Build Skills to Benefit From Later Life Static Complementarity
Returns Per Unit Dollar Invested

- Prenatal programs
- Programs targeted toward the earliest years
- Preschool programs
- Schooling
- Job Training

Rate of Return to Investment in Human Capital

- Prenatal
- 0-3
- 4-5
- School
- Post-School

Heckman
Health, Skills, and Parenting
Powerful Evidence For Effectiveness of Early Interventions
Demonstrates the Power of Family Influence
Successful Interventions Percolate Throughout the Lifetime Through Multiple Channels
Some 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 of participants and parenting 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
Starts at Age 3
2 hrs a Day – Two Years
Curriculum: Plan, Do, Review
10% Rate of Return Per Dollar Invested (through age 40 and ignoring health benefits)
Ongoing Work: Follow-up Through Mid-Fifties
Figure 7: Male Cognitive Dynamics

The graph illustrates the cognitive dynamics of males in treatment and control groups over age. The key metrics are IQ scores, which are shown for different ages from entry to age 10.

- **Treatment Group IQ Scores:** 79.2, 94.9, 95.4, 91.5, 91.1, 88.3, 88.4, 83.7, 87.7, 89.1, 89.0, 86.0
- **Control Group IQ Scores:** 77.8, 83.1, 84.8, 85.8, 87.7, 89.1, 89.0, 86.0

The graph shows a trend where the IQ scores of the treatment group are generally higher than those of the control group, particularly from age 4 onwards.
• Worked primarily through noncognitive channels.
• Early interventions promoting skills lower the probability of engaging in unhealthy behaviors in adulthood.
Figure 8: Perry Preschool Program: Histograms of Indices of Personality Skills and CAT Scores

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

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

Source: Heckman et al. (2013).
Figure 8: Perry Preschool Program: Histograms of Indices of Personality Skills and CAT Scores, Cont’d

Panel C. Academic motivation, control

Panel D. Academic motivation, treatment

Source: Heckman et al. (2013).
Child Preferences, Beliefs, and Skills Induced By Intervention
Figure 9: Felt as belonging to school at 19 (sign of factor); feels able to change things in life at 40; has little control over things at 40

Average Treatment Effect, Pooled: .48 (p-value: .01)
Average Treatment Effect, Females: .5600000000000001 (p-value: .03)
Average Treatment Effect, Males: .4 (p-value: .06)
Figure 10: Invites friends home frequently at 15 (sign of factor); help others at 27

Average Treatment Effect, Pooled: .39 (p-value: .03)
Average Treatment Effect, Females: .44 (p-value: .12)
Average Treatment Effect, Males: .35 (p-value: .07)
Decomposition of Treatment Effects, Males

- CAT total*, age 14 (+)
- Employed, age 19 (+)
- Monthly Income, age 27 (+)
- No tobacco use, age 27 (+)
- # of adult arrests, age 27 (-)
- Jobless for more than 2 years, age 40 (-)
- Ever on welfare (-)
- Total charges of viol.crimes with victim costs, age 40, (-)
- Total charges of all crimes, age 40 (-)
- Total # of lifetime arrests, age 40 (-)
- Total # of adult arrests, age 40 (-)
- Total # of misdemeanor arrests, age 40 (-)
- Total charges of all crimes with victim costs, age 40 (-)
- Any charges of a crime with victim cost, age 40 (-)
Effects of Perry at Late Midlife
Joint Work with Ganesh Karapakula
Crime
Figure 11: Cumulative conviction counts for violent misdemeanors for Perry men

Cumulative counts of convictions for violent misdemeanors for Perry men

- Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)

$\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$
Figure 12: Cumulative conviction counts for property, violent, or drug-related misdemeanors in the pooled sample
Figure 13: Probability of ever having been convicted more than once for violent misdemeanors in the male subsample

Ever convicted more than once for violent misdemeanors for Perry men

Fraction
0 0.05 0.1 0.15 0.2 0.25
15 20 25 30 35 40 45 50
Age

Control Mean ($\mu_0$)
Treatment Mean ($\mu_1$)
$\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$

Heckman Health, Skills, and Parenting
Employment
Figure 14: Monthly earnings (in 2017 USD) for male participants

Monthly earnings (in 2017 USD) of Perry men

- Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)
- $\mu_0 + [\tau_0, \tau_u]$, where $[\tau_0, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$
Figure 15: Employment rate for male participants

Employment status of Perry men

Age in years (bandwidth = 3)

Fraction employed

0 0.2 0.4 0.6 0.8

Heckman Health, Skills, and Parenting
Figure 16: Employment rate for female participants

Employment status of Perry women

- Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)
- $\mu_0 + [\tau_0, \tau_u]$, where $[\tau_0, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$
Health
Table 1: Post-midlife health effects on Perry men

<table>
<thead>
<tr>
<th>Condition</th>
<th>Control Mean</th>
<th>Treatment Mean</th>
<th>Worst-case p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>High total cholesterol</td>
<td>0.944</td>
<td>0.708</td>
<td>0.018</td>
</tr>
<tr>
<td>High C-reactive protein</td>
<td>0.542</td>
<td>0.346</td>
<td>0.030</td>
</tr>
<tr>
<td>Weekly homecooking rate</td>
<td>4.333</td>
<td>7.724</td>
<td>0.041</td>
</tr>
<tr>
<td>Monthly bedridden rate</td>
<td>0.032</td>
<td>0.015</td>
<td>0.065</td>
</tr>
</tbody>
</table>
**Table 2: Post-midlife health effects on Perry women**

<table>
<thead>
<tr>
<th></th>
<th>Control Mean</th>
<th>Treatment Mean</th>
<th>Worst-case p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hair cortisol</td>
<td>89.29</td>
<td>39.01</td>
<td>0.024</td>
</tr>
<tr>
<td>Regular exercise</td>
<td>0.250</td>
<td>0.435</td>
<td>0.079</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.000</td>
<td>0.826</td>
<td>0.037</td>
</tr>
<tr>
<td>Treated for substance usage</td>
<td>0.150</td>
<td>0.000</td>
<td>0.027</td>
</tr>
<tr>
<td>Prolonged uninsured status</td>
<td>0.200</td>
<td>0.043</td>
<td>0.059</td>
</tr>
</tbody>
</table>
Cognitive and Noncognitive Skills
Table 3: Significant effects on cognitive and socioemotional outcomes in the pooled sample

<table>
<thead>
<tr>
<th></th>
<th>Control Mean</th>
<th>Treatment Mean</th>
<th>Worst-case p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General intelligence (Empirical Bayes (EB) score)</td>
<td>−0.194</td>
<td>0.187</td>
<td>0.054</td>
</tr>
<tr>
<td>Positive personality (EB score based on self-rating)</td>
<td>−0.158</td>
<td>0.155</td>
<td>0.033</td>
</tr>
<tr>
<td>Positive personality (EB score based on self and external ratings)</td>
<td>−0.211</td>
<td>0.216</td>
<td>0.040</td>
</tr>
</tbody>
</table>
Table 4: Significant effects on Perry men’s cognitive and socioemotional outcomes

<table>
<thead>
<tr>
<th></th>
<th>Control Mean</th>
<th>Treatment Mean</th>
<th>Worst-case p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>General intelligence (Empirical Bayes (EB) score)</td>
<td>-0.239</td>
<td>0.245</td>
<td>0.051</td>
</tr>
<tr>
<td>Positive personality (EB score based on self-rating)</td>
<td>-0.135</td>
<td>0.144</td>
<td>0.030</td>
</tr>
<tr>
<td>Positive personality (EB score based on self and external ratings)</td>
<td>-0.149</td>
<td>0.169</td>
<td>0.058</td>
</tr>
</tbody>
</table>
Parenting Mechanisms Generating Treatment Effects
Parental response to Perry Preschool Program after 1 year experience of treatment:
Parental Warmth, Perry Preschool
Parental Authoritarianism, Perry Preschool
Intergenerational Externalities: The Effects of the Perry Preschool Program on the Children of Perry Participants
Joint work with Ganesh Karapakula
Selected Outcomes for All Children of the Perry Participants

- Completed high school: P = .0849
- In good health: P = .0624
- Employed full-time: P = .0548
- Never suspended: P = .0347
- Never arrested: P = .0792

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

Legend:
- Control group's mean
- Treatment effect (difference-in-means)
Figure 17: Summaries of selected intergenerational outcomes

Outcomes of **Pooled** Children of **Pooled** Perry Subjects

Never Suspended [Age ≥ 18]
Never Suspended [Age ≥ 21]
Completed Regular HS w/o Suspension [Age ≥ 18]
Completed Regular HS w/o Suspension [Age ≥ 21]
Completed Any HS w/o Suspension [Age ≥ 18]
Completed Any HS w/o Suspension [Age ≥ 21]
Never Suspended or Arrested [Age ≥ 21]
Never Suspended or Arrested [Age ≥ 23]
Never Suspended, Addicted, or Arrested [Age ≥ 21]
Never Suspended, Addicted, or Arrested [Age ≥ 23]
In Good Health [Age ≥ 18]
In Good Health [Age ≥ 21]

Fraction of the children with the outcome

- **Control Mean** ($\mu_0$)
- **Treatment Mean** ($\mu_1$)
- $\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 17: Summaries of selected intergenerational outcomes

Outcomes of **Pooled** Children of **Pooled** Perry Subjects

- Employed Full-Time [Age ≥ 23]
- Employed Full-Time as Any HS Grad [Age ≥ 21]
- Employed Full-Time as Any HS Grad [Age ≥ 23]
- Employed Full-Time as Regular HS Grad [Age ≥ 18]
- Employed Full-Time as Regular HS Grad [Age ≥ 21]
- Employed Full-Time as Regular HS Grad [Age ≥ 23]
- Employed Full-Time with Some College [Age ≥ 18]
- Employed Full-Time with Some College [Age ≥ 21]
- Employed Full-Time with Some College [Age ≥ 23]

Fraction of the children with the outcome

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.

Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)

$\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$
Figure 18: Selected outcomes of the male children of the pooled participants

Outcomes of Male Children of Pooled Perry Subjects

- Employed Full-Time as Regular HS Grad [Age ≥ 21]
- Employed Full-Time as Regular HS Grad [Age ≥ 23]
- Employed Full-Time with Some College [Age ≥ 18]
- Employed Full-Time with Some College [Age ≥ 21]
- Employed Full-Time with Some College [Age ≥ 23]
- In Good Health [Age ≥ 18]
- In Good Health [Age ≥ 21]
- Never Suspended or Arrested [Age ≥ 21]
- Never Suspended, Addicted, or Arrested [Age ≥ 21]

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 19: Selected outcomes of the female children of the pooled participants

Outcomes of **Female** Children of **Pooled** Perry Subjects

- Never Suspended [Age ≥ 21]
- Completed Regular High School [Age ≥ 21]
- Completed Regular HS w/o Suspension [Age ≥ 18]
- Completed Regular HS w/o Suspension [Age ≥ 21]
- Completed Any HS w/o Suspension [Age ≥ 18]
- Completed Any HS w/o Suspension [Age ≥ 21]
- Employed Full-Time as Regular HS Grad [Age ≥ 21]
- Employed Full-Time as Regular HS Grad [Age ≥ 23]
- Employed Full-Time with Some College [Age ≥ 23]

Fraction of the children with the outcome

- Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)
- $\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 20: Selected outcomes of the pooled children of the male participants

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 21: Selected outcomes of the male children of the male participants

Outcomes of Male Children of Male Perry Subjects

- Never Suspended [Age ≥ 21]
- Employed Full-Time with Some College [Age ≥ 18]
- Employed Full-Time with Some College [Age ≥ 21]
- Completed College [Age ≥ 21]
- Completed College [Age ≥ 23]
- Employed Full-Time as College Graduate [Age ≥ 21]
- Employed Full-Time as College Graduate [Age ≥ 23]
- Never Arrested [Age ≥ 21]
- Never Suspended or Arrested [Age ≥ 21]
- Never Addicted or Arrested [Age ≥ 21]
- Never Suspended, Addicted, or Arrested [Age ≥ 21]

Fraction of the children with the outcome

- Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)
- $\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
**Figure 22:** Selected outcomes of the female children of the male participants

![Diagram showing selected outcomes of female children of male Perry Subjects]

The diagram illustrates the outcomes for different categories such as:
- Never Suspended ([Age ≥ 21])
- Completed Regular High School ([Age ≥ 18])
- Completed Regular High School ([Age ≥ 21])
- Completed Regular HS w/o Suspension ([Age ≥ 18])
- Completed Regular HS w/o Suspension ([Age ≥ 21])
- Completed Any HS w/o Suspension ([Age ≥ 21])
- Employed Full-Time as Regular HS Grad ([Age ≥ 18])
- Employed Full-Time as Regular HS Grad ([Age ≥ 21])
- Employed Full-Time as Regular HS Grad ([Age ≥ 23])

The y-axis represents the fraction of the children with the outcome, while the x-axis shows the fraction of the children with the outcome. The data points are marked with squares for the control mean ($\mu_0$) and circles for the treatment mean ($\mu_1$). The line $\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u]$ = 90% CI for $\mu_1 - \mu_0$.

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended ([Age ≥ 18])' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 23: Selected outcomes of the pooled children of the female participants

![Figure 23](image-url)

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.
Figure 24: Selected outcomes of the male children of the female participants

Outcomes of Male Children of Female Perry Subjects

- Never Suspended [Age ≥ 18]
- Never Suspended [Age ≥ 21]
- Completed Regular HS w/o Suspension [Age ≥ 18]
- Completed Any HS w/o Suspension [Age ≥ 18]
- Completed Any HS w/o Suspension [Age ≥ 21]
- Attended College [Age ≥ 18]
- Employed Full-Time with Some College [Age ≥ 18]
- Employed Full-Time with Some College [Age ≥ 21]
- Employed Full-Time with Some College [Age ≥ 23]

Fraction of the children with the outcome

Control Mean ($\mu_0$)
- Treatment Mean ($\mu_1$)

$\mu_0 + [\tau_l, \tau_u]$, where $[\tau_l, \tau_u] = 90\%$ CI for $\mu_1 - \mu_0$

Note: Brackets next to the outcome indicate sample restriction. For example, 'Never Suspended [Age ≥ 18]' refers to the binary indicator of never having been suspended from school, restricted to the sample of children aged 18 and above.