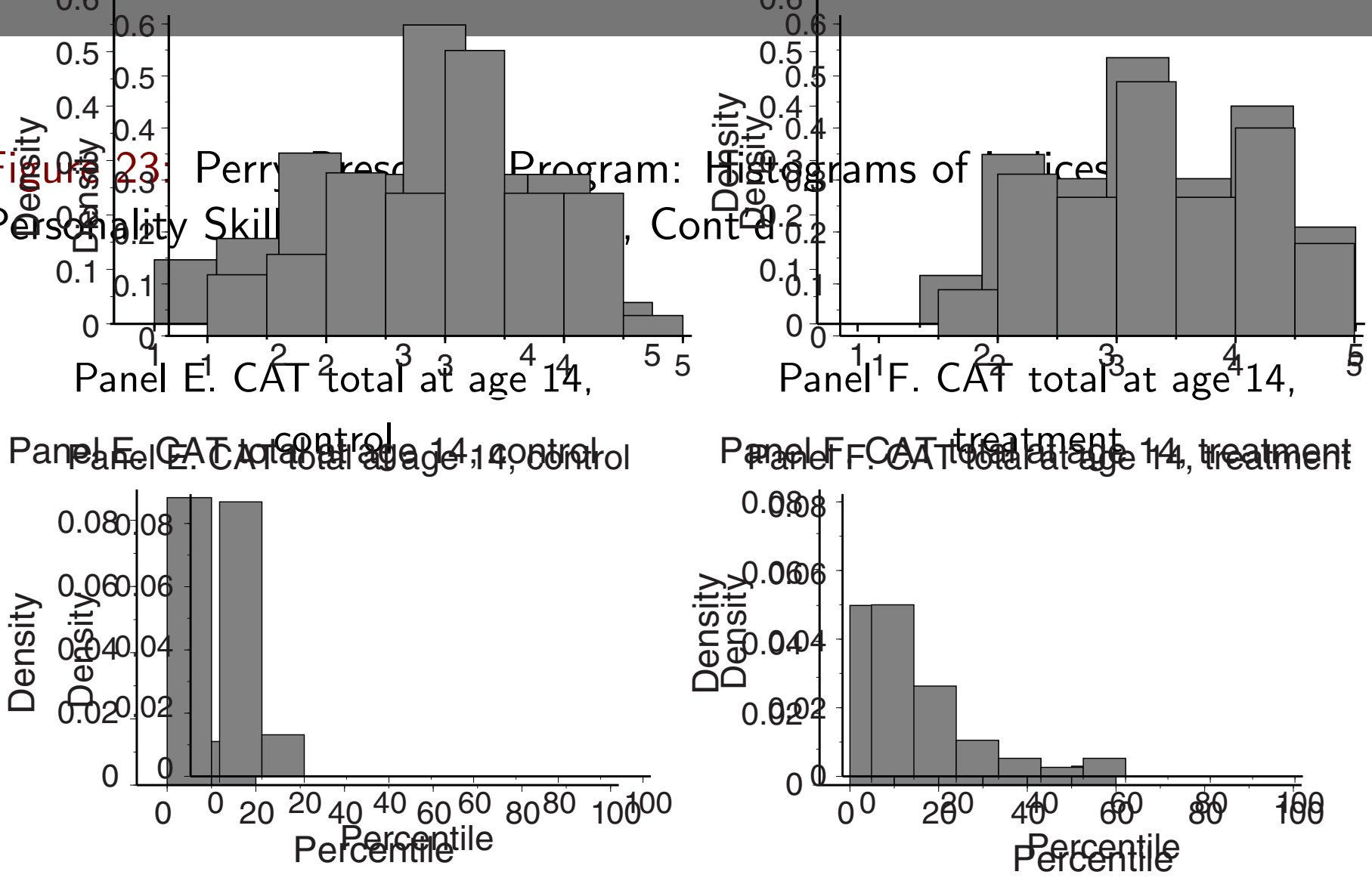


FIGURE 2. HISTOGRAMS OF INDICES OF PERSONALITY SKILLS AND CAT SCORES

FIGURE 2. HISTOGRAMS OF INDICES OF PERSONALITY SKILLS AND CAT SCORES

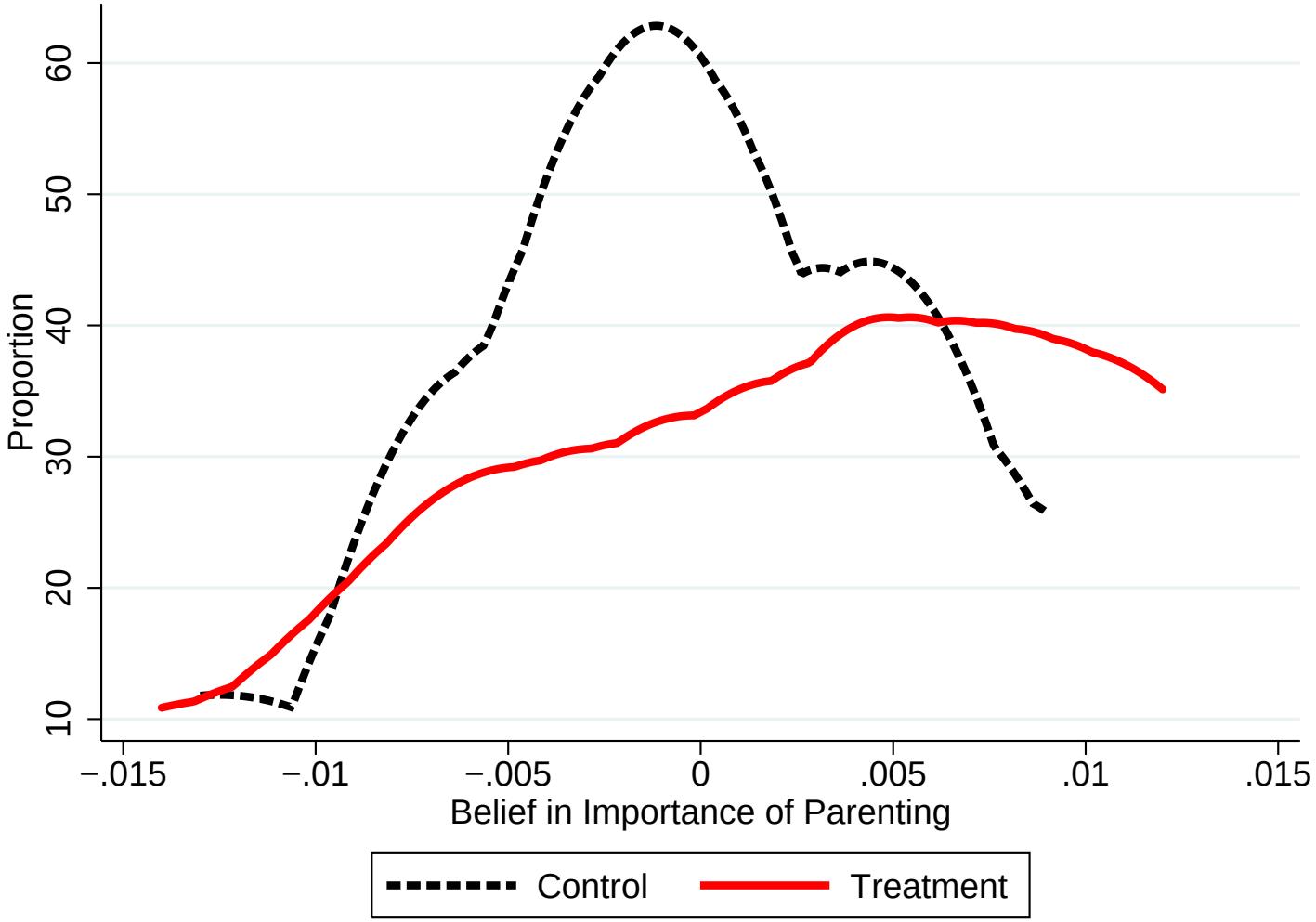
Source: Heckman et al. (2013).

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 descrip-

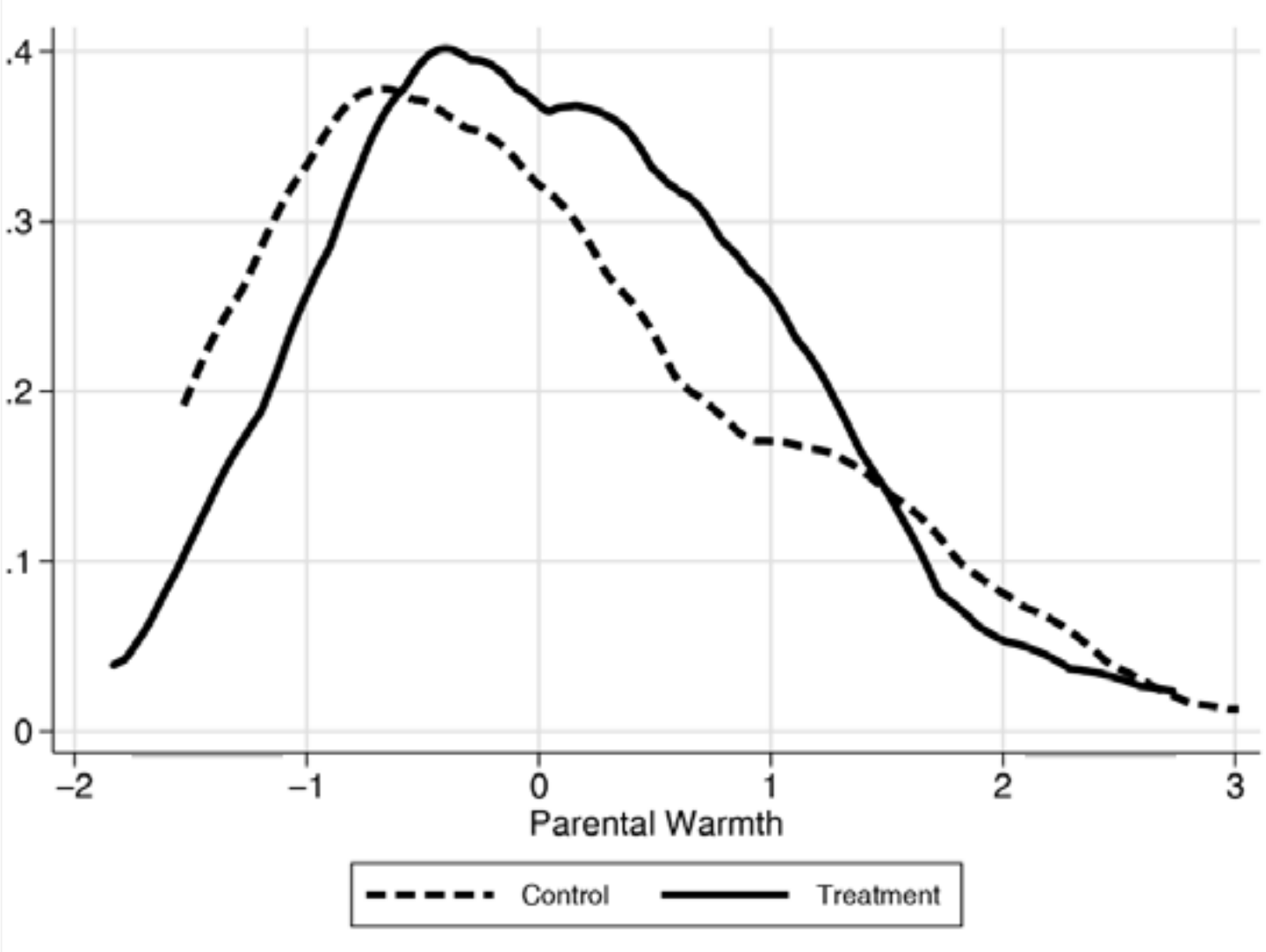
Notes: Indices for externalizing behavior and academic motivation are unweighted averages of measures listed in Table 2. "CAT" is the California Achievement Test score expressed in percentiles of the general population distribution of the scores. See online Appendix B.4 for descrip-

Mechanisms

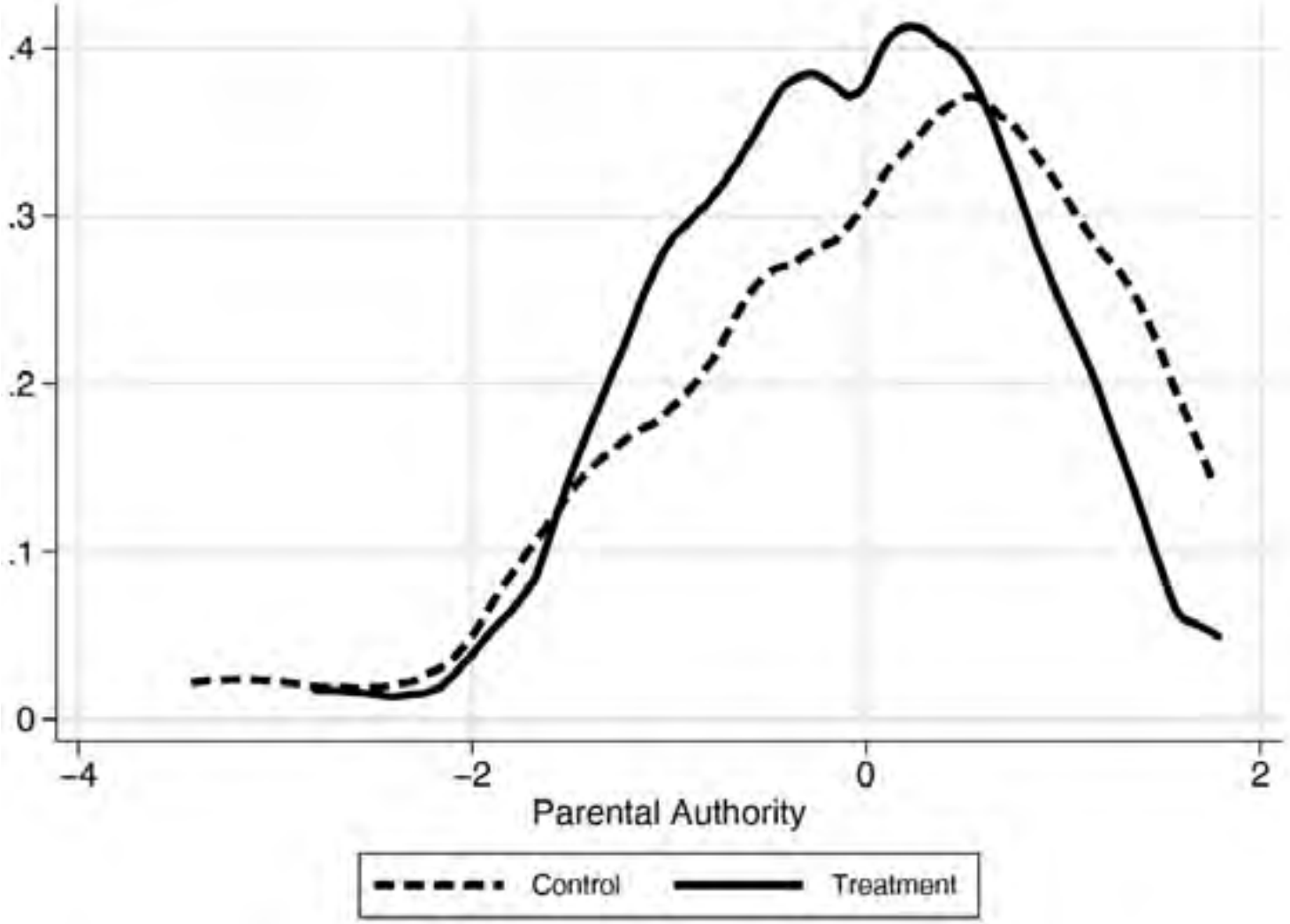
Parental response to Perry Preschool Program after 1 year experience of treatment:



Parental Warmth, Perry Preschool

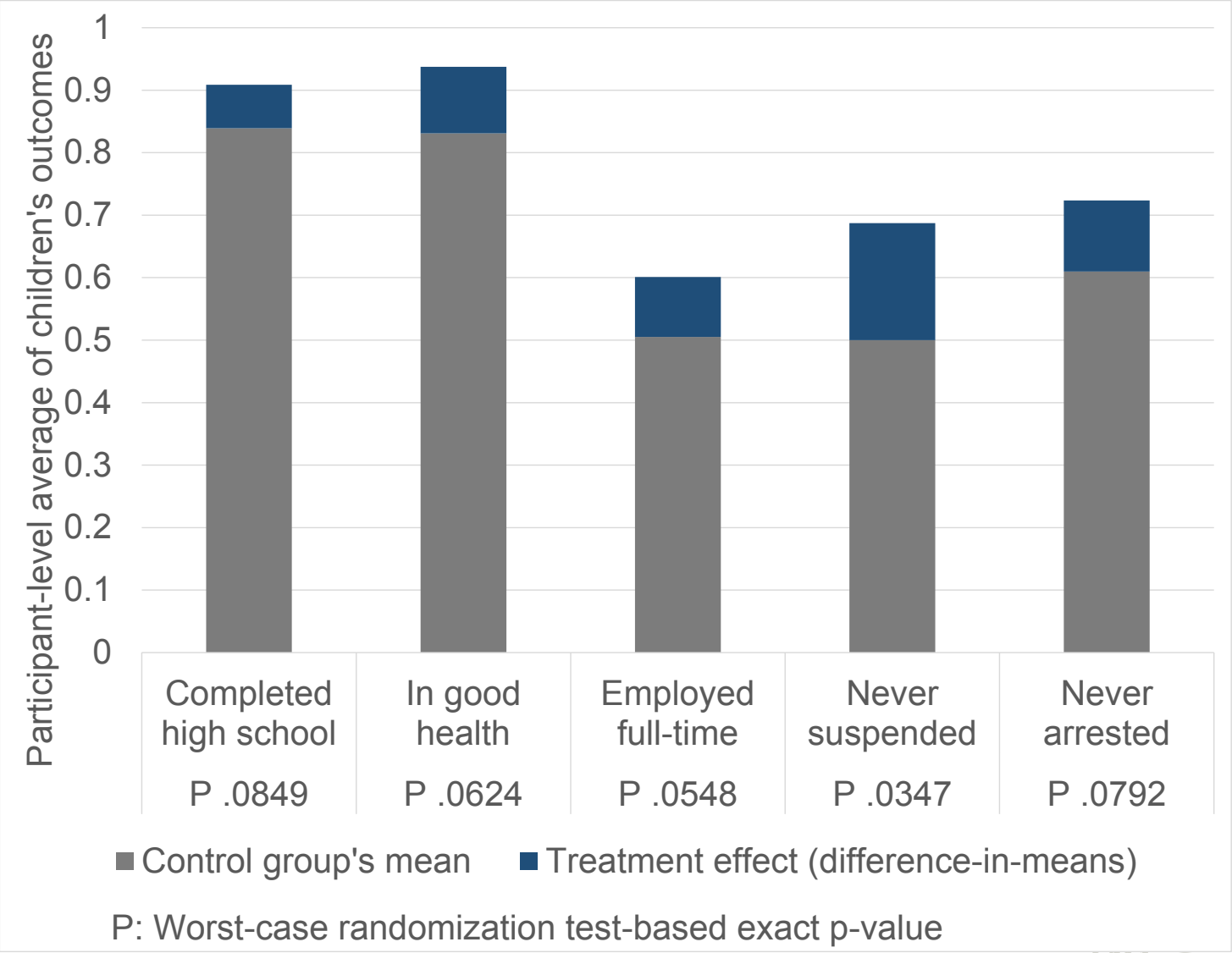


Parental Authoritarianism, Perry Preschool

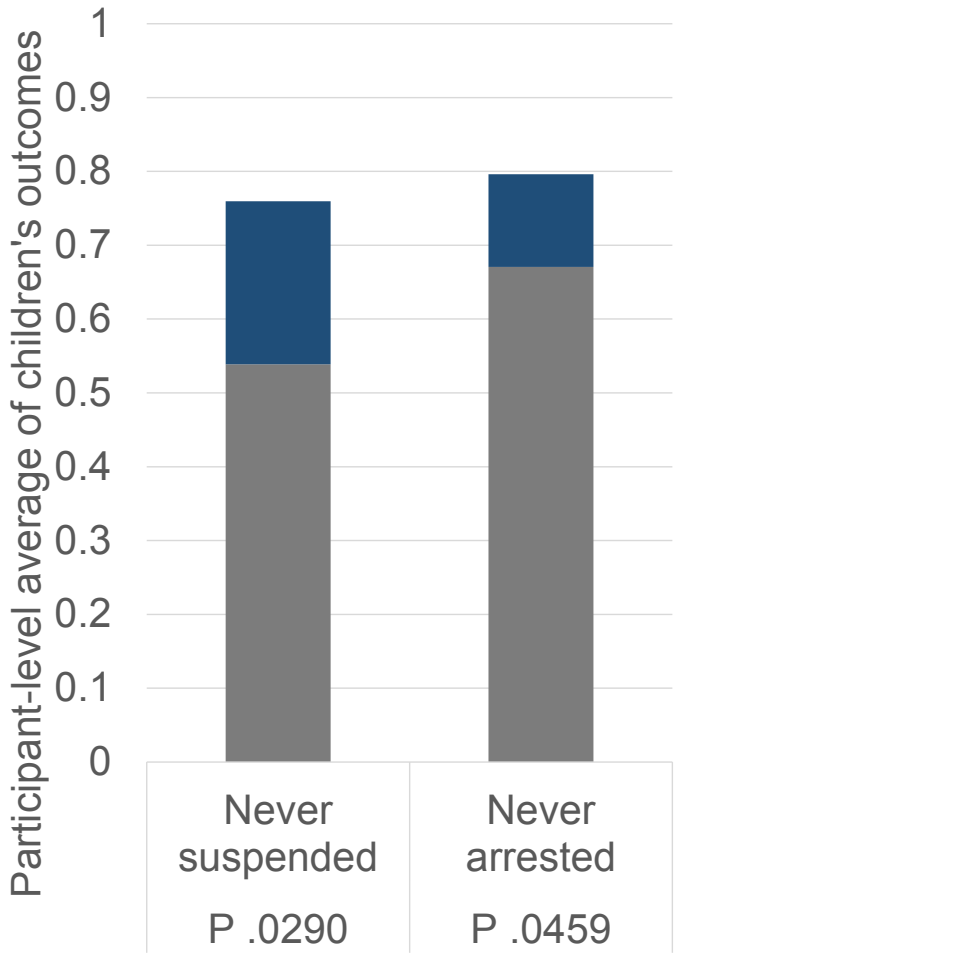


Intergenerational Effects of Perry Program

Selected Outcomes for All Children of the Perry Participants

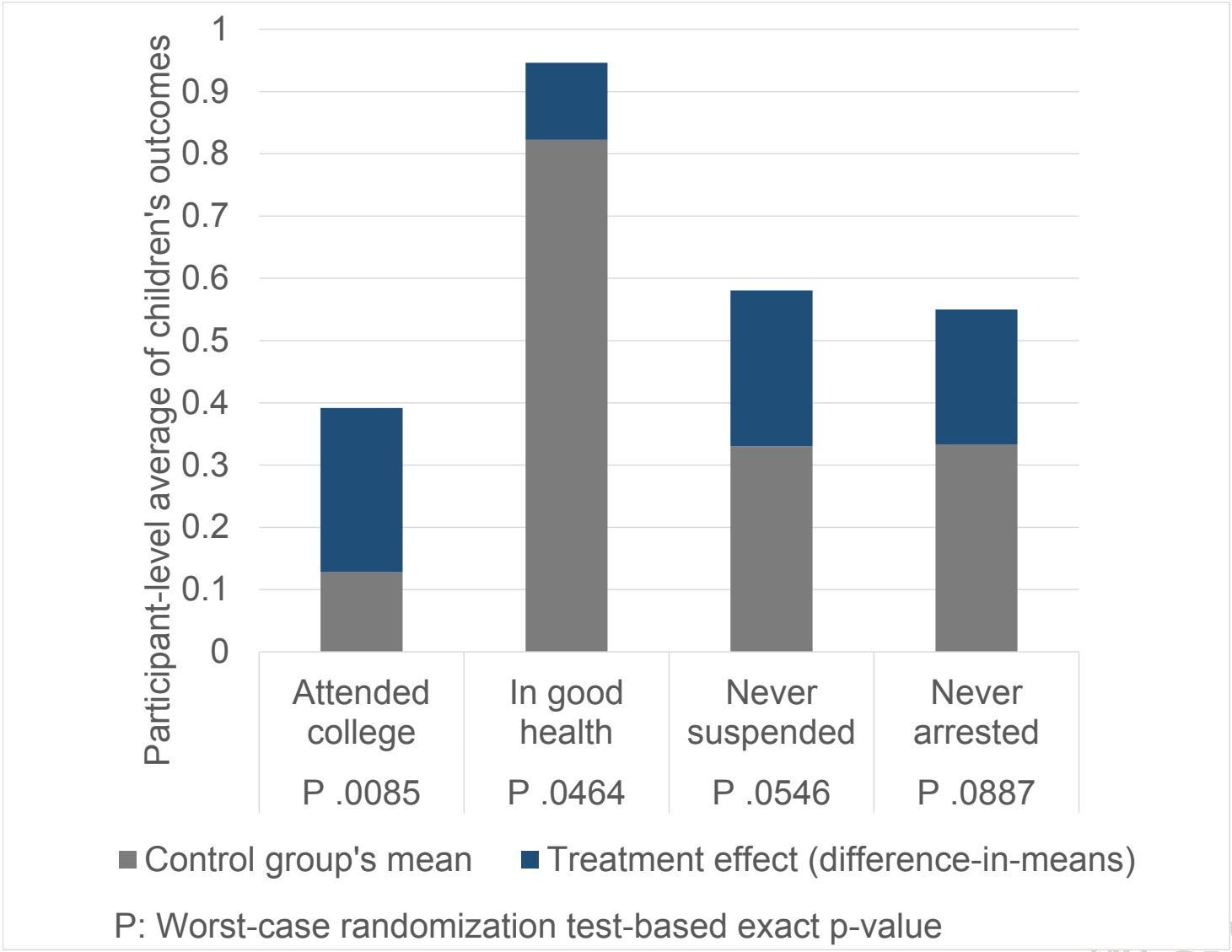


Selected Outcomes for All Children of the Male Participants

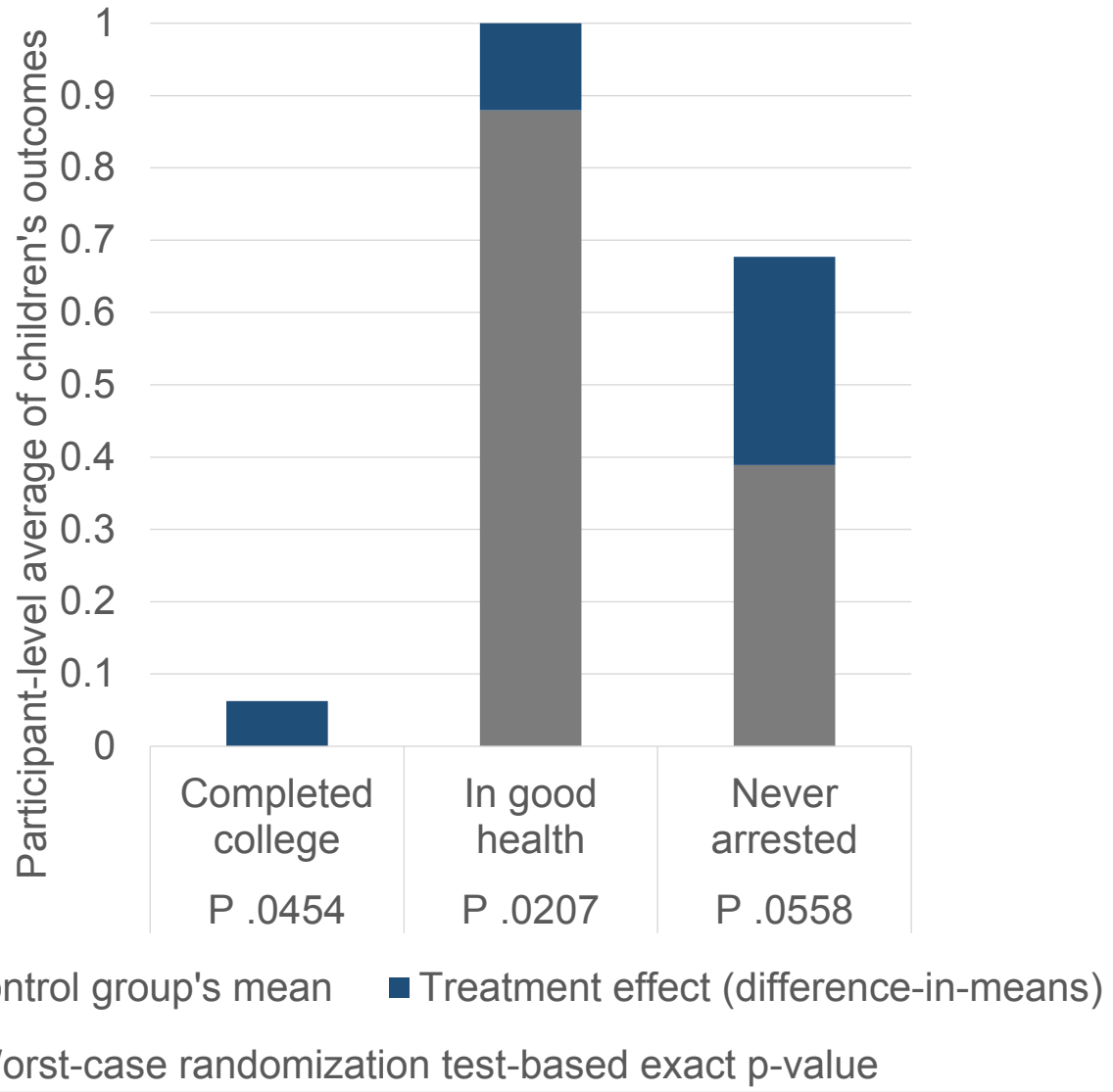


P: Worst-case randomization test-based exact p-value

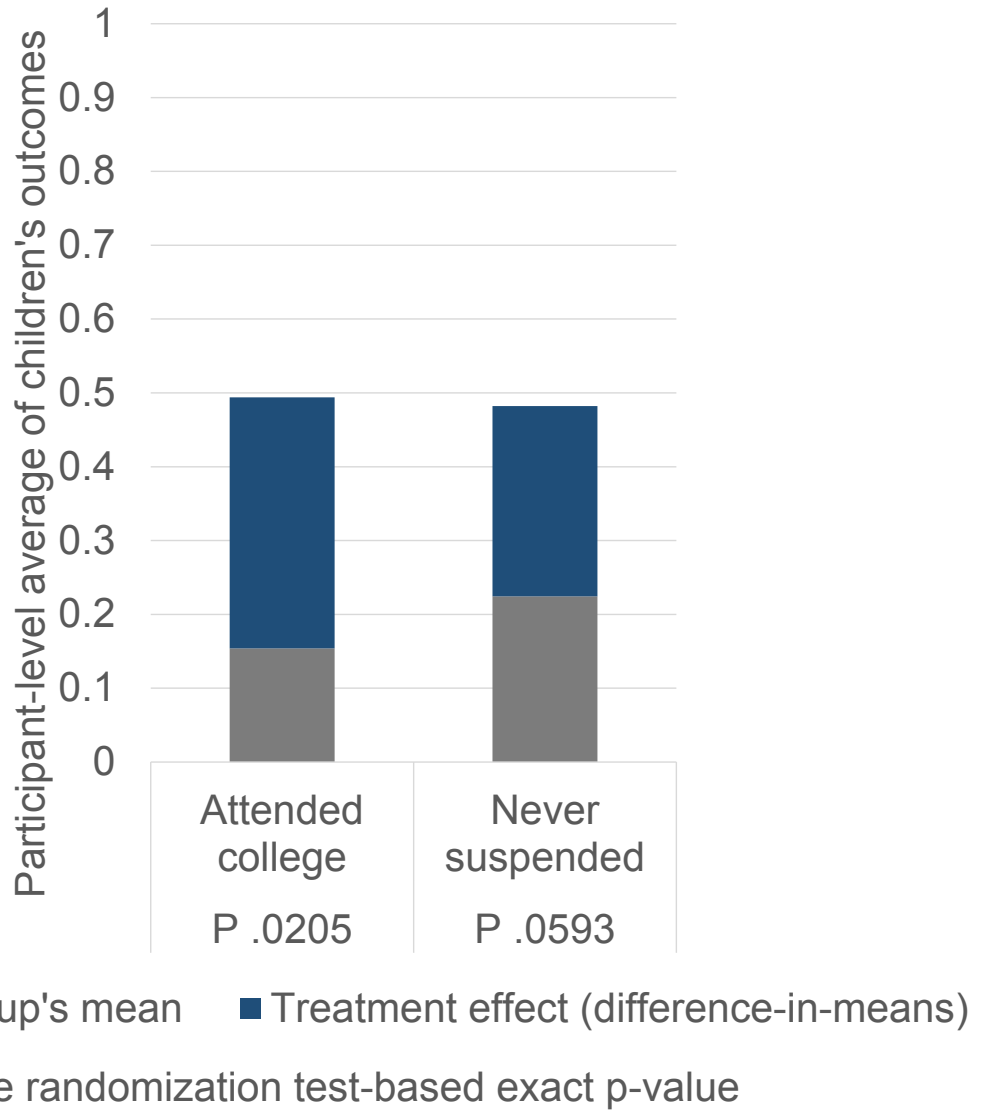
Selected Outcomes for Male Children of the Perry Participants



Selected Outcomes for Male Children of the Male Participants



Selected Outcomes for Male Children of the Female Participants



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

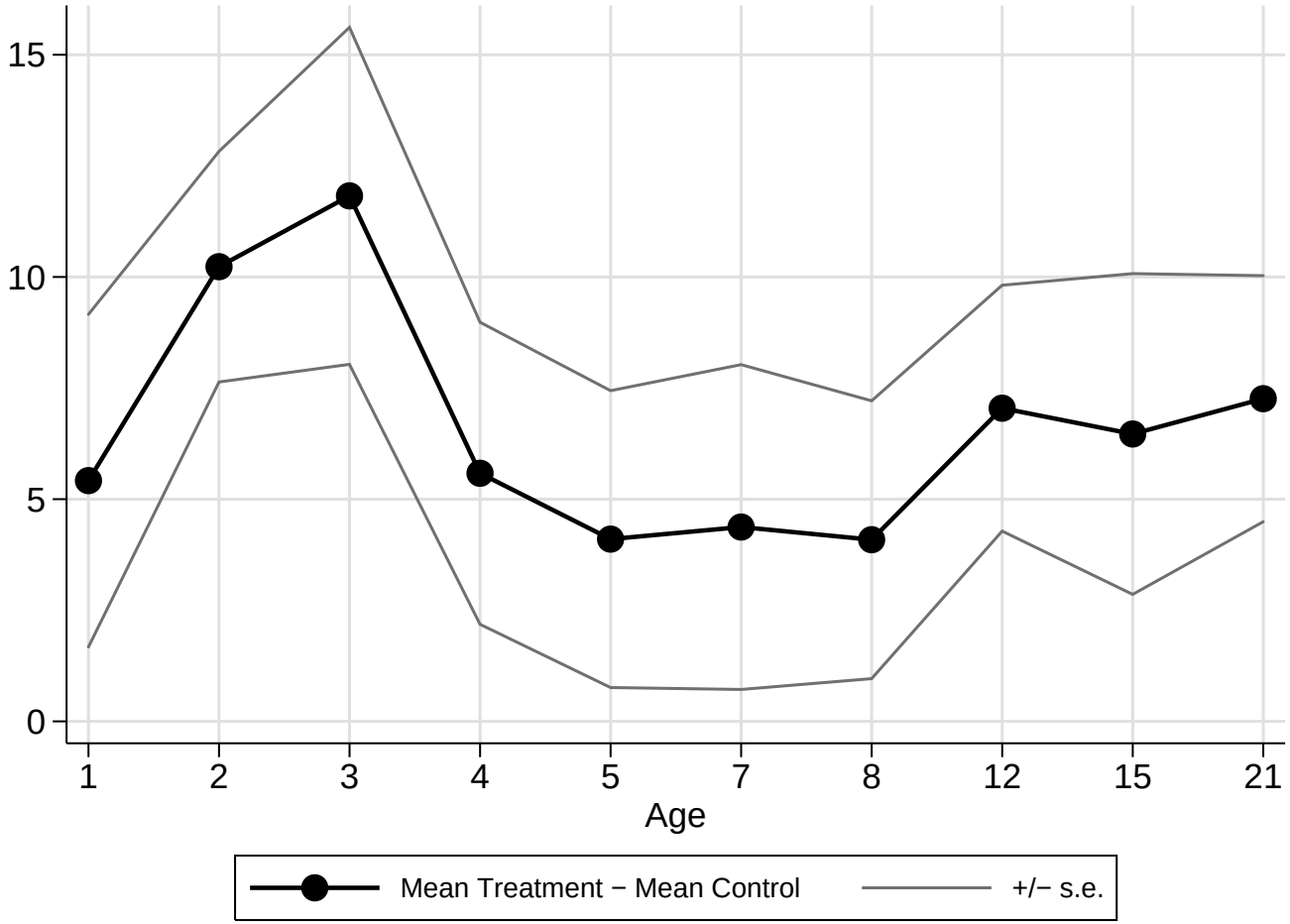
Figure 24: Abecedarian Project, Health Effects at Age 35 (Males)

	Treatment Mean	Control Mean	Treatment p-value
Systolic Blood Pressure	125.79	143.33	0.018
Diastolic Blood Pressure	78.53	92.00	0.024
Pre-Hypertension	0.68	0.78	0.235
Hypertension	0.10	0.44	0.011
HDL Cholesterol	53.21	42.00	0.067
Cholesterol/HDL-C	3.89	4.69	0.057
Abdominal Obesity	065	0.87	0.136
Metabolic Syndrome	0.00	0.25	0.009

Source: Campbell, Conti, Heckman, Moon, Pinto, Pungello, and Pan (2014).

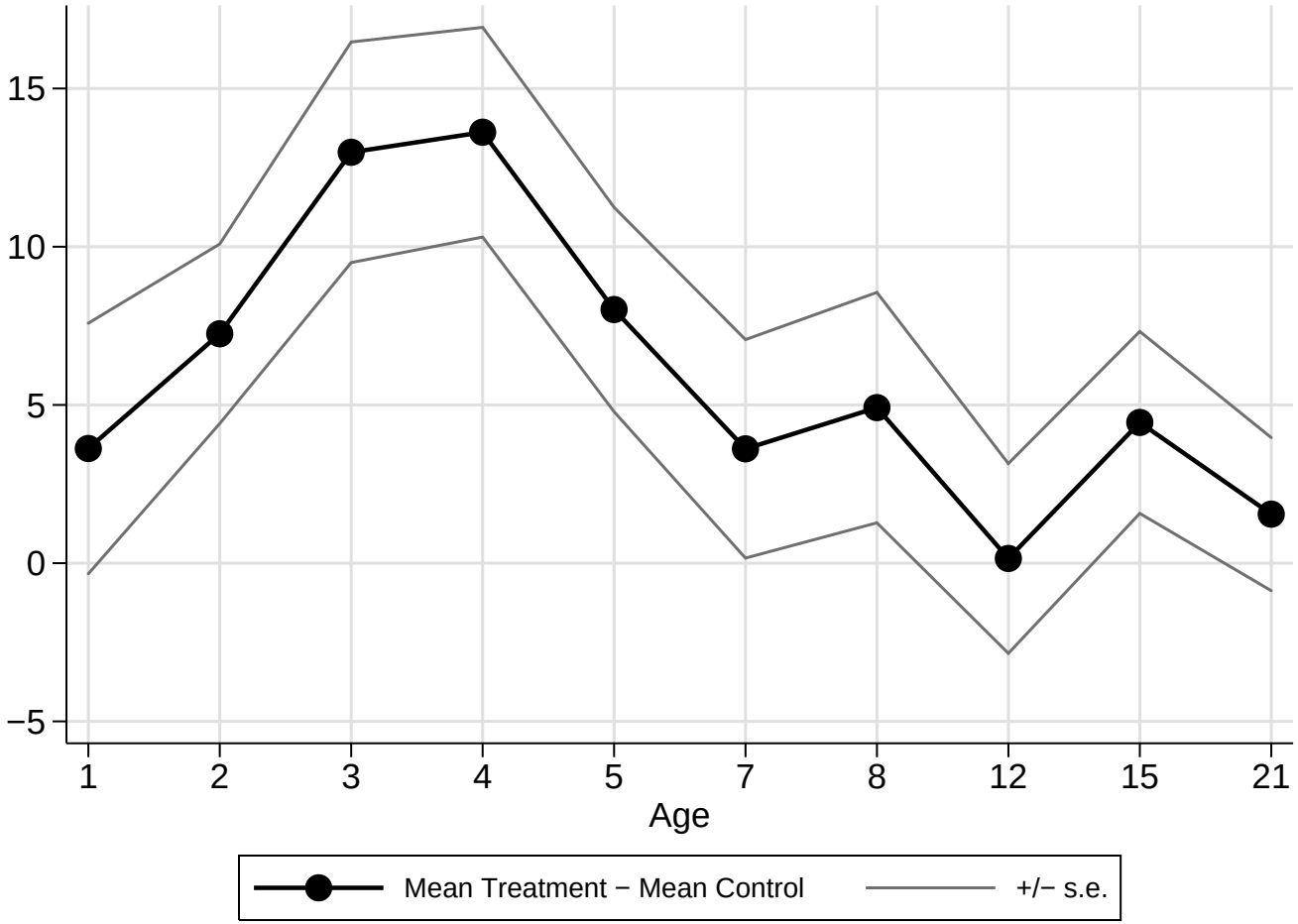
The Carolina Abecedarian Project: Early Start Boosts IQ

Figure 25: Treatment Effects on IQ, Females



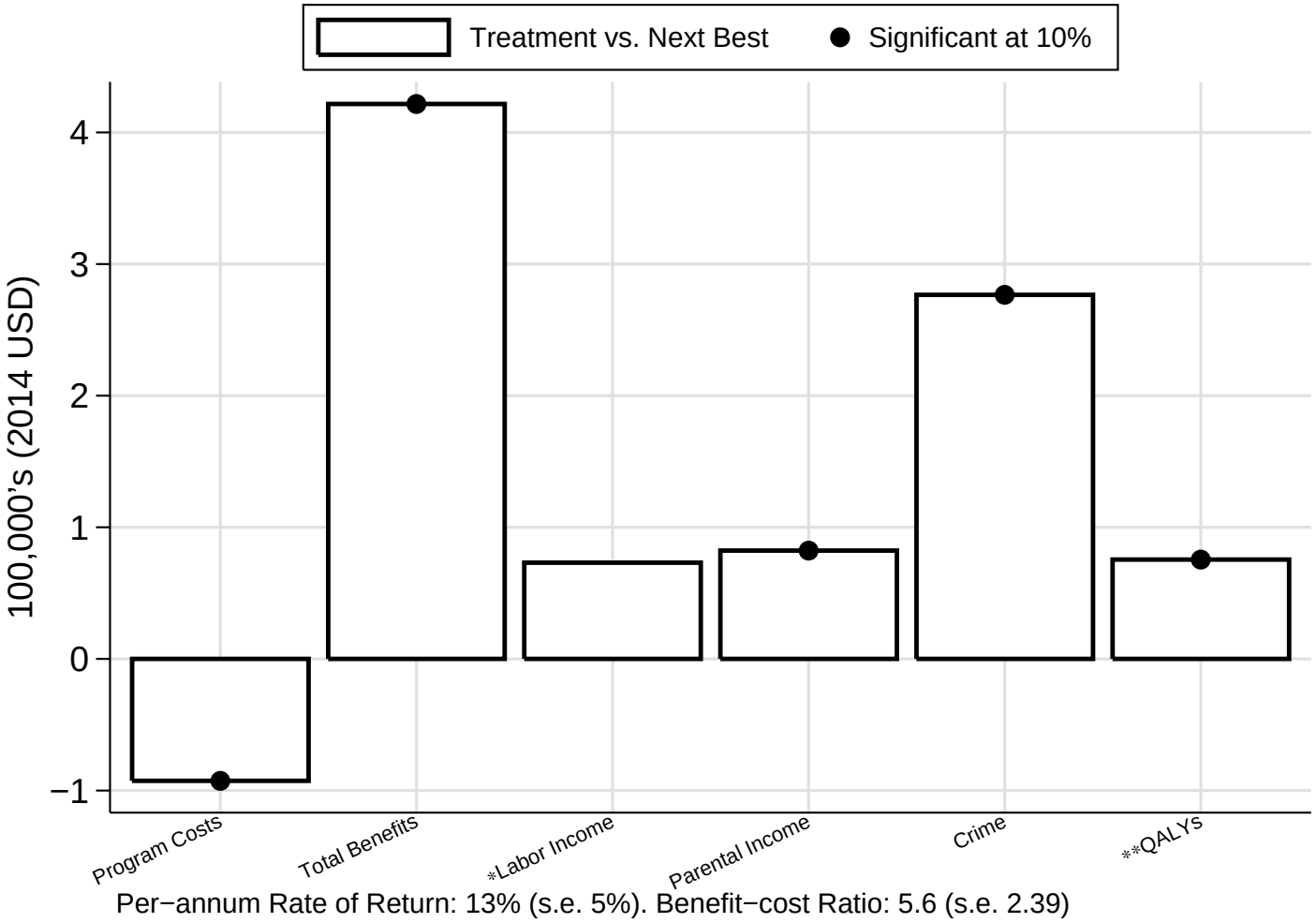
Note: This figure displays the mean difference in IQ at different ages between the treatment and control group. The line with circles represents the raw difference. The line with squares represents the difference when controlling for IQ at age 3 by linear regression. All measures are age-standardized 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.

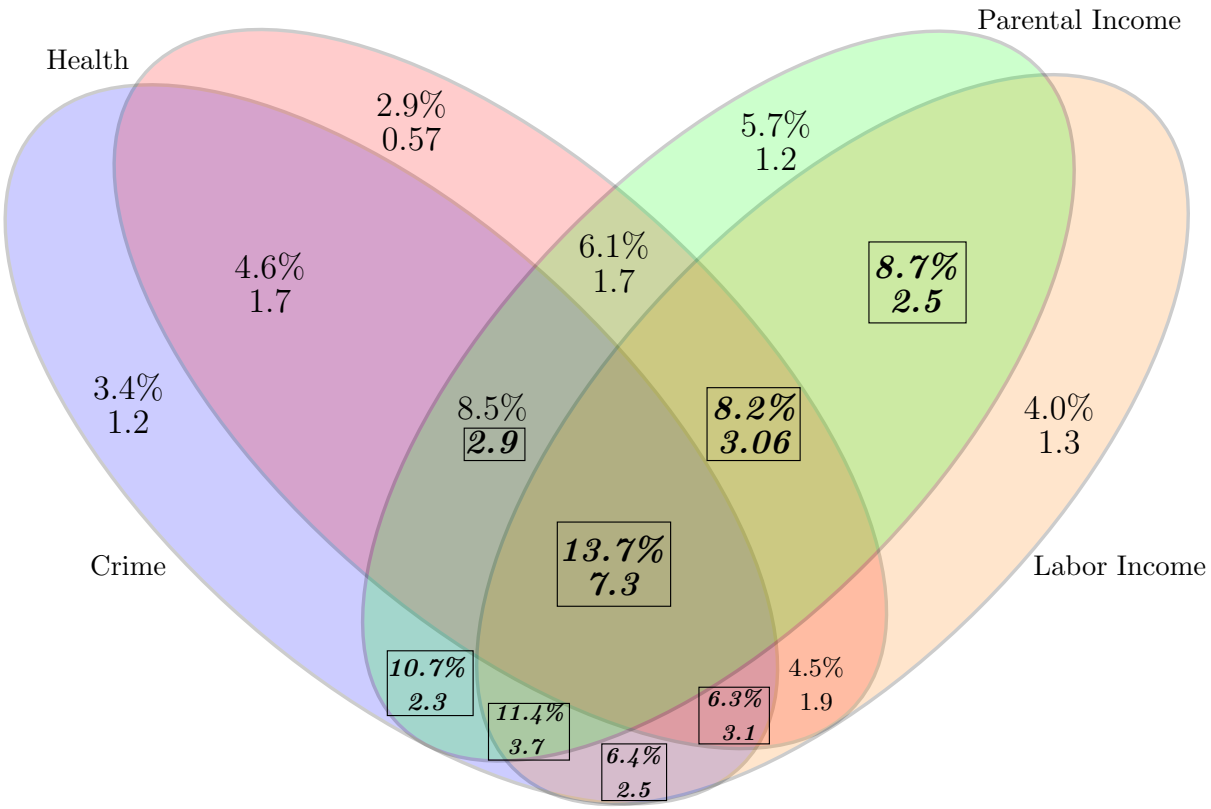
Figure 27: Net Present Value of Main Components of the Cost/Benefit Analysis Over the Life Cycle per Program Participant, Treatment vs. Next Best



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 3: Cost/Benefit Analysis of ABC/CARE, Summary

	Females			Males			Pooled		
Removed Component	NPV	IRR	B/C	NPV	IRR	B/C	NPV	IRR	B/C
None	161,759	**10.1%**	**2.61**	919,049	**14.7%**	**10.19**	636,674	**13.7%**	**7.33**
		(6%)	(0.73)		(4%)	(2.93)		(3%)	(1.84)
Parental Income	148,854	4%	1.12	107,907	**11%**	**9.10**	116,953	**9%**	**6.17**
		(2%)	(0.65)		(3%)	(2.92)		(3%)	(1.87)
Subject Labor Income	41,908	9%	**2.21**	238,105	**13%**	**7.75**	133,032	**13%**	**6.03**
		(6%)	(0.66)		(5%)	(2.23)		(4%)	(1.77)
Subject Transfer Income	419	**10%**	**2.61**	-7,265	**15%**	**10.26**	-4,372	**14%**	**7.38**
		(6%)	(0.73)		(4%)	(2.93)		(3%)	(1.84)
Subject QALY	42,102	9%	**2.20**	106,218	**14%**	**9.14**	87,181	**13%**	**6.48**
		(6%)	(0.69)		(6%)	(2.73)		(5%)	(1.79)
Medical Expenditures	-16,037	9%	**2.77**	-42,038	**15%**	**10.61**	-31,221	**14%**	**7.65**
		(6%)	(0.76)		(3%)	(2.89)		(3%)	(1.85)
Alternative Preschools	16,691	8%	**2.45**	13,434	**14%**	**10.05**	14,659	**12%**	**7.19**
		(5%)	(0.73)		(4%)	(2.92)		(3%)	(1.84)
Education Costs	1,457	**10%**	**2.59**	-7,852	**15%**	**10.26**	-4,518	**14%**	**7.37**
		(6%)	(0.72)		(4%)	(2.93)		(3%)	(1.86)
Crime Costs	31,668	10%	**2.34**	638,923	**9%**	4.08	450,368	**8%**	**3.06**
		(6%)	(0.62)		(5%)	(2.18)		(4%)	(1.01)
Deadweight Loss		**18%**	**3.83**		**19%**	**15.38**		**18%**	**11.01**
		(12%)	(1.04)		(6%)	(4.35)		(5%)	(2.79)
0% Discount Rate			**5.06**			**25.45**			**17.40**
			(2.82)			(10.42)			(5.90)
7% Discount Rate			**1.49**			**3.78**			**2.91**
			(0.32)			(0.79)			(0.59)

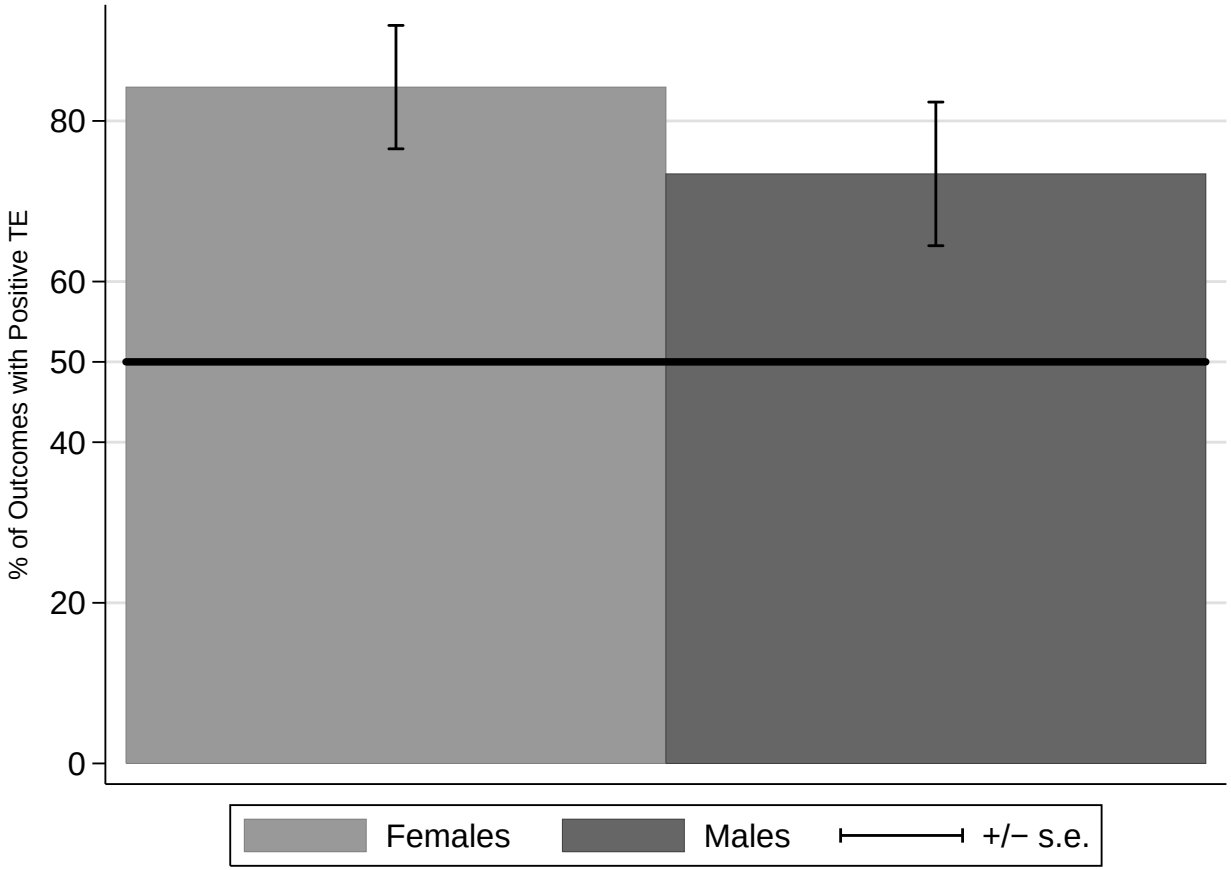
More Rigorous and Reliable Estimates of Benefit/Cost Ratios

	Outcomes Analyzed	
Standard Approach (Kline and Walters; Chetty et al.)	Labor Income at Age 27	.09 (.04)
Our Approach	Lifetime Labor Income	1.55 (.76)
	All Sources	7.33 (1.84)

Gender Differences

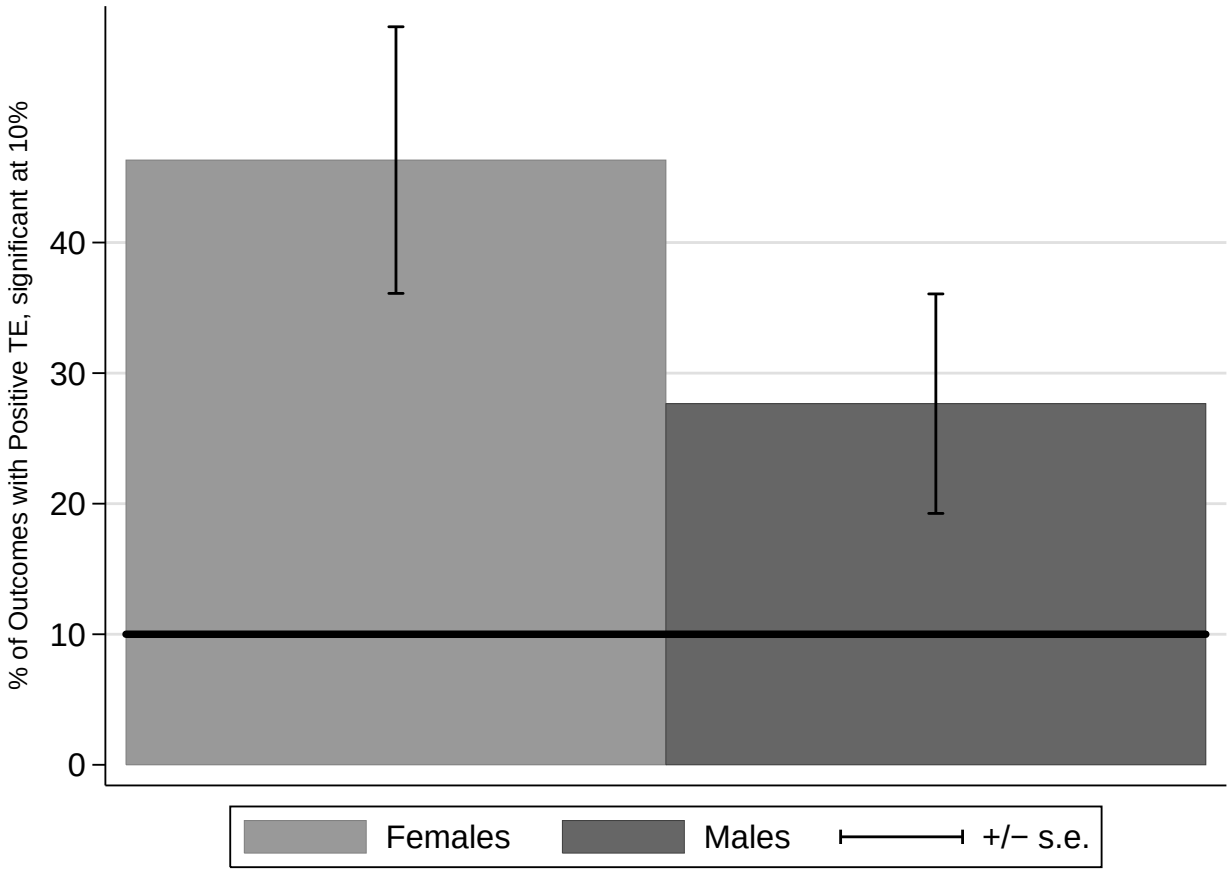
Preview of Results: Treatment Effects

Figure 29: Percentage of Outcomes with a Positive Treatment Effect

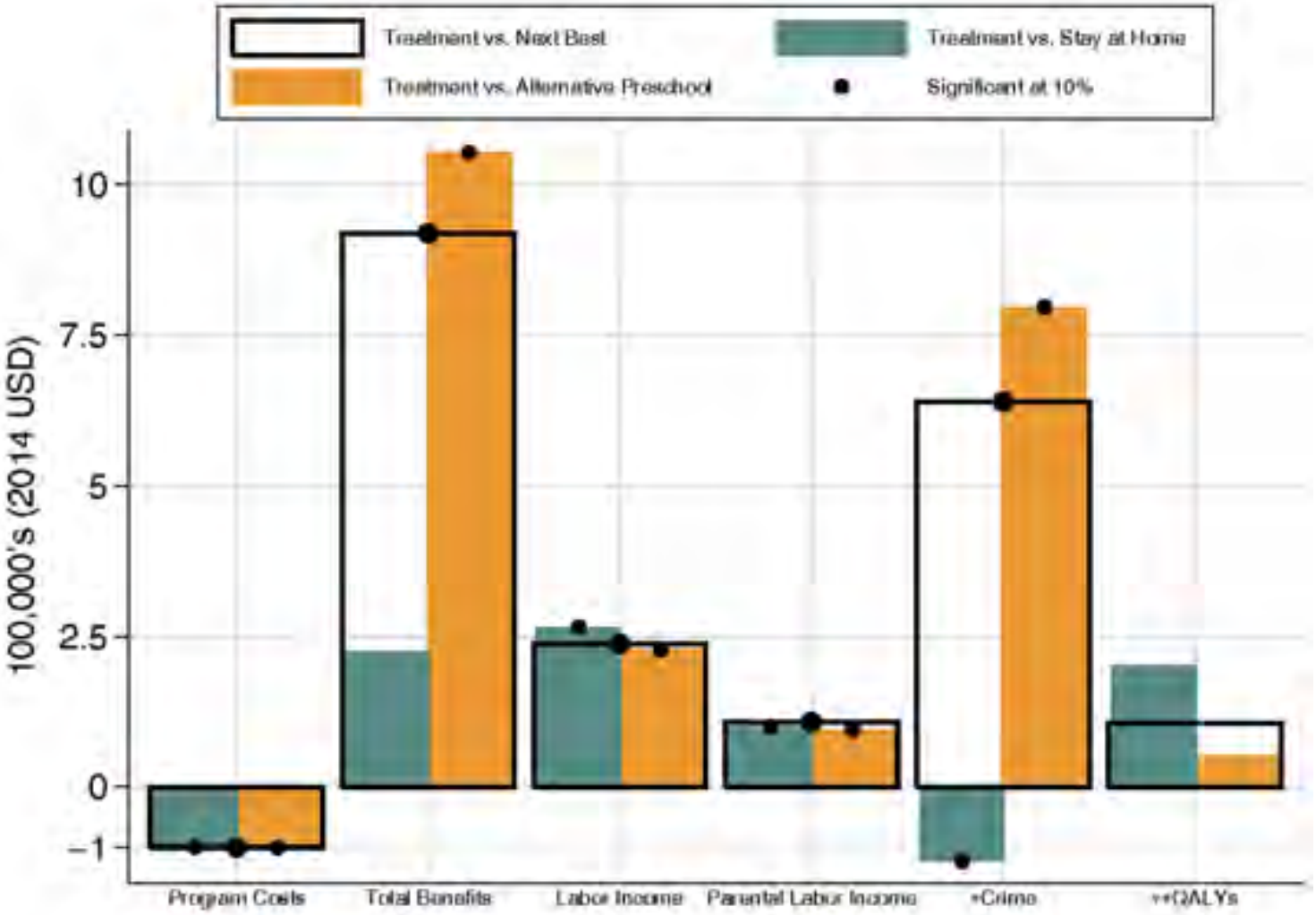


Preview of Results: Treatment Effects

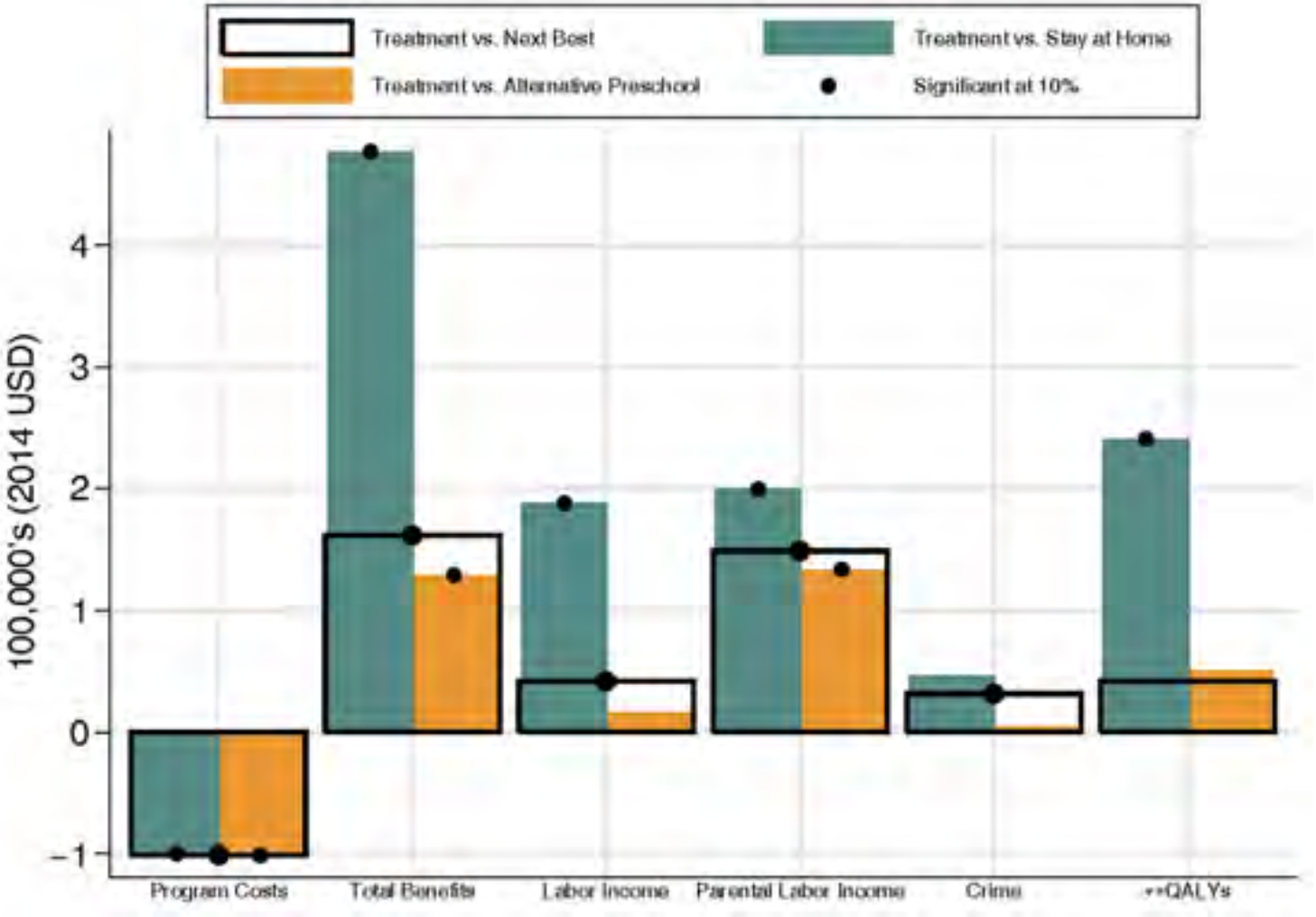
Figure 30: Percentage of Outcomes with Positive and Significant Treatment Effects (at 10%)



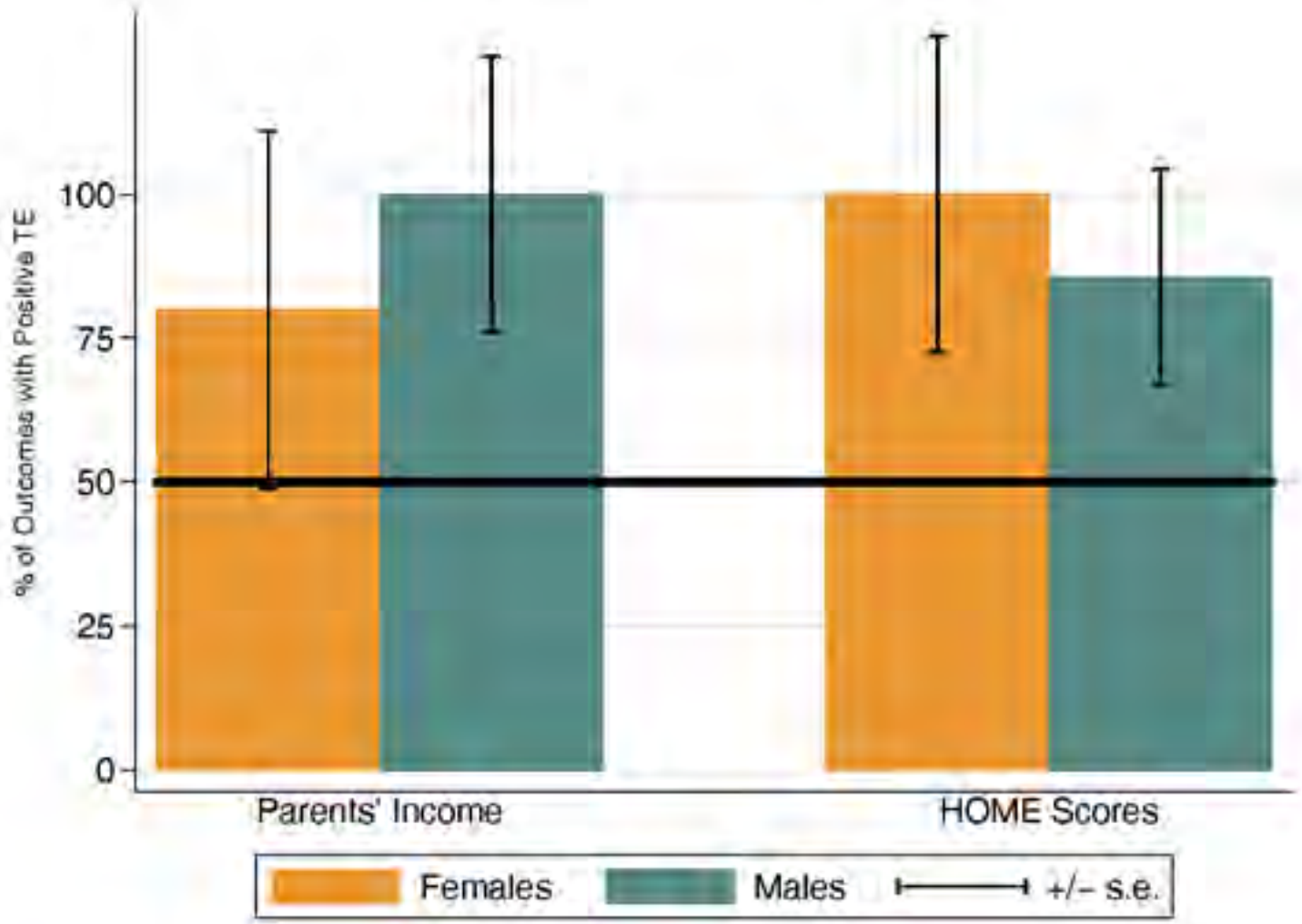
Life-cycle Net Present Value of Main Components of the CBA: Males



Life-cycle Net Present Value of Main Components of the CBA: Females

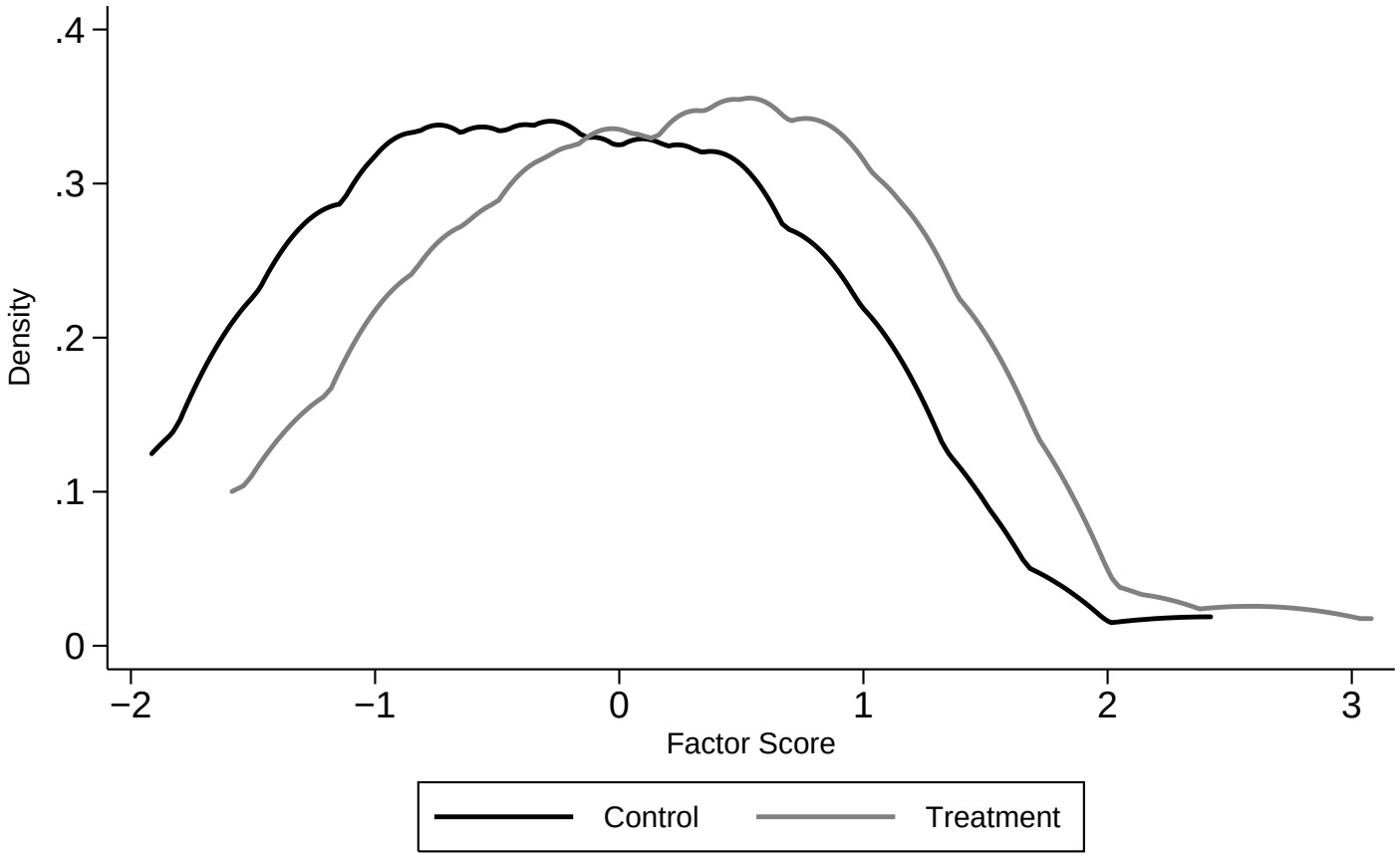


Home Scores and Parental Income



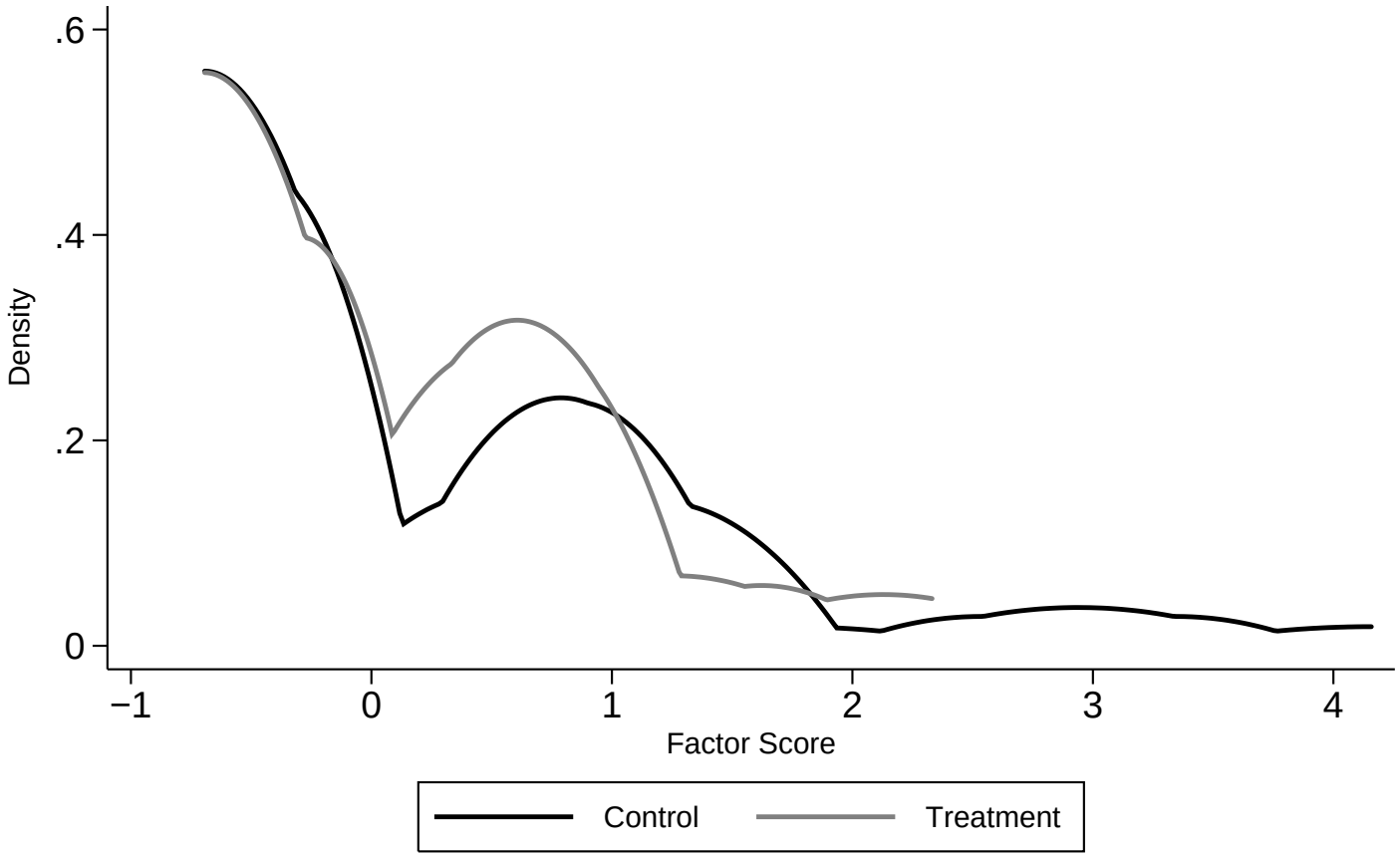
Response of Parents to Interventions

Figure 31: Number of people whom one can confide at 21 (sign of factor); gets emotional support from dad; close to parents at 21



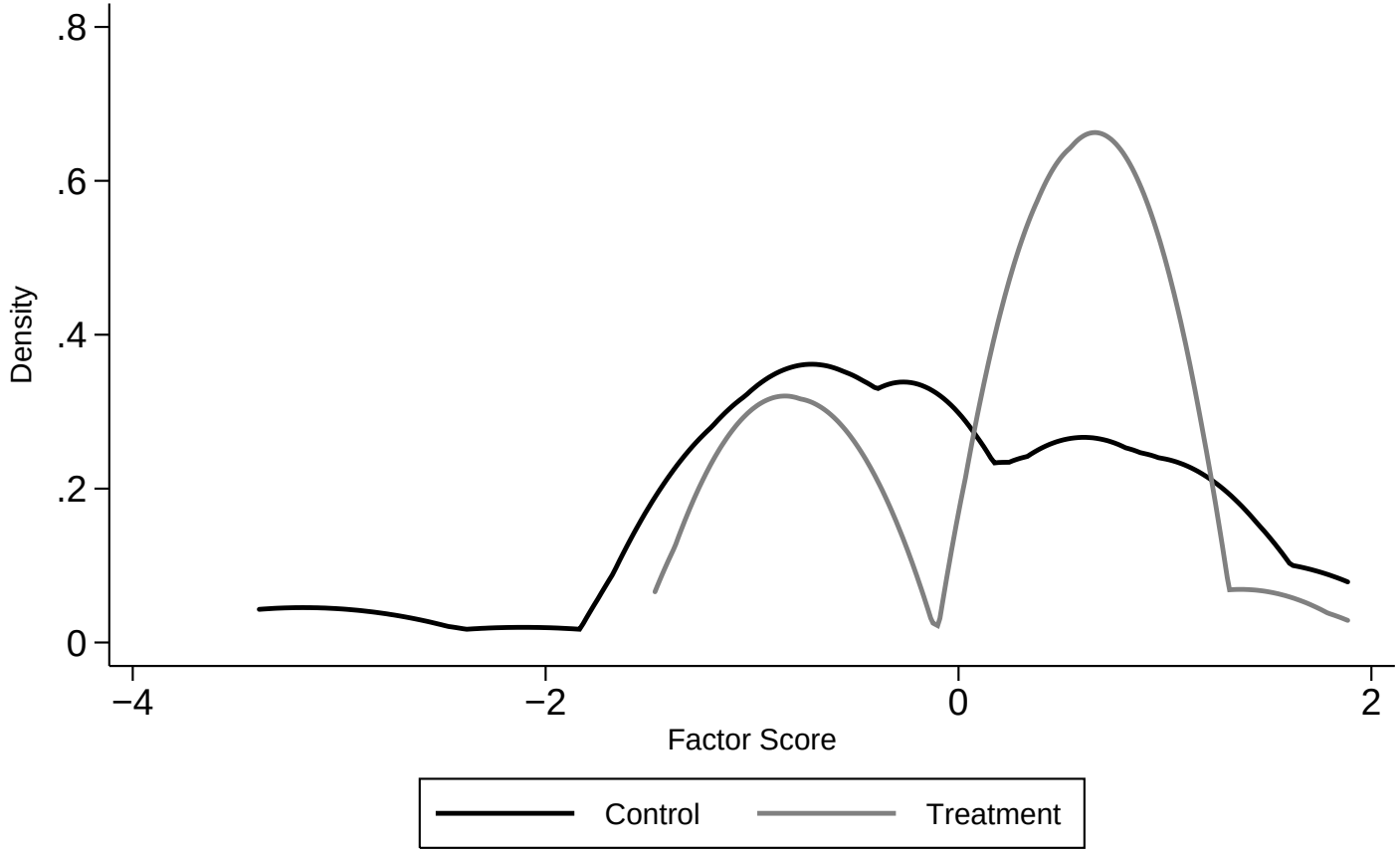
Average Treatment Effect, Pooled: .44 (p−value: .02)
Average Treatment Effect, Females: .72 (p−value: .01)
Average Treatment Effect, Males: .23 (p−value: .21)

Figure 32: Incarcerated at 21; ever cited for breaking the law at 30 (sign of factor)



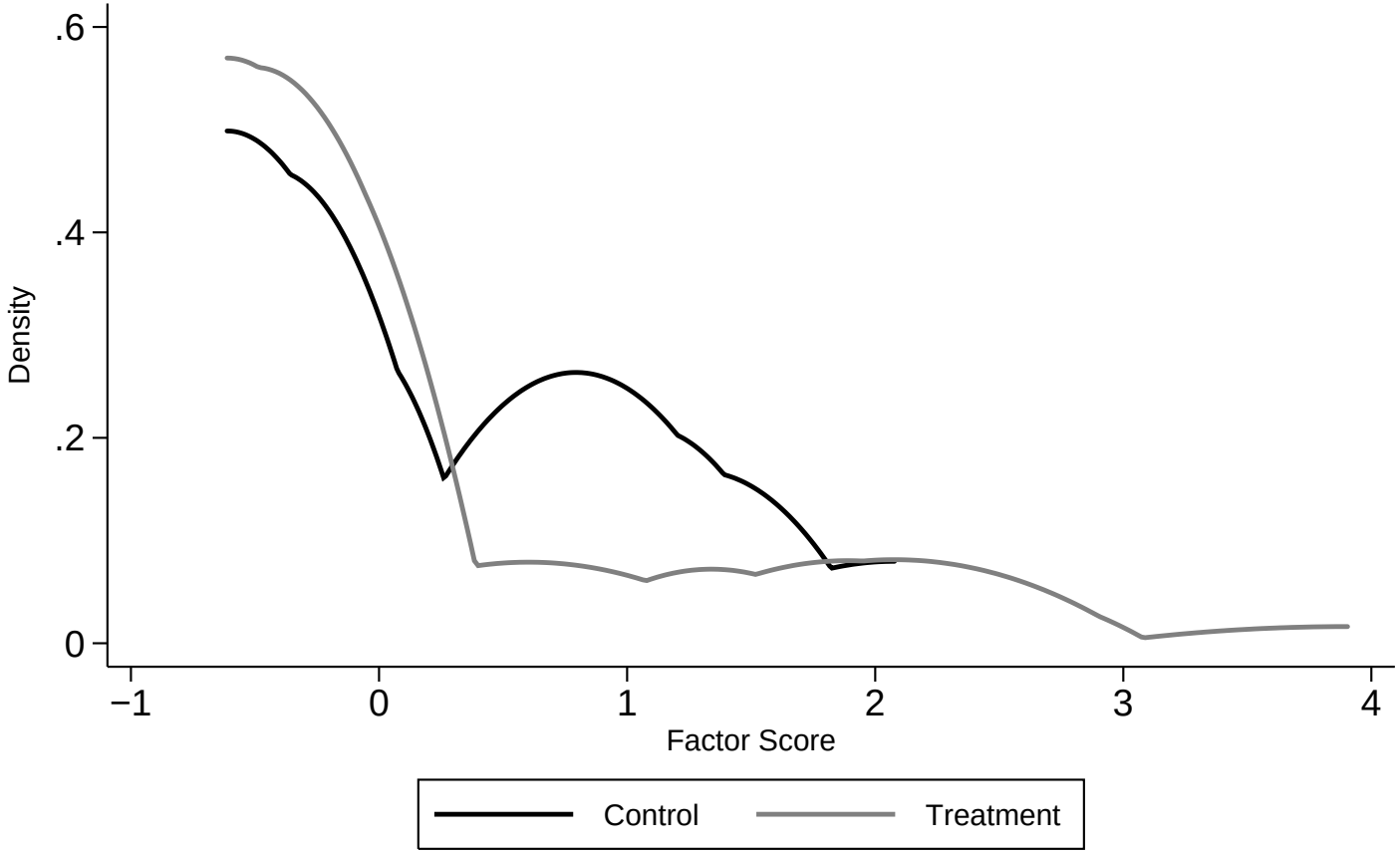
Average Treatment Effect, Pooled: −.11 (p−value: .29)
Average Treatment Effect, Females: .07 (p−value: .34)
Average Treatment Effect, Males: −.48 (p−value: .08)

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)

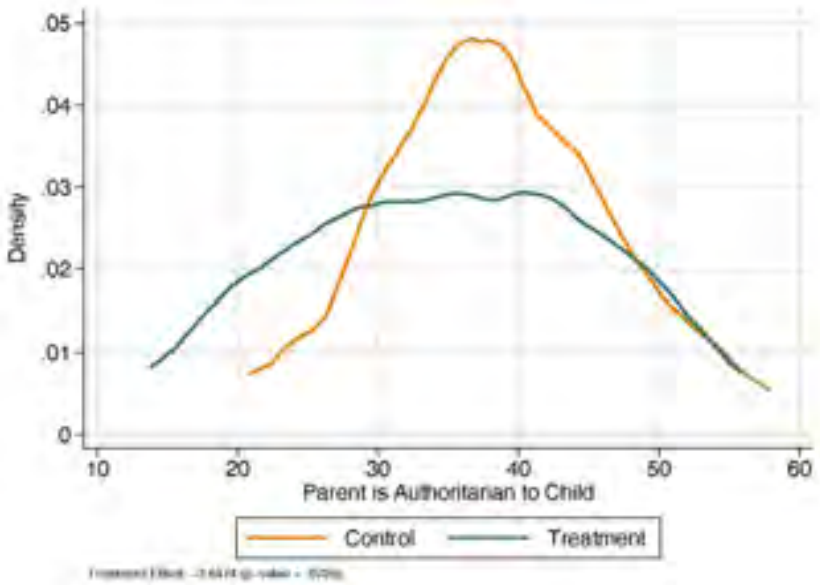
Figure 34: Child is sick at 7 and 10 (sign of factor)



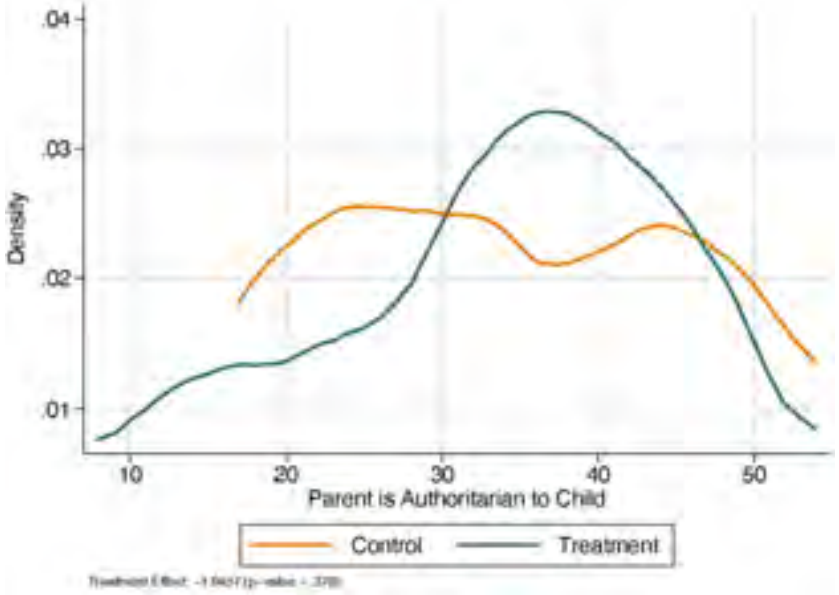
Average Treatment Effect, Pooled: −.19 (p−value: .19)
Average Treatment Effect, Females: .36 (p−value: .12)
Average Treatment Effect, Males: −.75 (p−value: 0)

Authoritative Parenting

Females



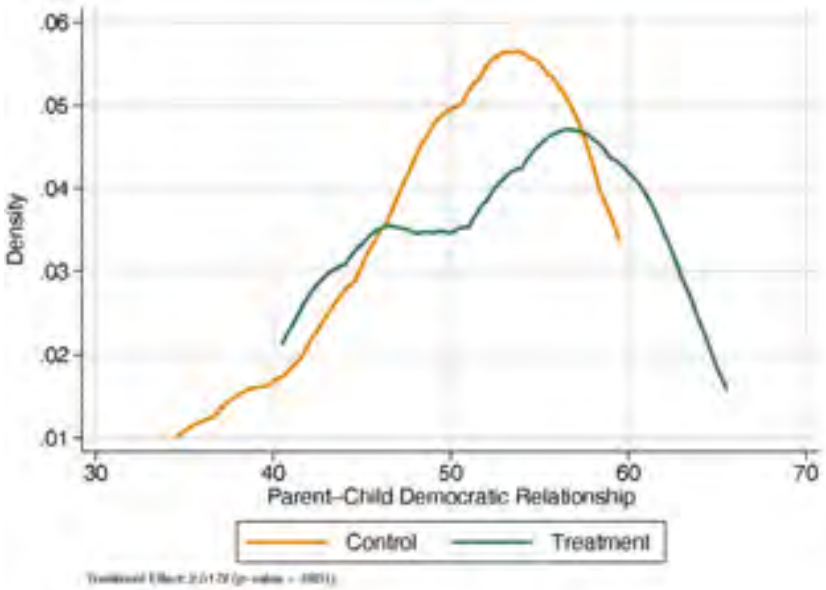
Males



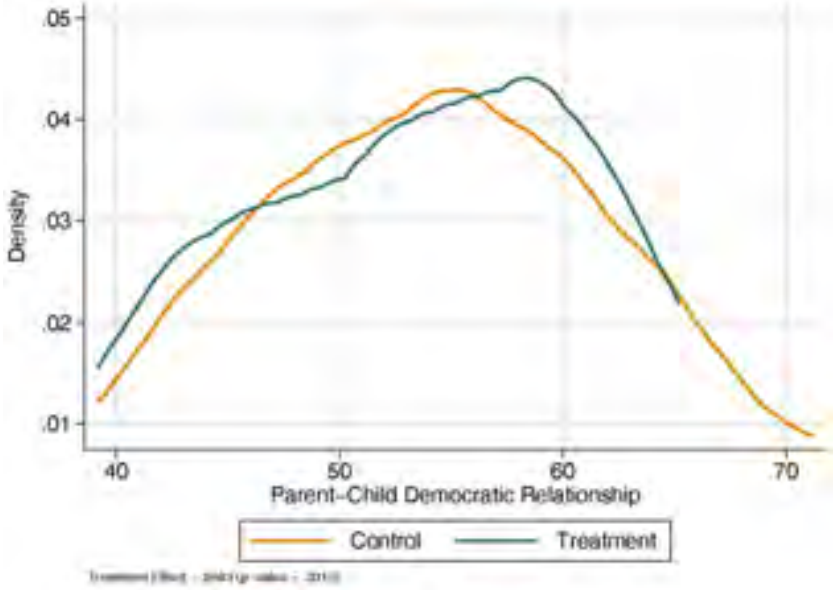
Note: This plot densities by treatment status of a (factor) measure of parent authoritativeness based on the Parental Attitude Research Instrument (PARI).

Democratic Parenting

Females



Males



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

	Outcomes Analyzed	**Stepdown *p*-value***
A. First Job	0.27	0.11
All Full Time Non-Temporary	0.35	0.01
	0.53	0.03
B. Last Job	0.27	0.06
All Full Time Non-Temporary	0.40	0.01
	.050	0.00
C. Current Job	0.27	0.09
All Full Time Non-Temporary	0.43	0.02
	0.44	0.02
D. Average Earnings	0.40	0.01
All Full Time Non-Temporary	0.34	0.01
	0.47	0.01

*Adjusts for multiple hypothesis testing

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Impact of Treatment on Education and Skills

	Sample Size	Control Mean	Treatment Effect	Stepdown *p*-value*
A. Schooling				
In school	97	0.15	0.17	0.04
In school full-time	97	0.07	0.18	0.01
B. Skills				
Cognitive factor	102	-0.46	0.59	0.01
Externalizing behavior factor	102	-0.23	0.22	0.30
Internalizing behavior factor	102	-0.32	0.39	0.05
Ever expelled from school	105	0.17	-0.12	0.02

*Adjusts for multiple hypothesis testing

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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

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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)

1. Self-reported health
2. Voting
3. Trust
4. Employment
5. Wages
6. Participation in welfare
7. Depression
8. Self-esteem
9. Incarceration
10. Health related work limitations
11. Smoking
12. White-collar employment

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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.

Summary

- 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.

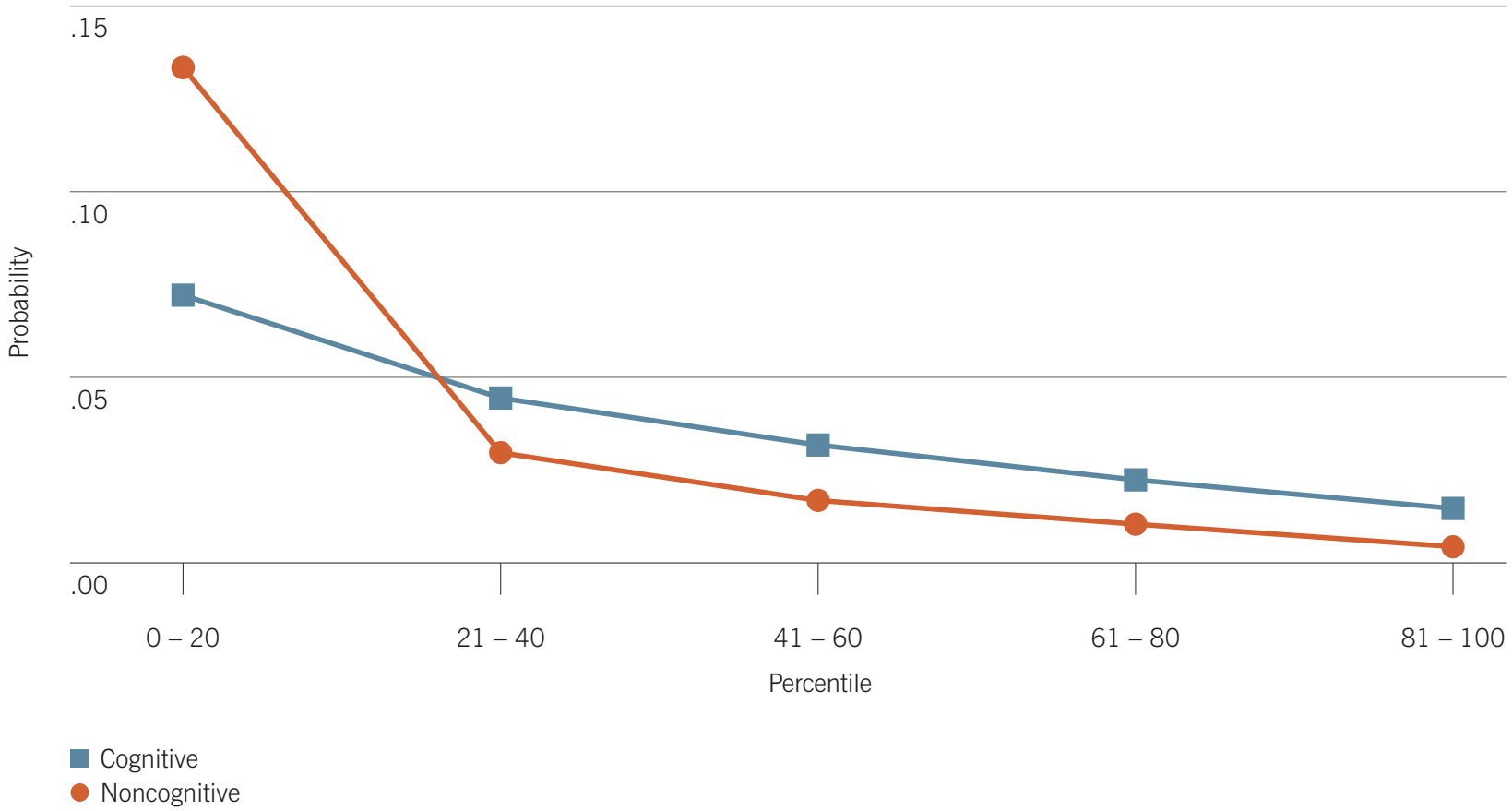
- It has been suggested that policies that redistribute income toward disadvantaged families might be highly effective in producing greater opportunity for disadvantaged children.
- **But income transfers alone do not solve the problem of intergenerational mobility.**
- The U.S. tried a policy of redistribution 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.

Source: Heckman, Stixrud, and Urzua (2006).

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.

Source: Heckman, Stixrud, and Urzua (2006).

Figure 36: Cognitive and Socio-Emotional Factors: Physical Health, Males

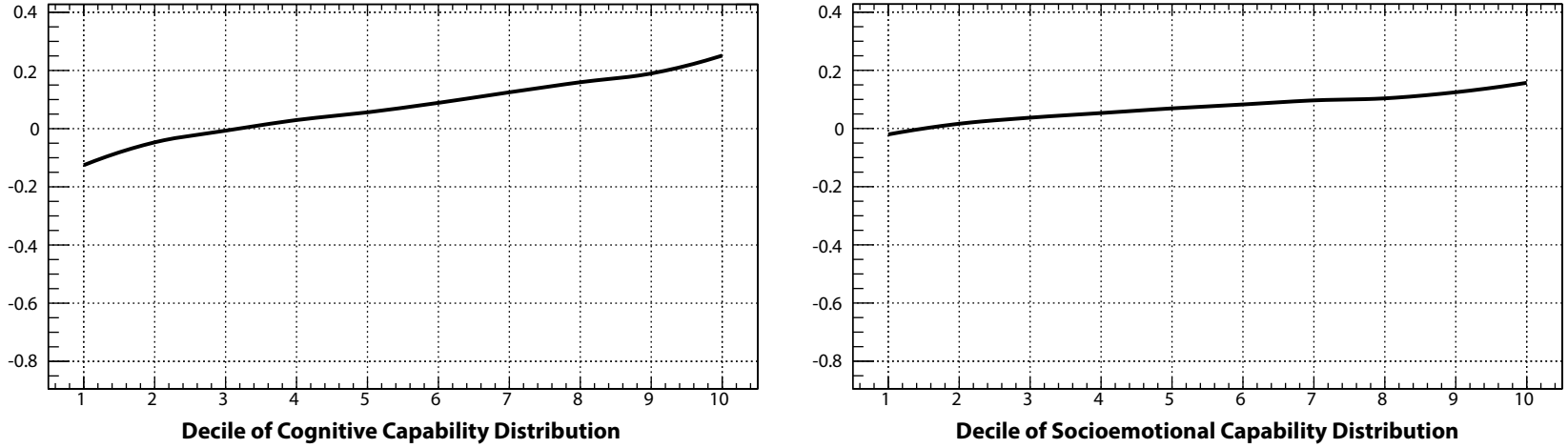
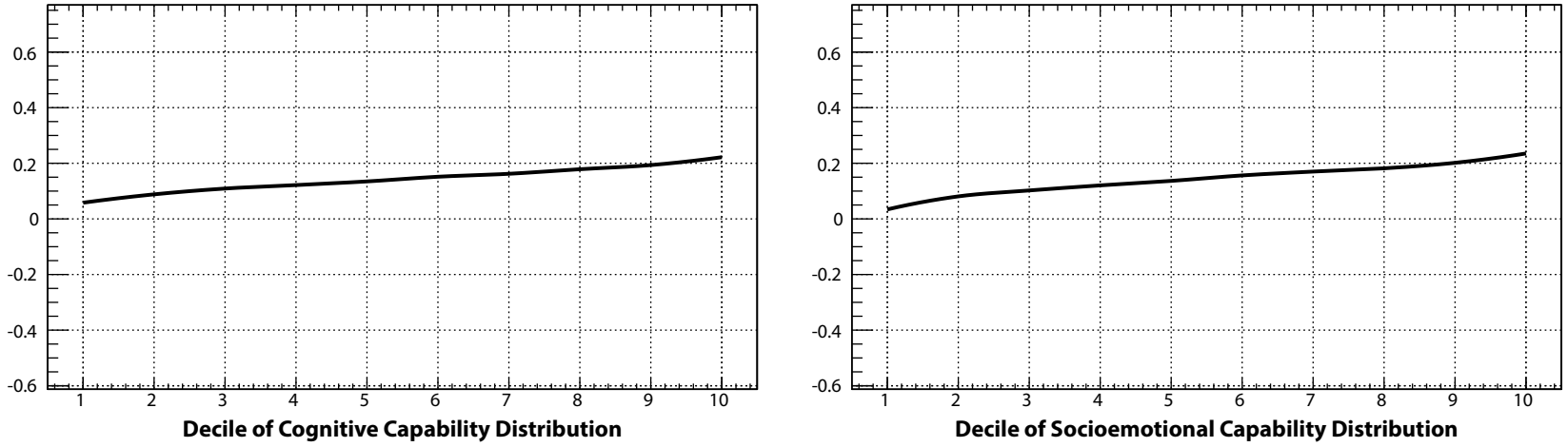
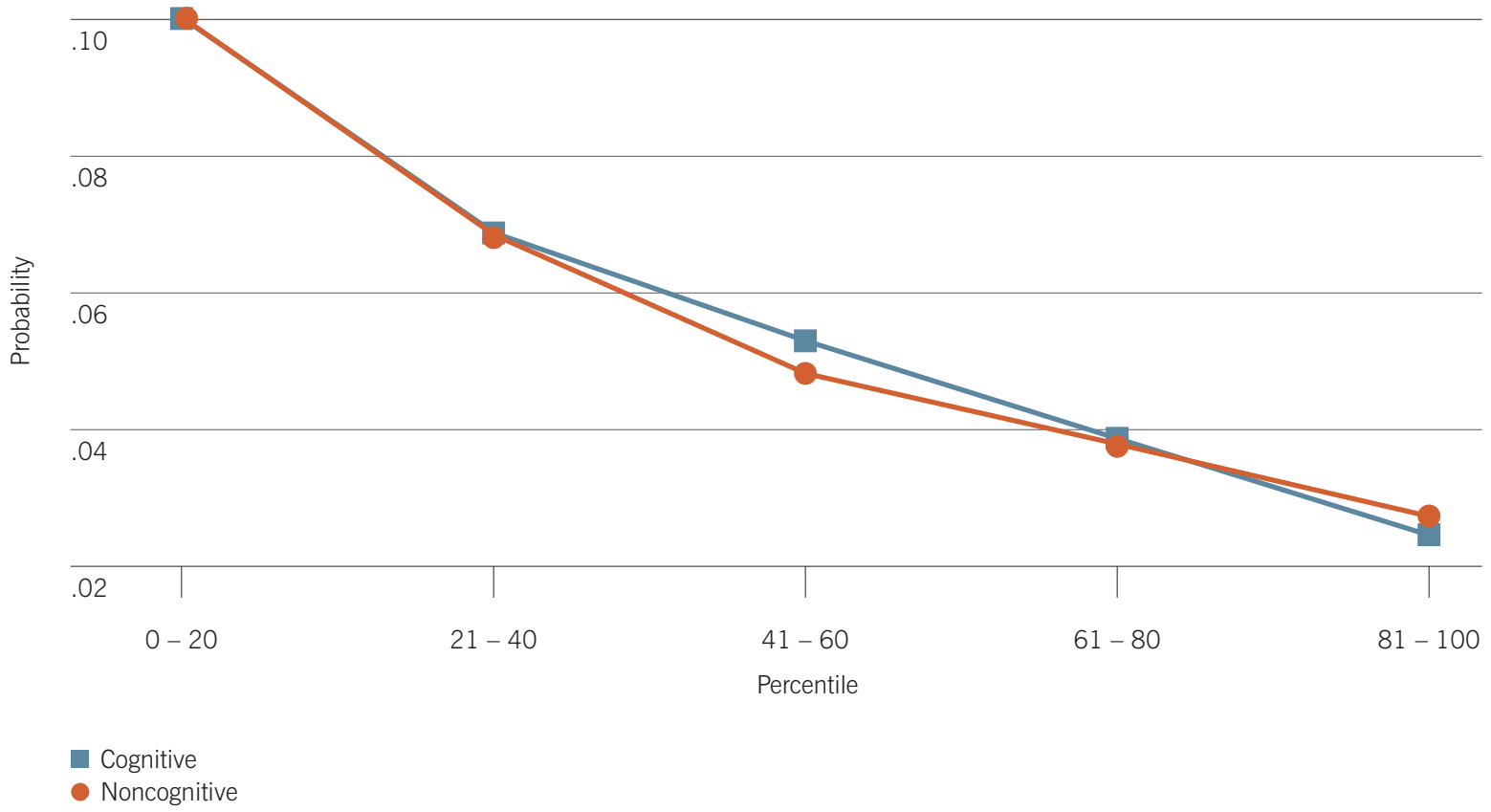


Figure 37: The Effect of Cognitive and Socio-Emotional Endowments on Mental Health at Age 40



Probability of Being Single With Children (Females)

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 noncognitive ability after integrating the cognitive ability.

Source: Heckman, Stixrud, and Urzua (2006).

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.
Source: Heckman, Stixrud, and Urzua (2006).

Figure 39: Cognitive and Socio-Emotional Factors: Probability of Graduating from Secondary School, Males

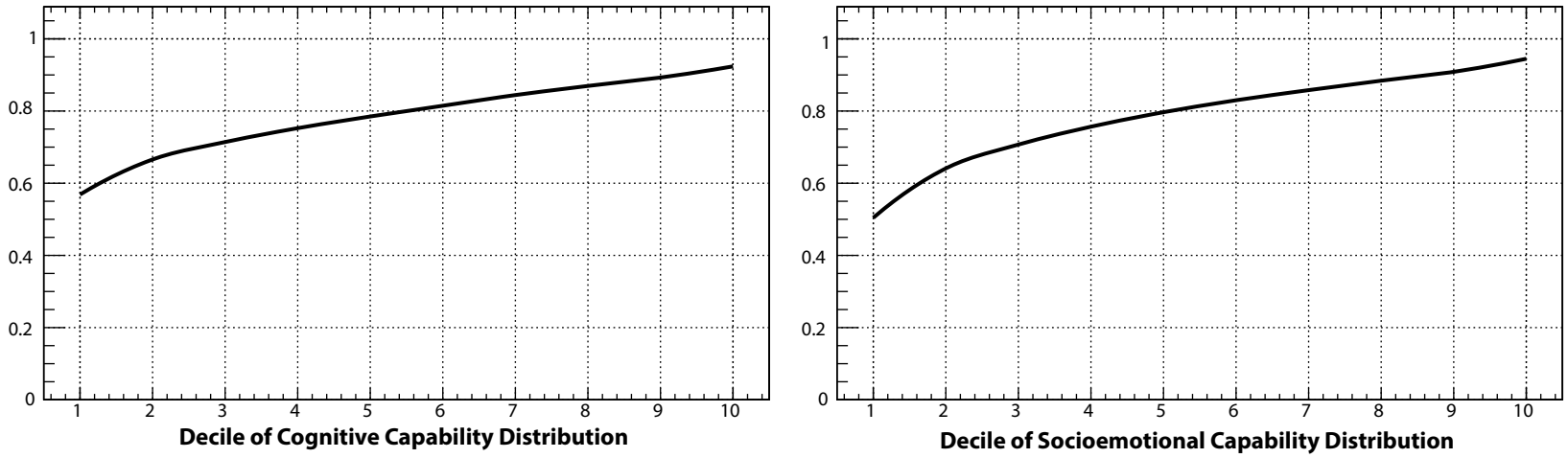
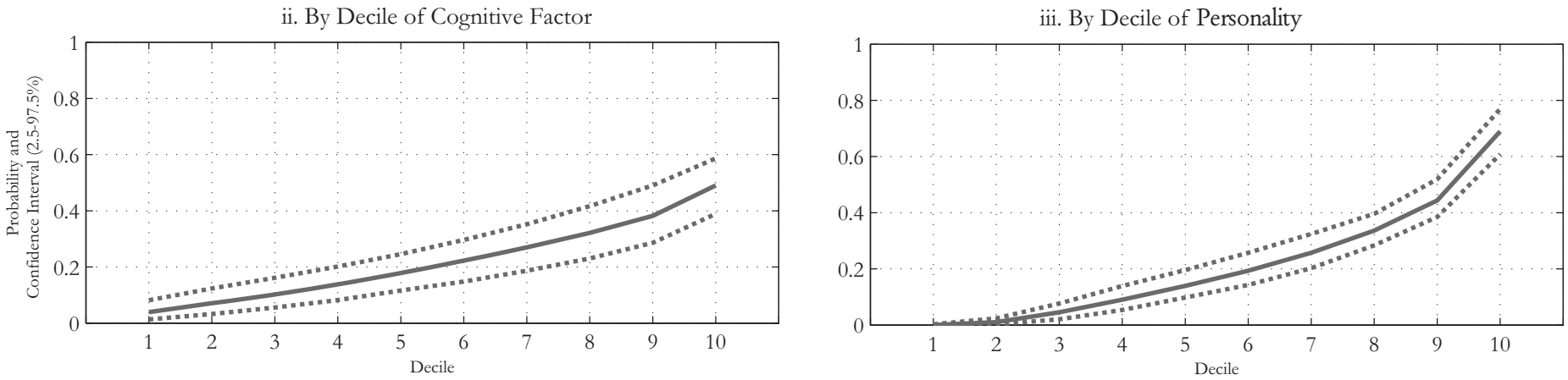


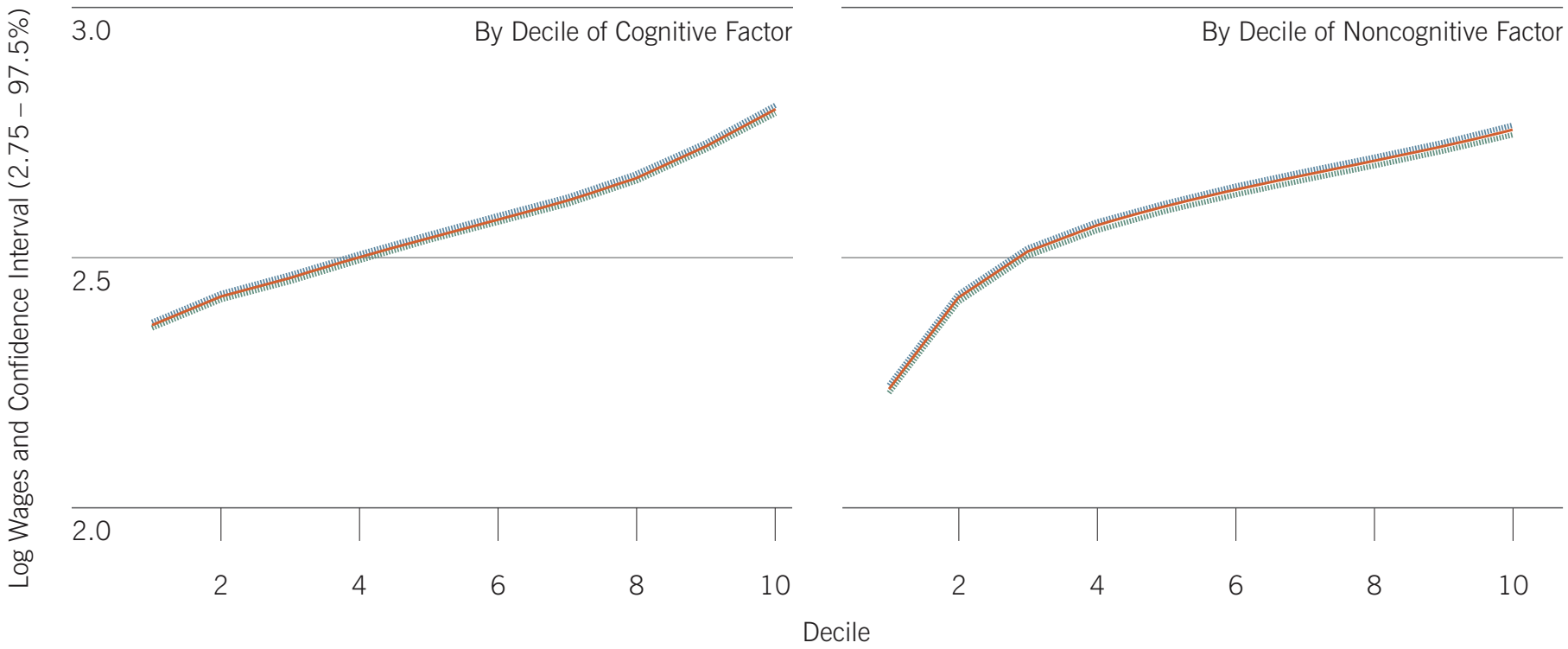
Figure 40: Probability of Being a Four-Year College Graduate by Age 30



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).

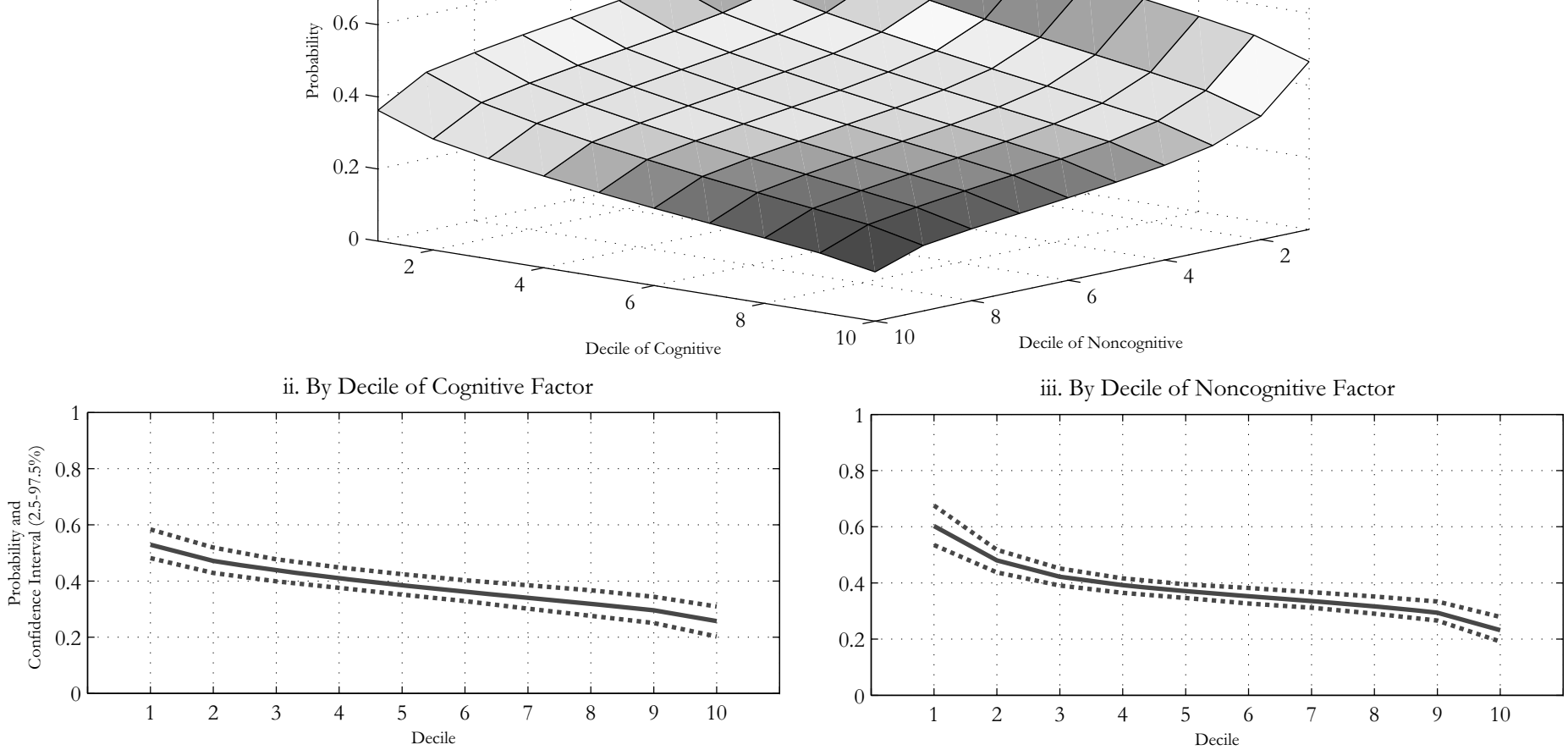
Mean Log Wages by Age 30 (Males)

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 (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

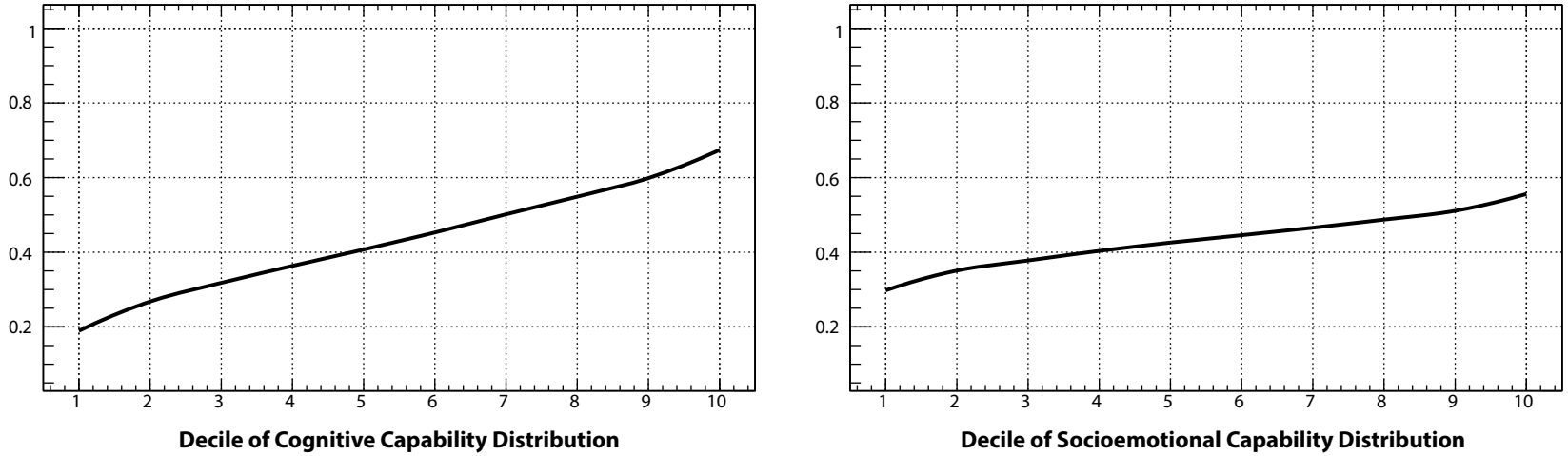


Figure 44: The Effect of Cognitive and Socio-Emotional Endowments on Heavy Drinking During Adulthood

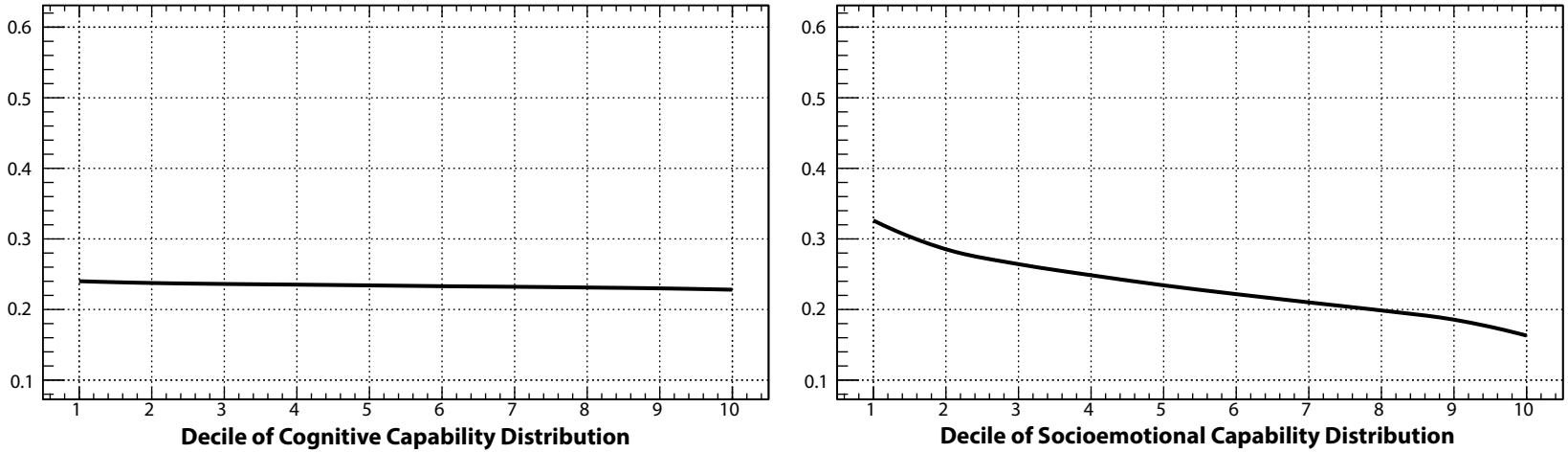
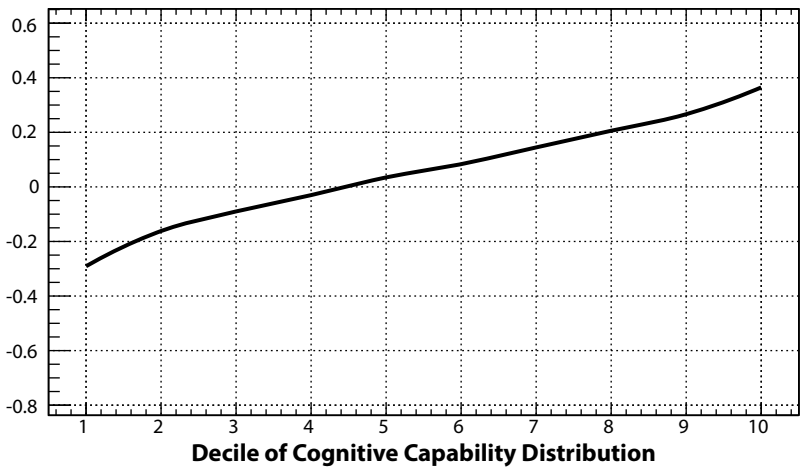


Figure 45: The Effect of Cognitive and Socio-Emotional Endowments on Pearlin's "Personal Mastery Scale": Sense of Self-Mastery



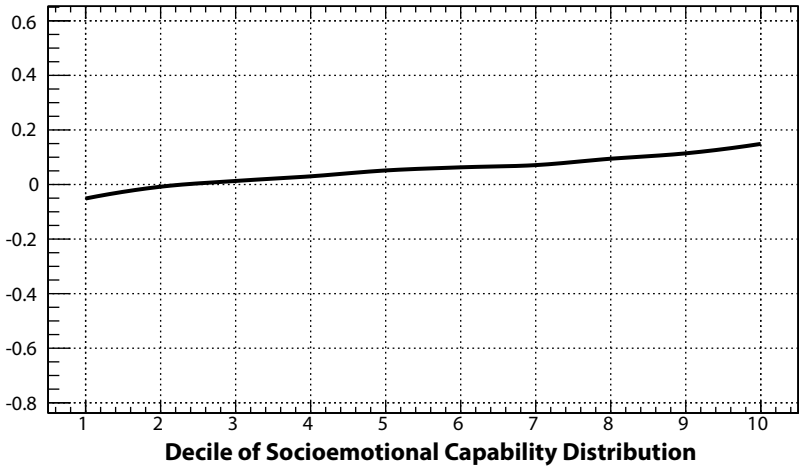
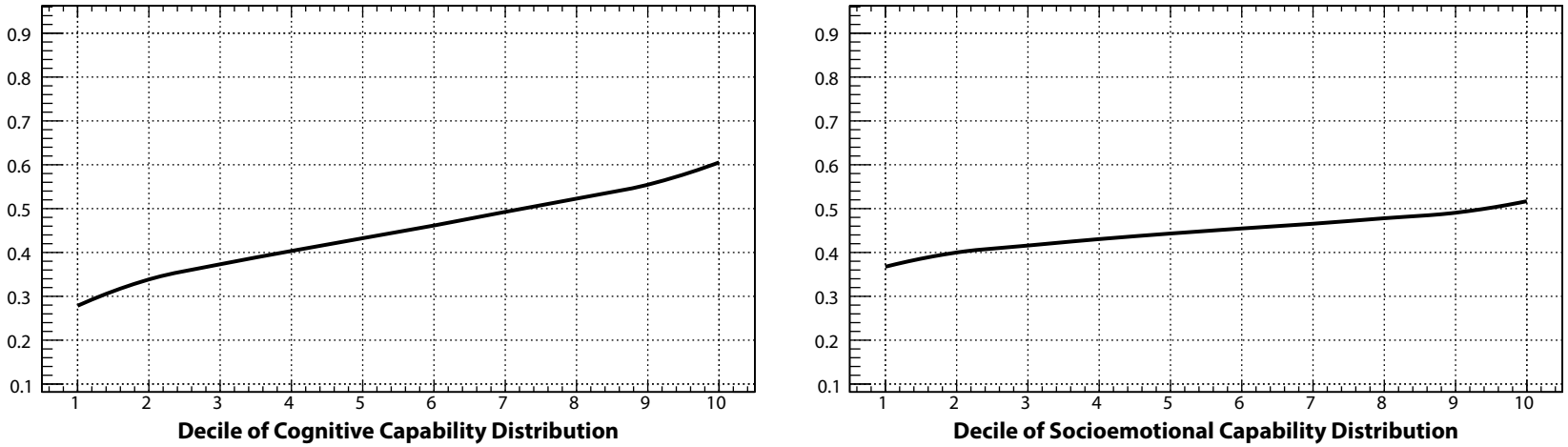


Figure 46: The Effect of Cognitive and Socio-Emotional Endowments on Trusting People (2008)



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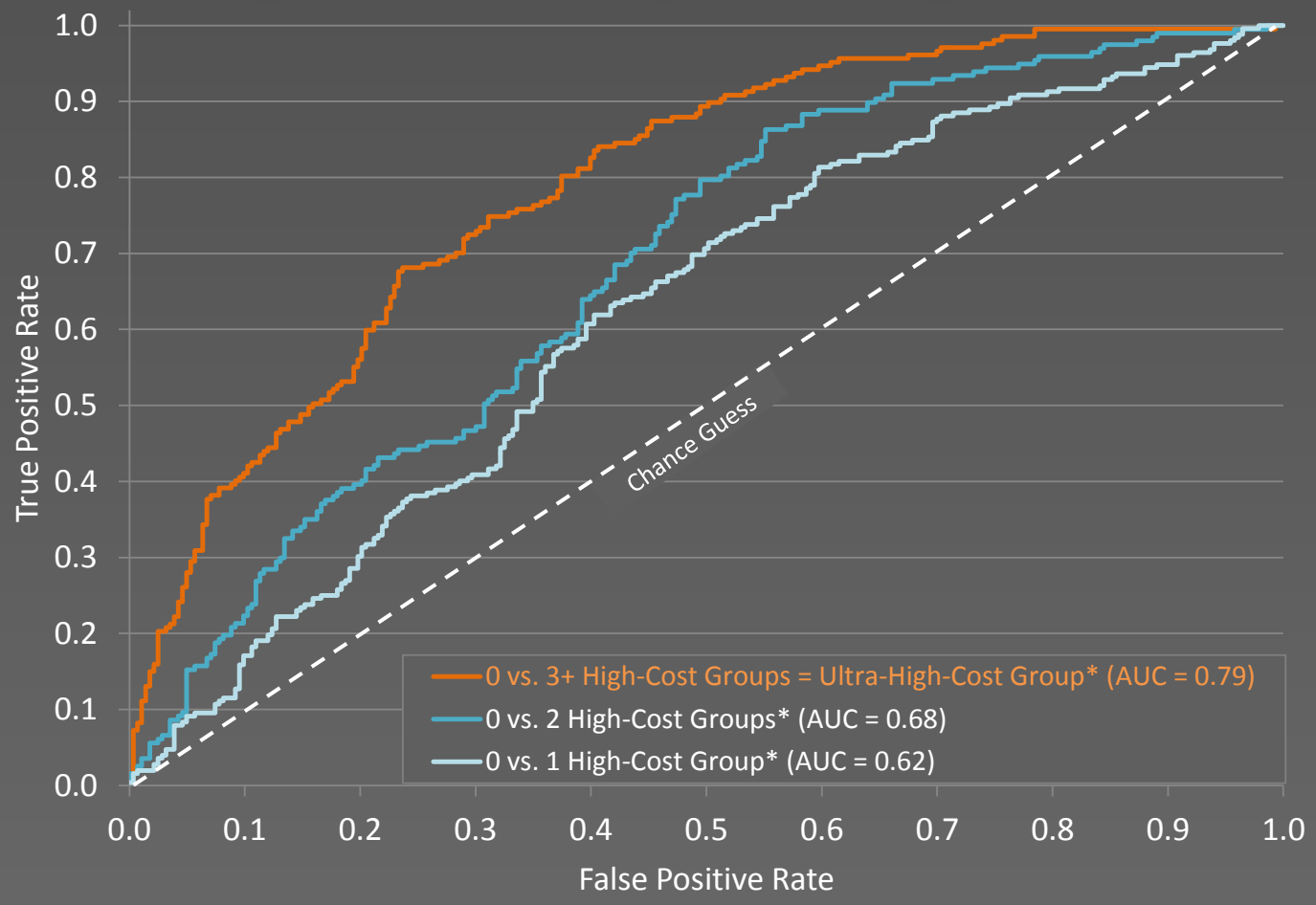
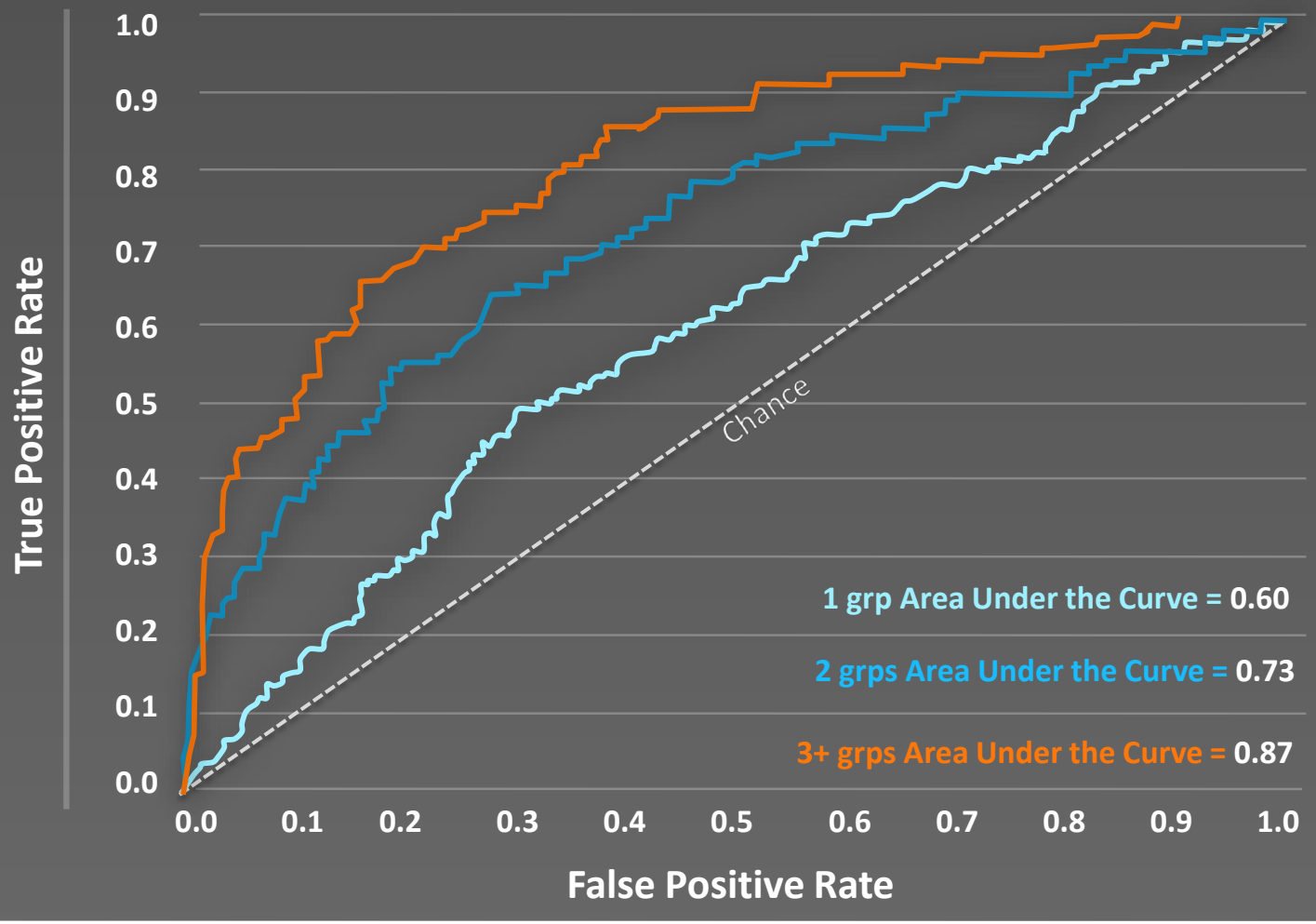
Age-3 Brain Health predicts high-need/high-cost group



ROC-Curve Discriminating Individuals in 0 vs. 1, 0 vs. 2, and 0 vs. 3+ User Groups



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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).

4. Skills are multiple in nature.
   i. 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.
   ii. An important lesson from recent research is that cognitive skills are only part of what is required for success in life.
   iii. 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.
   iv. Cognitive and non-cognitive skills are both important causal determinants of life cycle outcomes with equal strength for many outcomes.

5. Gaps in skills across socio-economic groups open up very early:
   a. Persist strongly for cognitive skills
   b. Less strongly for non-cognitive skills
   c. Widen with age for many biological skills
6. 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.

7. 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.
   i. Family influence extends well beyond the transmission of genes.
   ii. Cognitive and social skills are not fixed at birth, they are not solely genetically determined, and they can be enhanced.
8. The powerful role of early family influence is a concern because family environments in Brazil have deteriorated in many dimensions in recent years.

9. 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.

v. They also foster workforce productivity.
vi. These interventions have high benefit-cost ratios and rates of return. They pass efficiency criteria that any social program should be asked to pass.
vii. Quality early childhood policies are among the rare social policies that face no equality-efficiency tradeoff.
viii. **What is fair is also economically efficient.**
ix. 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.

10. This greater return arises because of the dynamics of skill formation.
    - i. Life cycle skill formation is a dynamic, synergistic process. Skills beget capabilites; 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.
    - ii. The longer society waits to intervene in the life cycle of a disadvantaged child, the more costly it is to remediate disadvantage.
    - iii. Similar dynamics are at work in creating child health and mental health.
    - iv. 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.

11. 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

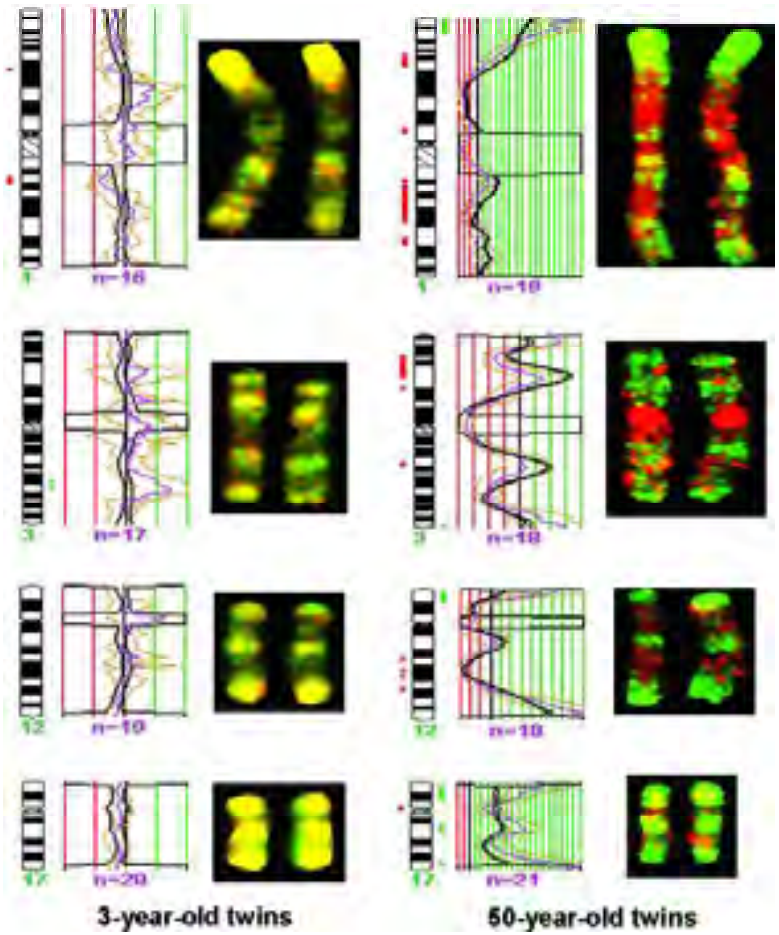
12. Many successful early childhood interventions followed over the life cycle operate primarily through boosting non-cognitive skills. IQ is often barely budged.
13. Long-term evaluations of interventions often provide a different assessment of the effectiveness of interventions than do short-run evaluations.
14. Adolescent remediation as currently implemented is largely ineffective, especially for cognitive interventions.

15. Remediation is less effective than prevention when there are good detection strategies for identifying risk factors for later life.
16. There is growing recognition of which early conditions and environments create risk factors.
17. A major refocus of public policy is required to incorporate modern understanding of the life cycle dynamics of skill formation.
    i. Although schools and schooling are important, effective social policy targets and strengthens the family.
    ii. 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.

DNA Methylation

Figure 47: DNA Methylation and Histone Acetylation Patterns in Young and (

Methylation patterns in young and old twins



Manel Esteller

Source: Fraga, Ballestar et al. (2005)

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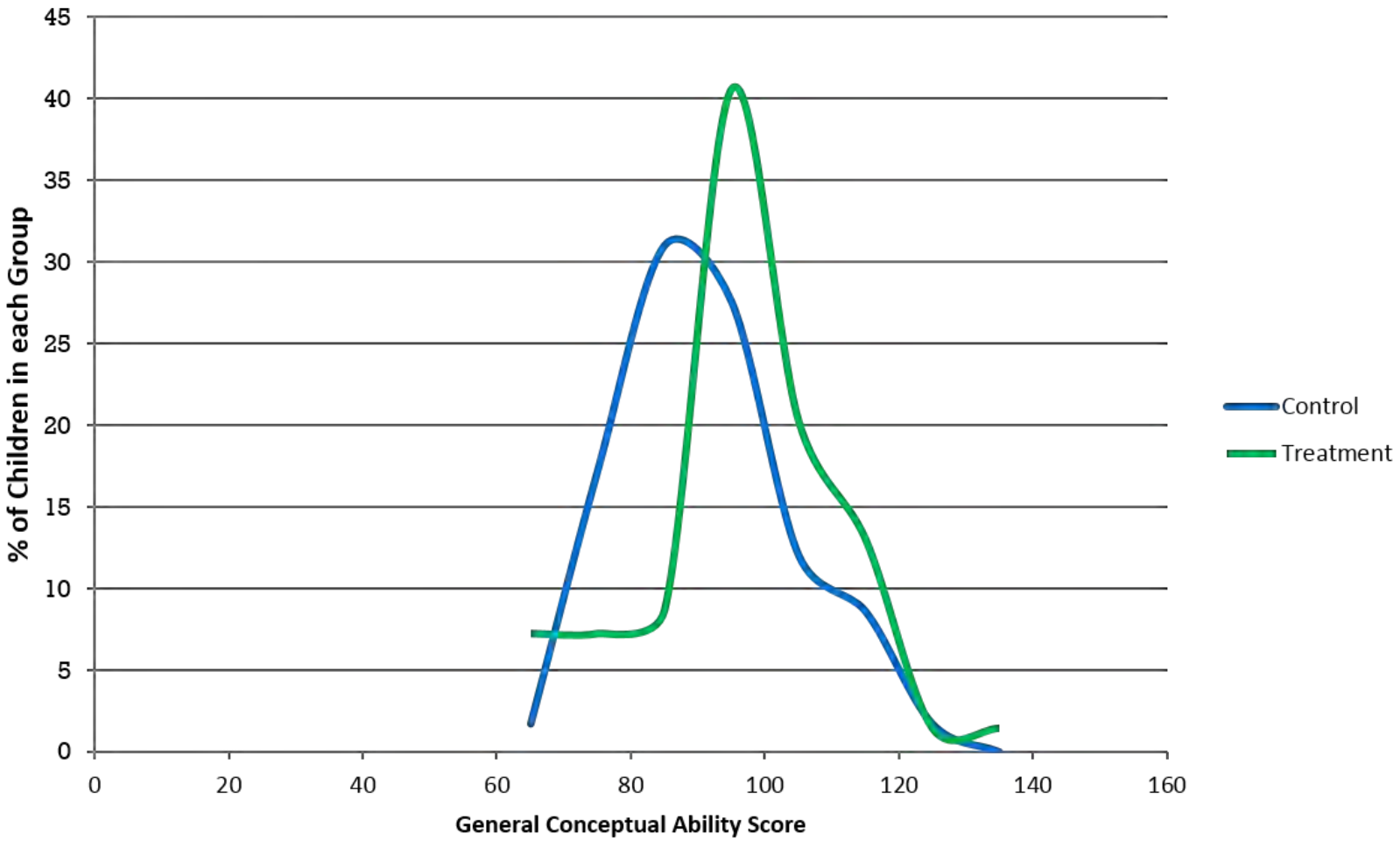
Figure 48: Distribution of BAS GCA Cognitive Scores



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

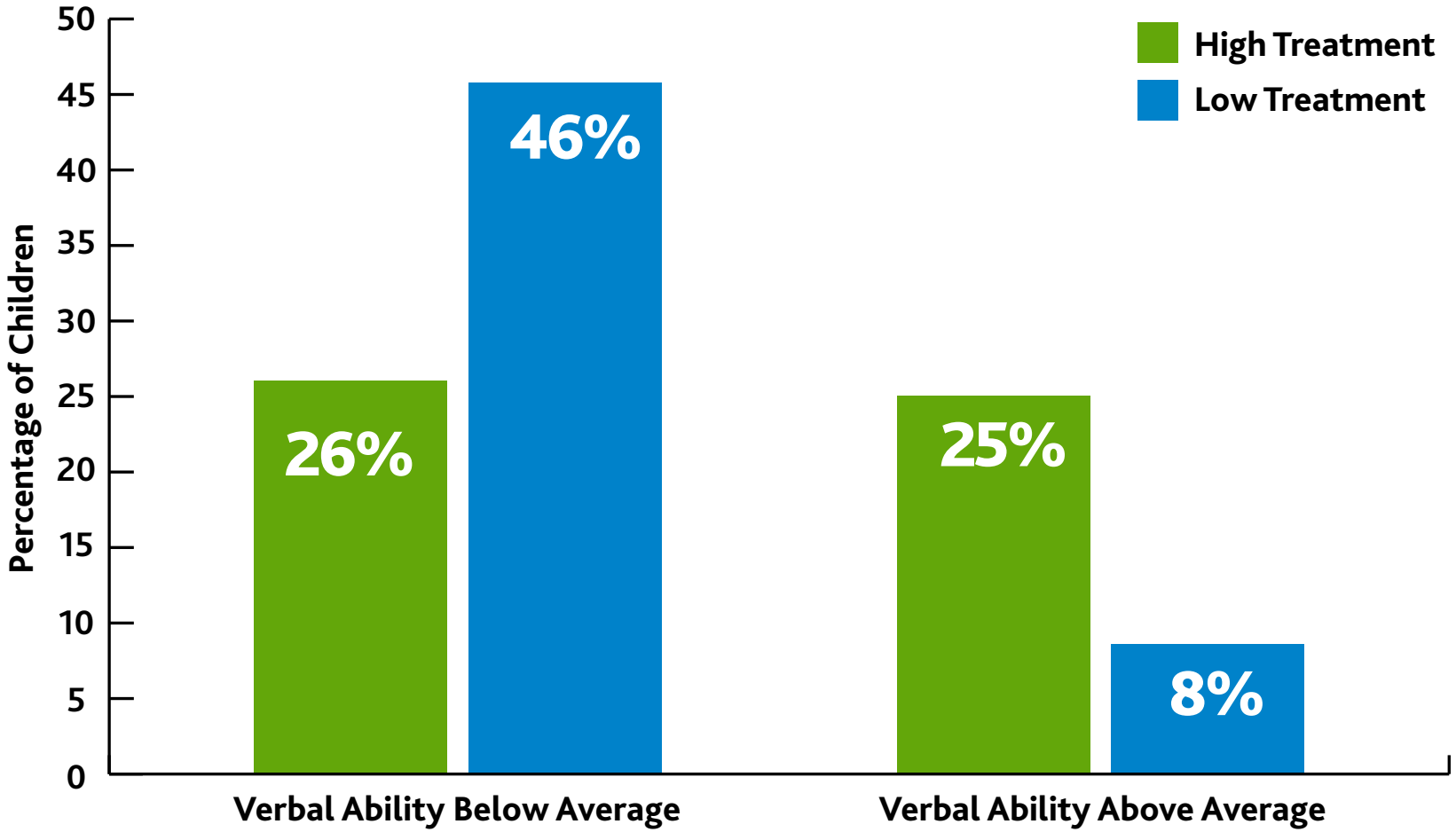


Figure ES.5 - *Percentage of Children Scoring Above and Below Average in Verbal Ability*

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).

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

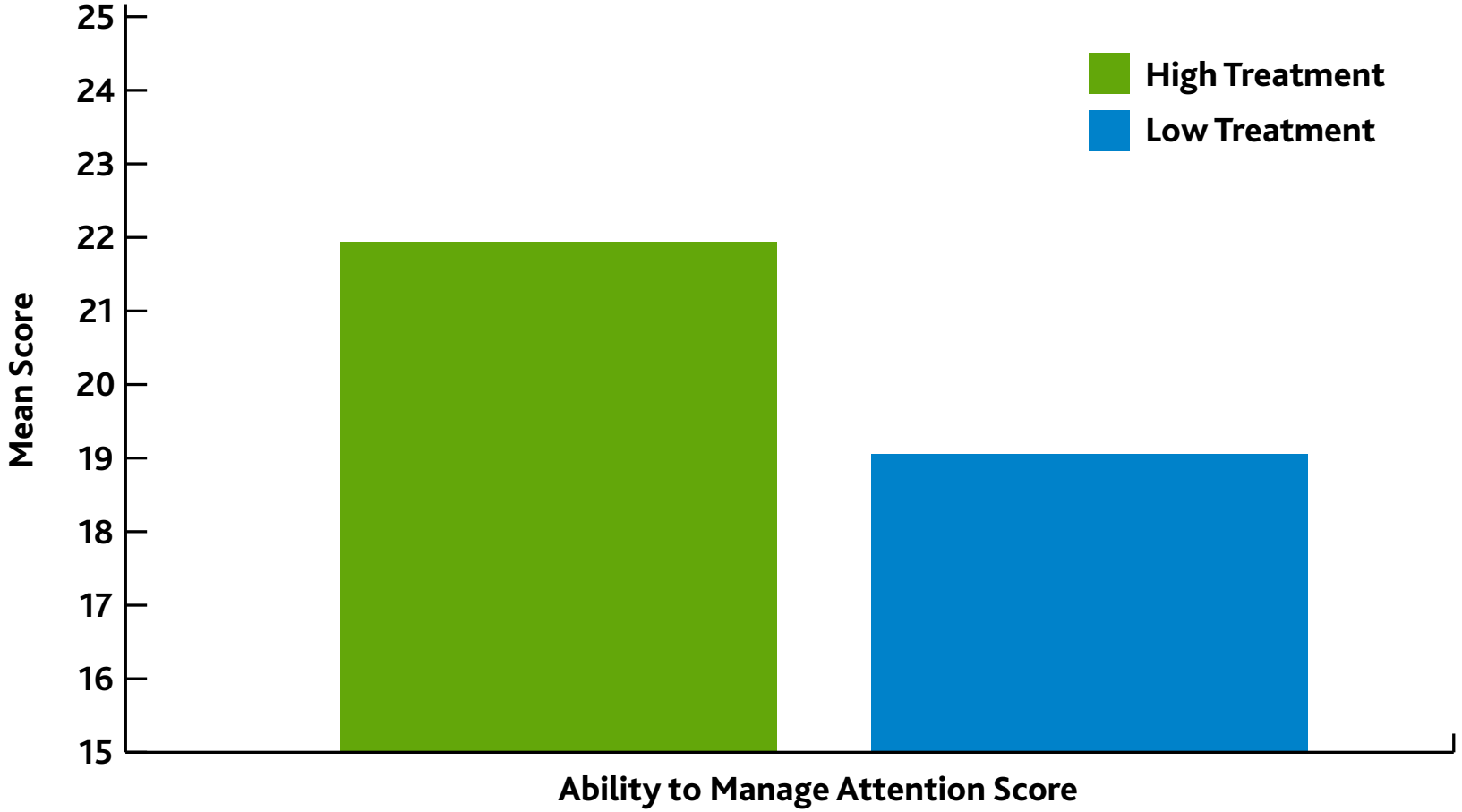
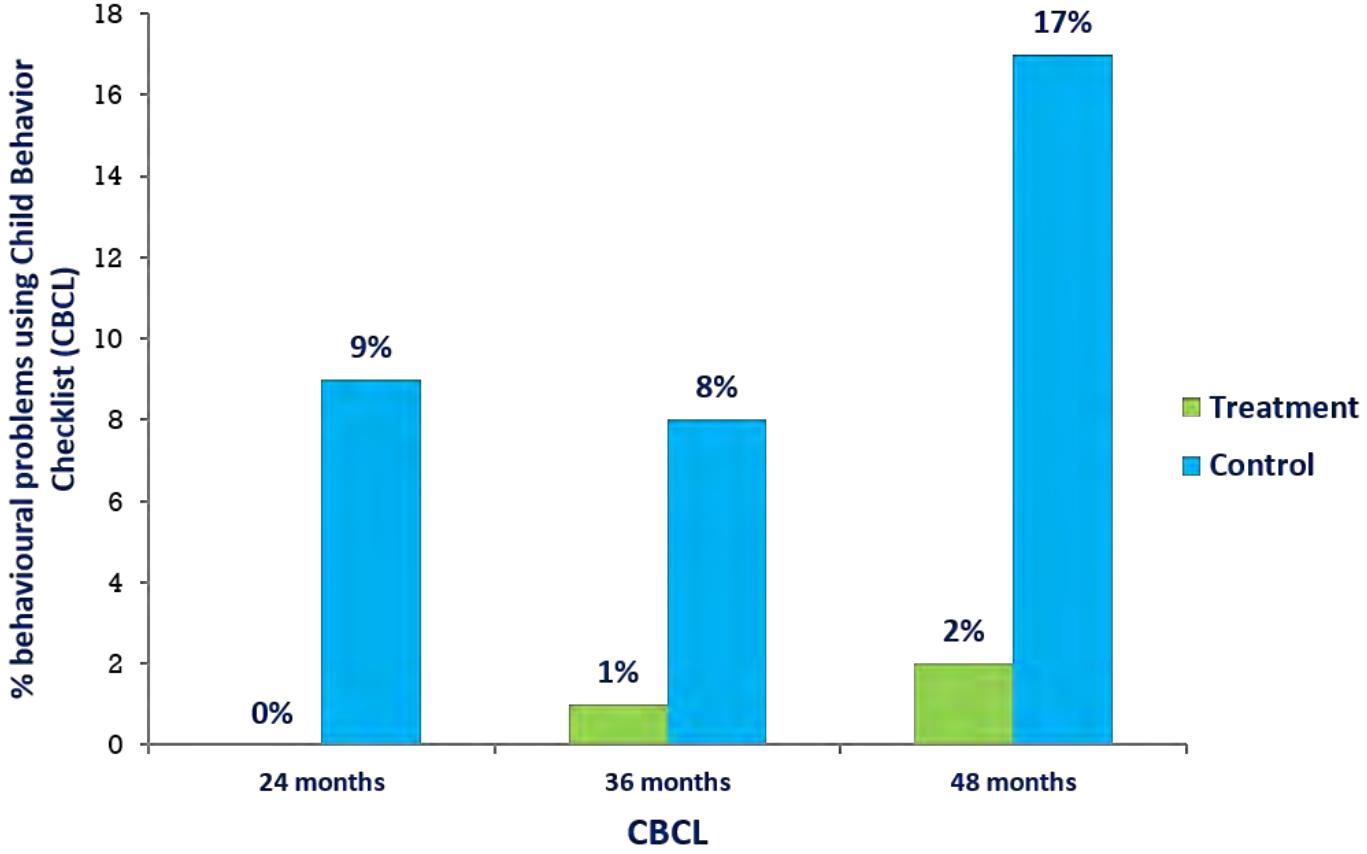


Figure ES.6 - *Mean Scores of Children on Ability to Manage Attention Task*

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).

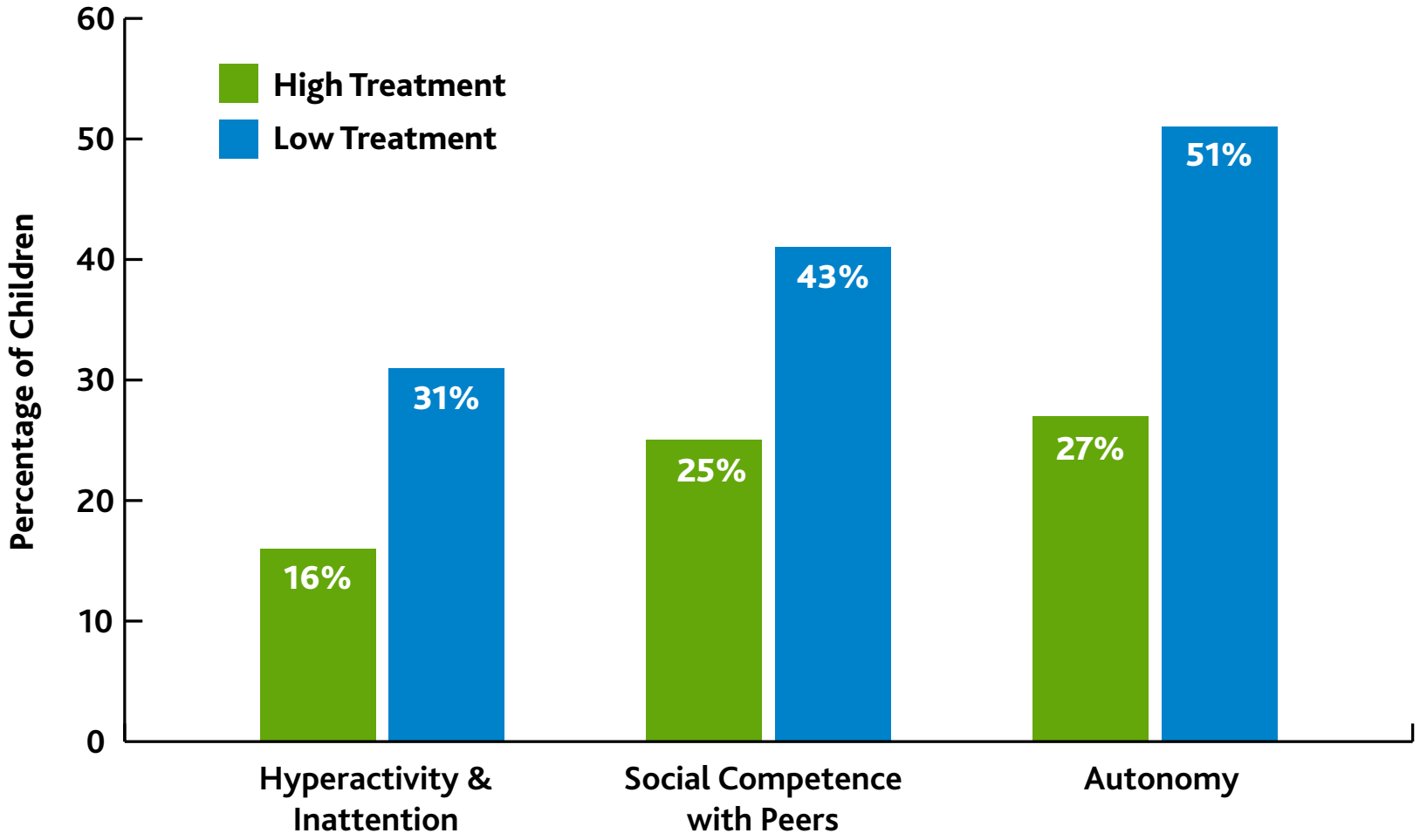
Figure 51: Behavioural Problems*



Preparing for Life (Doyle et al., 2016).
*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

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.

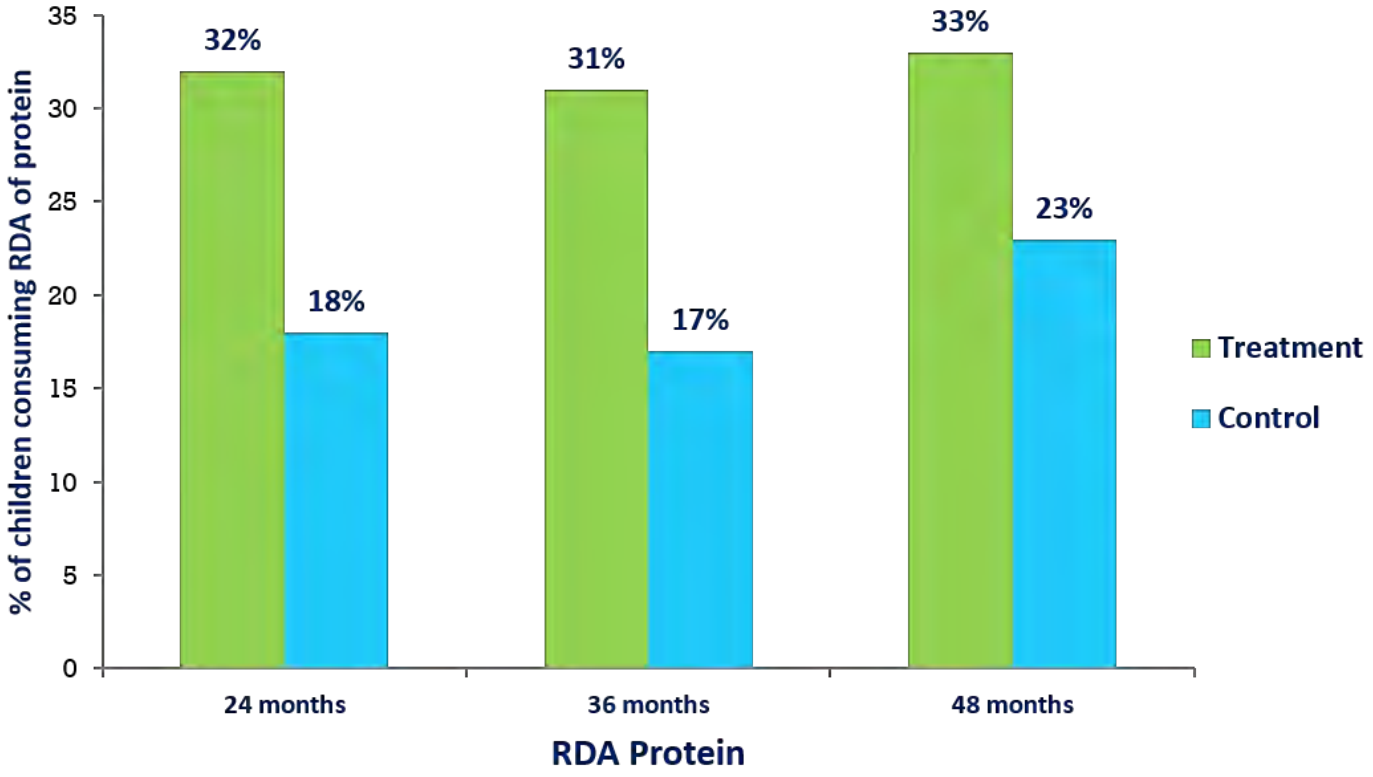
Figure 52: Percentage of Children 'Not on Track' on Measures of Social and Emotional Development At School Entry



Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).

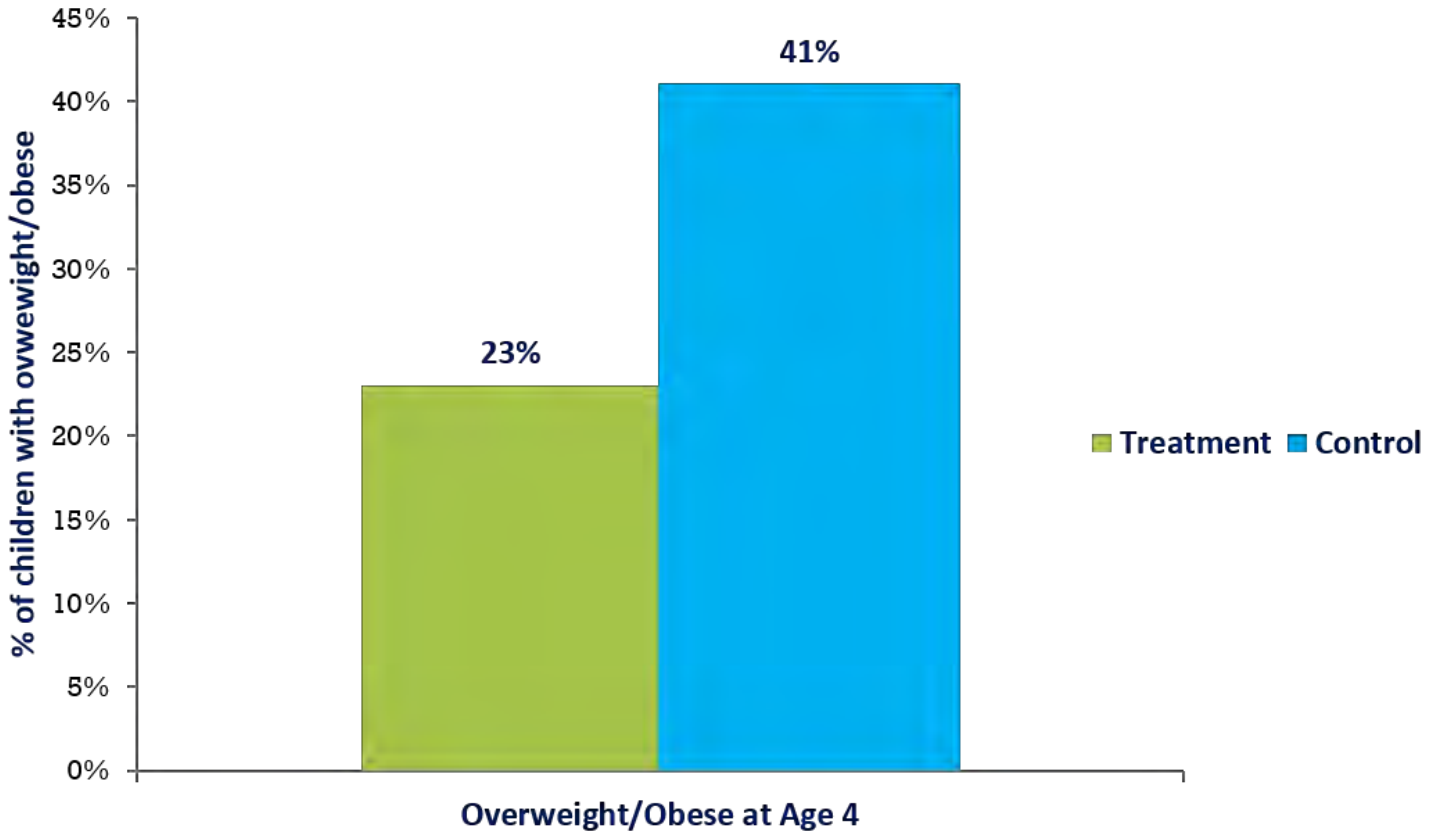
Figure EE7 - Percentage of Children 'Not on Track' on Measures of Social and Emotional Development

Figure 53: Protein Intake*



Preparing for Life (Doyle et al., 2016).
*IPW-adjusted permutation tests with 100,000 replications controlling for gender. One tailed (right-sided) test.

Figure 54: Body Mass Index at Age 4*



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

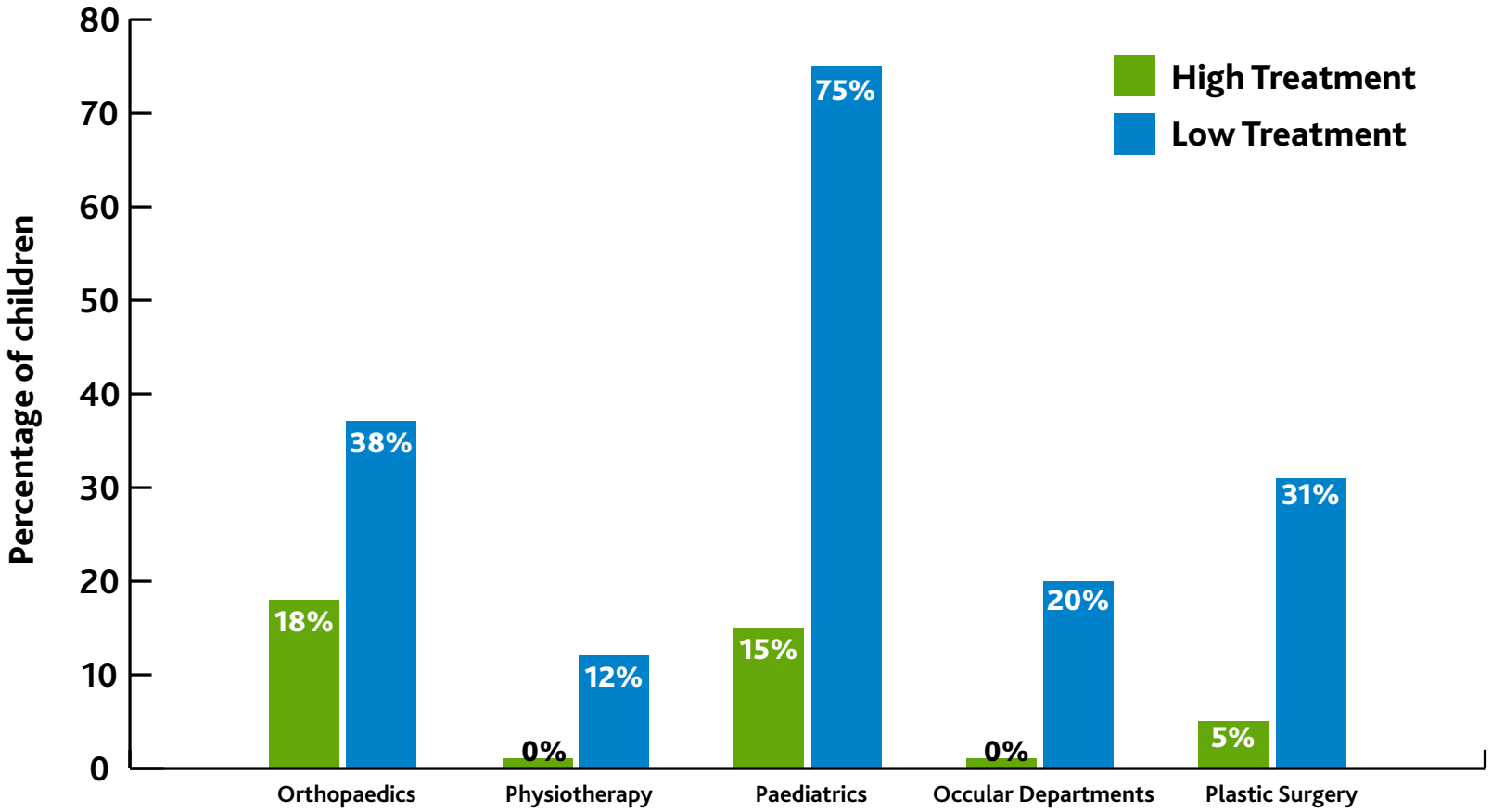


Figure ES.8 - *Percentage of Outpatient Children who ever visited Outpatient Departments*

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).

Figure 56: Mean Scores of Children on Physical Wellbeing and Motor Development At School Entry

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.

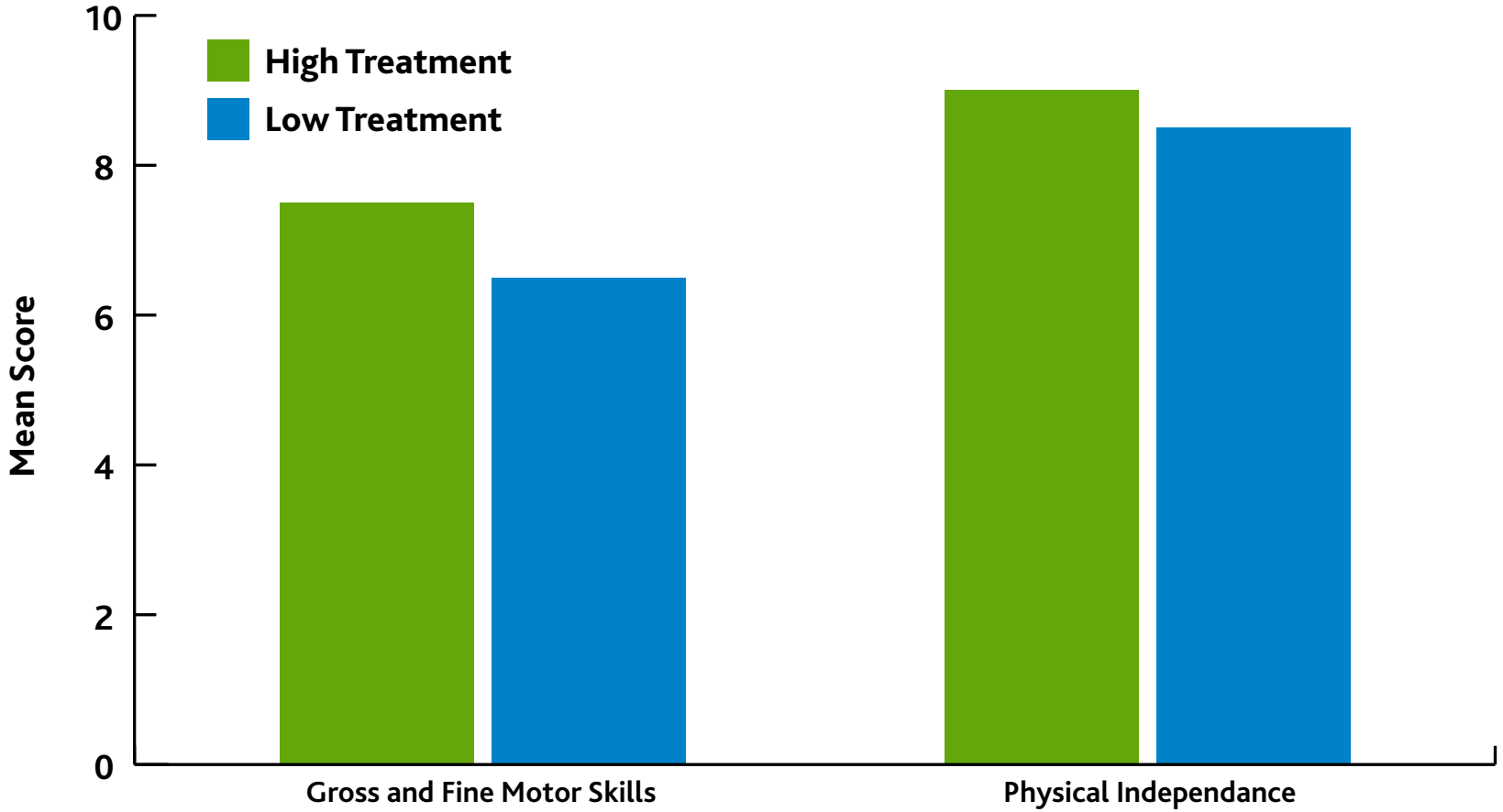


Figure ES.9 - *Mean Scores of Children on Physical Wellbeing and Motor Development at School Entry*

Source: PFL Evaluation Team at the UCD Geary Institute for Public Policy (2016).

Table 4: Physical Wellbeing

	M_{HIGH} (SD)	M_{LOW} (SD)	*IPW-p**	*IPW-step p**	Effect Size (Odds Ratio)
Emergency Department Use					
% Visits with triage level three or higher (more urgent)	39%	69%	**0.019**	**0.042**	3.44
% Visits caused by accidents	59%	72%	0.159	0.388	1.85
% Visits prompted by GP referral	42%	54%	0.166	0.166	1.59
% Visits resulting in prescription	45%	69%	**0.024**	0.113	2.64
% Ever left without being seen	6%	14%	0.228	0.364	2.32

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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