

Early Childhood Development Interventions: Impacts and Mechanisms.

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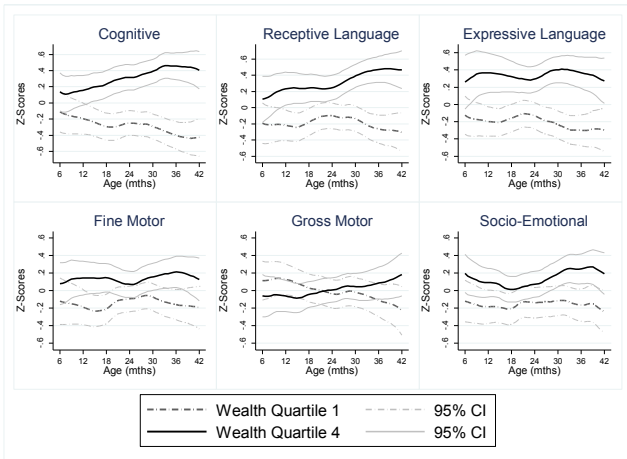
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Acknowledgement

- All work reported here derives from joint projects with:
 - Orazio Attanasio,
 - Sally Grantham McGregor
 - Marta Rubio-Codina
- The various Colombian projects included as co-coauthors:
Raquel Bernal, Helen Henningham, Camila Fernández,
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- In India co-authors include:
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Human Capital Accumulation and Poverty

Rubio-Codina et al. JHR 2014



Background

- Human Capital is key for escaping poverty and attaining higher standards of living
- It underlies better wages, improved health, reduced crime and indeed better outcomes for children
- Yet individuals in deprived communities often develop deficits from very early on
- This creates an intergenerational cycle of poverty with deficits in human capital at its heart

Background

- Increasingly evidence points to the importance of early years.
- But what do we really know?
- And how can we design effective and sustainable policies?
- A broader question relates to the nature of interventions:
 - Directly targeted and prescriptive?
 - Cash transfers?
- Here we will focus on the former

Background

- There has now been a substantial amount of research on various early childhood interventions.
- Prominent studies include:
 - The Perry pre-school experiment in the US (3-5 year olds; pre-school and home-visiting. Successful in improving labor market attachment and lowering crime - Heckman et al., 2013).
 - The Abecedarian program in the US (1972 - 111 children from low income families - successful in improving educational outcomes and long term health - Campbell, G Conti, JJ Heckman, et al., 2014).
- In developing countries the most prominent examples is:
 - The Jamaica study (129 undernourished children in Kingston, Jamaica).
- These programs have demonstrated the potential of early interventions to produce sustained outcomes for children from disadvantaged backgrounds.

The Jamaica Experiment

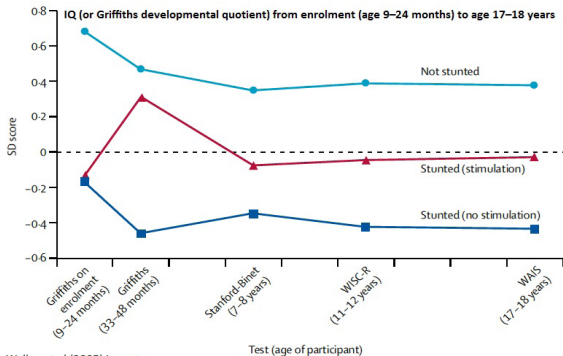
Grantham-McGregor et al. 1991 - Lancet and later papers

- The Jamaica experiment included three treatments and a control group
- The treatments were:
 - Infant Stimulation
 - Nutrition (milk supplement)
 - Both
- The stimulation followed a structured curriculum, that we will discuss later
- It was delivered by professional health assistants
- It targeted children from 9-24 months and the intervention lasted 2 years

The Jamaica Experiment

Grantham-McGregor et al. 1991 - Lancet and later papers

- Grantham-McGregor and colleagues have demonstrated using the Jamaica experiment that cognition effects are sustainable



Walker et al (2005) Lancet

- Recently Gertler, Heckman, Grantham-McGregor et al. (2012) have shown that the effects translate into labor market outcomes.

The Policy Challenge

- This experiment and other similar and successful experiments are small scale efficacy trials tightly supervised.
- As such they are not scalable
- To better understand how these ideas can form the basis of policy we need to implement scalable versions
- This involves addressing the sustainability of the program, understanding changes in parental behavior and understanding how the ideas propagate and take root in a community.

Some Important Questions

- The key presumption of such interventions is that directly targeting families with parenting interventions is more effective than some kind of transfer program.
- So shifting parental beliefs and practices is at the center of how these operate.
- How do these interventions affect household behavior, in terms of investments in children, crowding-in or crowding-out of resources?
- What kind of spillovers do these interventions have in the family and the broader community/network?
- Can they be scaled up?

Our Interventions - Scaling Up

Table: Child Stimulation and Early Education studies by our group

All Interventions are cluster randomized at the community level

Country	Intervention	Nutrition	Duration	Start Age	Sample Size	Population	Status
Colombia	Home Visiting	Yes	18 m	12-24m	96 Towns 1420 children	CCT Beneficiaries	Published BMJ & PLOS Med.
Colombia	Play groups	Yes	10 m	0-12m	87 towns 1456 children	Lowest two SE strata	Completed
India/Odisha	Home Visiting	No	18 m	12-24m	54 slums 378 children	Migrants in slums	Completed
India/Odisha	Home Visiting and Playgroups	Yes	24 m	7-16m	192 Villages 1400 children	Rural	Completed
India/Odisha	Daycare centers	No	18/24 m	31-40m	as above Re- Randomized	Rural	Starting

The basic Structure of the studies

- The basic structure was guided by the Jamaica experiment by Sally Grantham-McGregor et al. 1991 - Lancet (SGM)
- However there are important new elements:
 - **Intervention:** the emphasis on designing the program using local resources in a scalable fashion
 - **Large scale implementation** over a broad geographical area with a large number of clusters and children.
 - **Mimic scalable delivery** at implementation.
 - Whenever possible use existing **government structures**.
 - **Research Design:** collect detailed household data to allow modeling the behavioral impact of the intervention to identify mechanisms.

Reach up and Learn The Grantham-McGregor Curriculum

- Much of our work is based on the curriculum first developed by Grantham-McGregor and her team, including Sue Walker.
- Promote child-development in an integrated manner:
- Cognitive, Language, Socio-Emotional, Motor
- Encourage mothers to teach her children based on events surrounding daily routine activities
- Involve other children or members of the family where possible – this could reinforce the intervention by extending play activities and also generate important spillovers.

Types of Activities – Culturally adapted

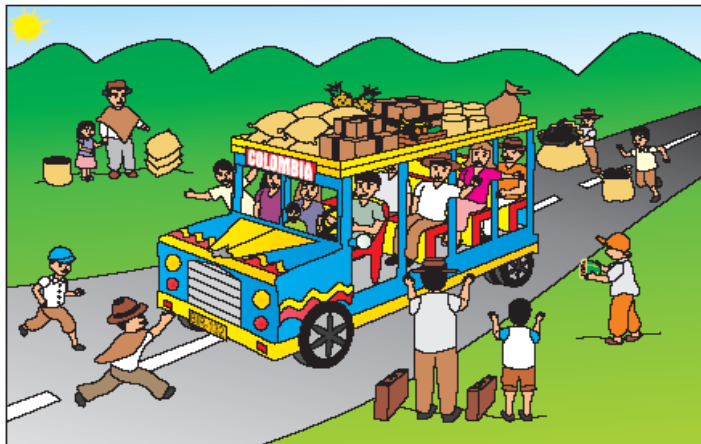
- Picture Books
- Pictures to stimulate conversation
- Puzzles
- Cubes/Blocks and patterns
- Toys from recycled material
- Language games and songs.

Conversation Scenes and Puzzles



Conversation Scenes - example from Colombia

Material from Attanasio, Fernandez, Fitzsimmons, Grantham McGregor,
Meghir and Rubio Codina



La Ciba - 82

Toys made from waste materials



Home Made Toys by Mothers



Intervention Design: Home Visits

- We adapted the *Reach up and Learn* curriculum to the relevant local context.
- The delivery of the curriculum relied on
 - ① **Mentors:** College graduates that would supervise the implementation
 - ② **Home visitors:** Women from the local community who are trained by the mentors
- In Colombia the HVs were local elected representatives for the CCT program
- In India these are community workers hired by Pratham
- Local women are important because:
 - They are well connected in their communities and thus well placed to build trust
 - They may act as a conduit for the broader acceptance and propagation of the intervention
 - They solve the HR problem of who will deliver the intervention

Intervention Design - Home Visits

- The home visitors were hired full time.
- After training, the mentors kept going to the communities on a regular basis for monitoring the implementation, giving feedback and counseling
- The mentors were constantly in touch with the Home Visitors and helped them solve problems with the visits
- In the HV modality we treat all children in a community within a pre-specified age range
- Age range is designed to be as early as possible keeping practicalities in mind

The Design

- Each Home Visitor visited the household once a week for one hour approximately
- The session began with a review of the activities from the previous week
- Materials were then replaced with those supporting the new set of activities
- The intervention lasted for 18-24 months (depending on the case).

The Home Visitors - Colombia

- Home visitors are drawn from the local population
- They have slightly better human capital characteristics but no special level of education
- An example is given below for Colombia:

	Home Visitor	Mother
Years of Education	8.5	7.4
Age	37	26
Working	56%	47%
Madre Lider	63%	-
Married/Cohab	70%	78%
Kids<6	53%	All
No Kids	35%	-
Peabody PVT	28.2 (8.7)	26.9 (8.8)
t-stat for difference in PPVT scores 1.87		

Home Visits



Alternative Intervention: Play groups

- We have also been experimenting with playgroups in two contexts:
 - ① Introduce structured curriculum in local day-care centers
 - ② Create weekly playgroups in villages
- The playgroups offer a cheaper model
- They may also foster the creation of networks that could reinforce the practices.

Evaluation Design

- All our interventions have used a cluster RCT
- We use a cluster design to avoid the possibility of spillovers
- We collect data from all children, even if they drop out (unless they migrate)
- Negligible attrition

Colombia: Characteristics of the population in small-town Colombia

Table: Child and Maternal characteristics

	Control	Stimulation	Supplementation	Both Interventions
Child Characteristics				
Age in months	18.3	18.1	18.0	18.0
Male	49.7%	46.9%	53.9%	51.1%
Birthweight in g	3,222	3,267	3,245	3,247
Stunted: Z-score height-for-age <-2SD	15.9%	13.6%	10.5%	13.7%
Anaemic	46.1%	47.5%	45.6%	44.6%
First-Born	42.1%	35.9%	42.2%	36.1%
Maternal Characteristics				
Age	27.6	28.3	27.5	27.9
Education in years	7.7	7.2	7.4	7.5
Married	68.6%	70.1%	69.5%	65.8%
Depression Score: CES-D 10	9.4	8.4	9.5	8.8
Sample (towns/children)	24/318	24/318	24/308	24/319

Characteristics of the population for the urban slums experiment - Odisha

Table: Odisha: Child and Maternal characteristics

	Control Mean	Treatment Mean	P-value	Stepdown P-value
Child Characteristics				
Age in months	15.1	14.7	0.22	0.88
Male (%)	48.7	56.0	0.24	0.82
Firstborn %	46.5	47.6	0.82	1.00
Length-for-age WHO Z-score	-1.14	-0.87	0.07	0.32
Weight-for-length WHO Z-score	-0.58	-0.46	0.33	0.83
Parental Characteristics				
Mother's years of education	6.8	8.02	0.03	0.21
Sample size 54 slums, 378 children				

Inference

- For inference we use the Romano-Wolf step-down procedure to control for multiple testing
- We define groups of hypotheses and provide adjusted p-values within each group
- We control for the Family-Wise error rate that we would need to use to accept the null hypothesis of no effect
- FWE: the probability that any one of the tested hypotheses while true is rejected - i.e. the probability of a false positive.
- This approach protects against data mining and false positives

Results of the Stimulation Interventions - Main Outcomes

Table: Impacts of child stimulation

	Odisha		Colombia	
	Treatment Effect	Stepdown P-value	Treatment Effect	Stepdown P-Value
Bayley-III Z-Scores				
Cognition			0.26	0.002
Receptive language			0.22	0.032
Expressive language			0.084	>0.50
Fine motor			0.122	0.34
Factor Index			-	-

- No impact of micronutrient supplementation (Colombia)

Heterogeneity of Impacts: who benefits most

Mechanisms: Colombia

First Hint at Mechanisms: Increased Parental Investment in Children

	Home Made Toys	Bought Toys	Play Materials	Play Activities (previous 3 days)	Books for Adults
Stimulation	0.914** (0.180)	0.284* (0.134)	0.556** (0.128)	0.564** (0.152)	0.0188 (0.081)
Stim + Micronutr	0.719** (0.189)	0.167 (0.133)	0.452** (0.137)	0.731** (0.153)	0.140 (0.087)
Micronutrients	0.0886 (0.187)	0.337* (0.151)	0.213 (0.167)	0.217 (0.153)	0.104 (0.087)

n =1329; *significant at 5%; **significant at 1%

stars based on Standard p-values for separate hypotheses

The Cost

- India: \$ 170 per year per child.
- GDP per capita US\$1,700 at the time.
- 50% of cost is monitoring and supervision.
- At scale it can be reduced to
- Colombia: \$500 per year and child
- GDP per capita \$6,300 (2010)

Play Groups

- One question is whether ECD programs can work in groups
- The advantages of groups are that they are likely to be cheaper
- By fostering the creation of networks they may help sustain the practices propagated by interventions
- It is also possible that ECD practices are better implemented when there is greater social support, which may well be the case in groups
- On the other hand the one-on-one support for the mothers is weakened.

Play Groups - FAMI Intervention, Colombia

Early Stimulation and Nutrition: The Impacts of a Scalable Intervention by O. Attanasio, H. Baker-Henningham, R. Bernal, C. Meghir, D. Pineda, M. Rubio-Codina

- We implemented an intervention for groups in Colombia
- We used an existing ECD infrastructure, which ensures our program is fully scalable
- The intervention consisted of weekly meetings of mothers with their children at the “FAMI” center
- We modified the *Reach-Up and Learn* curriculum and implemented in the groups
- We also implemented a monthly home visit
- Finally the intervention also included offering food intended for the children.

Play Groups - Intervention

- Intervention lasted about 10 months
- It involved 87 towns and a total of 1456 children.
- The children were 0-1 years of age at baseline

FAMI Intervention: Main Outcomes

Table: Main Outcomes

	Beta (95% CI)	Stepdown P Value
Total Bayley (Factor of Z-Scales)	0.152 (0.030, 0.274)	0.048**
ASQ:SE Total Score (Z)	0.060 (-0.067, 0.187)	0.346
Height for age Z-Score	0.093 (-0.045, 0.230)	0.330

- To put things in context:
 - 74% of the children measured participated at least once
 - 28/55 sessions attended on average
 - In our home-visiting intervention we get about 55/72 sessions with near full participation
 - Depending on definition of compliance TOT is 0.3SD-0.4SD

FAMI Intervention: Further Outcomes

Table: Long term nutrition - Effects on height

	Beta (95% CI)	RW P value
Height-for-age between -5 SD and -1 SD	-0.058 (-0.115,0.000)	0.098*
Height-for-age between -1 SD and 1 SD	0.068 (0.012,0.124)	0.046**
Height-for age between 1 SD and 5 SD	-0.011 (-0.035,0.014)	0.39

- The nutritional subsidy did stick with the children. Not (all) crowded out

Modeling the Mechanisms

- One important question is how does the intervention work - What do they change?
- Channels we consider are
 - ① A direct impact of the intervention itself, independently of what parents do
 - ② Changes attributable to increased parental investments

Modeling the Mechanisms

- Changes in the production function may capture
- To address this issue we build a *Human Capital Production function*
- This depends on the resources and time devoted by parents to their children as well as the exposure of the program
- We find that the entire effect can be attributed to parents doing more as a result of the intervention.
- We also find that the effect fades out if parental inputs are not sustained - consistent with our follow up study.
- This is important because it emphasizes the centrality of the parenting component
- It also shows the way of reinforcing the intervention and sustaining the effects: work with parents!

The next steps

- We are now in the midst of a large scale intervention in rural Odisha
- This is implemented over 192 communities
- There are three experimental branches
 - Nutrition Intervention
 - Home Visiting + nutrition
 - Playgroup Intervention + nutrition
 - Control
- At this point we are re-randomizing the children in high quality pre-school and control
- a unique intervention we hope to follow up in the long run

THANK YOU!