

# Early Childhood Development Interventions - Scaling up and remaining effective

With material from Attanasio, Fernandez, Fitzsimons,  
Grantham-Mcgregor, Meghir and Rubio-Codina (BMJ)

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# Background

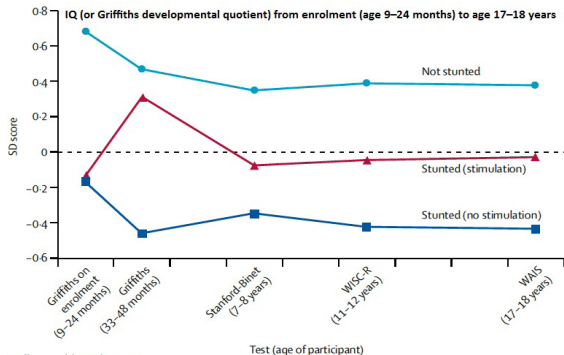
- There has now been a substantial amount of research on various early childhood interventions.
- Prominent studies include:
  - The Perry pre-school experiment in the US (3-5 year olds; pre-school and home-visiting. Successful in improving labor market attachment and lowering crime).
  - The Abecedarian program in the US (1972 - 111 children from low income families - successful in improving educational outcomes).
  - Other experiments with both home visiting and pre-schools in the US.
- In developing countries:
  - The Guatemala nutrition intervention.
  - 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

- The Jamaica experiment included three treatments and a control group
- The treatments were:
  - Infant Stimulation
  - Nutrition (calories)
  - 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 and colleagues have demonstrated using the Jamaica experiment that cognition effects are sustainable



- Recently Gertler, Heckman, McGregor et al. (2012) have shown that the effects are as important in labor market outcomes.
- Indeed the treatment group is indistinguishable from the “non-stunted” less disadvantaged comparison group.

## Some Important Questions

- The Jamaica experiment has demonstrated the potential of early childhood interventions for improving human capital and indeed labor market outcomes as well.
- However we need to address two key questions:
  - How can we design scalable interventions that are cost effective and sustainable
  - 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
- We set out to answer at least some of these questions

# An Intervention in Colombia

What follows is material from Attanasio, Fernandez, Fitzsimmons, Grantham  
McGregor, Meghir and Rubio Codina

- We designed a stimulation and micronutrient supplementation intervention in Colombia
- The basic structure was guided by the Jamaica experiment by Sally Grantham-McGregor et al. 1991 - Lancet (SGM)
- However there are two important new elements:
  - Intervention: the emphasis on designing the program using local resources in a scalable fashion
  - Research Design: collect detailed household data to allow modeling the behavioral impact of the intervention to identify mechanisms

# Scalability

- Rather than using professional health workers, we select local women to implement the intervention.
- We target our intervention to the beneficiaries of Familias en Accion - a CCT program.
  - The target population belong to the lowest economic group in terms of poverty as classifies by the SISBEN system
- This group is represented by elected women - Madres Lideres (MLs)
  - The MLs are better educated, more pro-active but still they are part of the community they are intended to serve.
- This is the key element for the scalability of the program.

# Intervention Design

- We adapted the Jamaica curriculum to the Colombian context.
- We trained 6 professionals, each was assigned to 8 villages.
- Our professionals (supervisors) trained 3/4 'madre lideres' in each village.
- The MLs were trained for three weeks.
  - This is perhaps insufficient



# Intervention Design

- MLs were hired on a part time basis by us.
- A scaled up intervention could do better and would have to have a regular update to the training
- After training, the supervisors kept going to the villages on a regular basis:
  - monitoring the implementation, giving feedback and counseling
- The monitors/ supervisors were in constantly in touch with the MLs sent them motivational messages and short information.

## Characteristics of Home Visitors

	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

# The Design

- Each ML visited 5-6 children and their mothers and distributed the micronutrients.
  - weekly visits of one hour each.
- The intervention lasted for 18 months.
  - Two years would probably be better but we had inadequate funds
- The intervention is cheap:
  - US\$ 500 per year per child.
  - 50% of cost is monitoring and supervision.
  - At scale it can be reduced to US\$300.

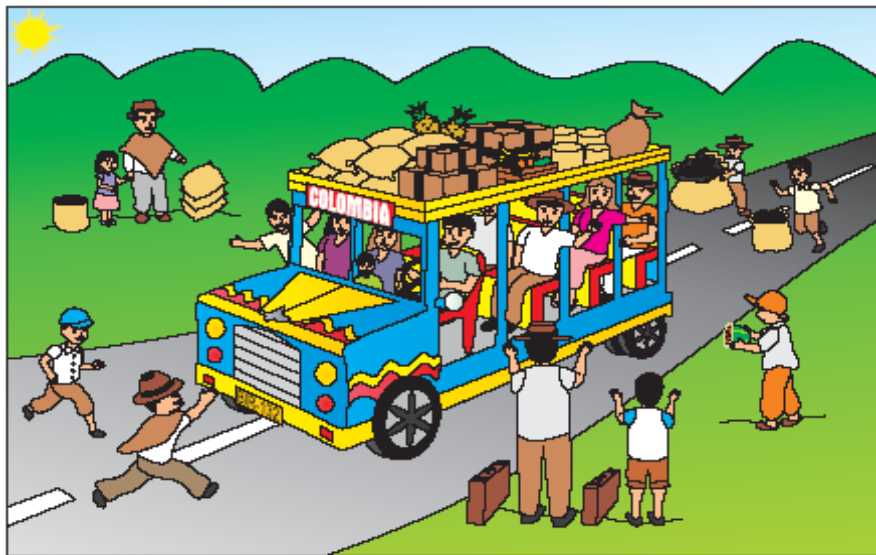
# The Grantham-McGregor Curriculum for Colombia

- Promote child-development in an integrated manner:
  - motor, language, cognitive, socio-emotional
- 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 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.

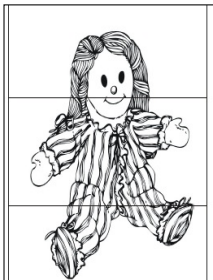
## Conversation Scenes



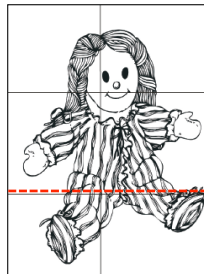
# Puzzles



Rompecabezas Pallaso  
(21 meses en adelante)



Rompecabezas Muñeca  
3 piezas (31 meses +)  
6 piezas (41 meses +)



# Toys





# Home Visits



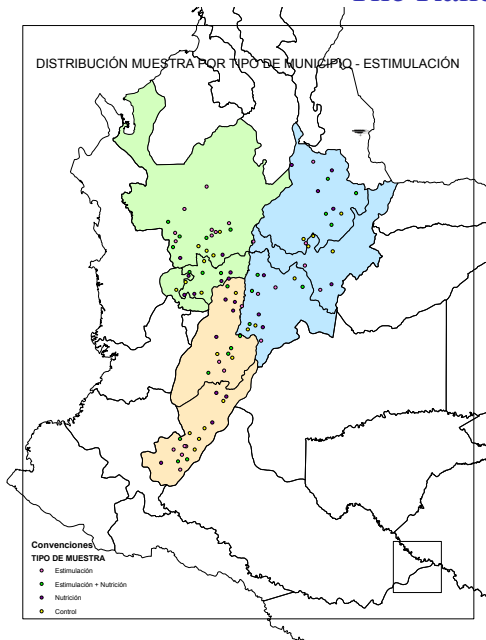
# Evaluation Design

- To answer these questions we designed an RCT and collected rich household data
- 96 municipalities in 3 regions
- ~1440 children from 12 to 24 months at the start of the intervention
- Semi-urban localities with 5000 to 50000 inhabitants

# Evaluation Design

- Random Assignment to four different groups
  - Stimulation
  - Micronutrient Supplementation
  - Stimulation and Micronutrients
  - Control (nothing - just observation)

# The Random Assignment



# Evaluation

- Choosing the children/families:
- In both treatment and control we drew randomly 5 MLs
- The families with children in the 1-2 year age group became our subject families (in both treatment and control)
- If the ML refused to participate we still kept the families so there is no selection bias between treatment and control. We just replaced the ML and kept the same families

# Evaluation

- February – May 2010: Baseline Data Collected; Socio-Economic questionnaire; Developmental measures for the children; Information about the mothers and child-rearing practices.
- All baseline data was completed before the start of the intervention
- September - December 2011: End of intervention and collection of follow up data
- Focus Groups

# Data and Measurement

- Extensive socio-economic, psychometric and anthropometric data collection at:
  - baseline (Jan – March 2010): ~1400 children ages 12 to 24
  - after 18 months (June – Sept 2011): ~1400 children ages 30 to 42 months
- Phase-in of intervention (train facilitators) as baseline data is collected.

# Child Questionnaire

- Motor and Cognitive Development: Bailey Test
- Socio-emotional Development: Bates Temperament
- Language Development: MacArthur-Bates
- Height, weight, haemoglobin and Morbidity
- Food Intakes (target child and <6 children in household)
- Child care arrangements & Time Use (target child and <6 children in household)



# Mother Questionnaire

- General Household Socio-economic Characteristics
- Education, labour supply and time use
- Reproductive History
- Health Condition
- Height, weight and haemoglobin
- Aversion to Inequality and to Risk
- Depression (CESD)
- Knowledge on Parenting
- Parenting Practices & the Home Environment

# Home Visitor Questionnaire

- Education, labour supply and time use
- Health Condition
- Aversion to Inequality and to Risk
- Knowledge on Parenting & Children

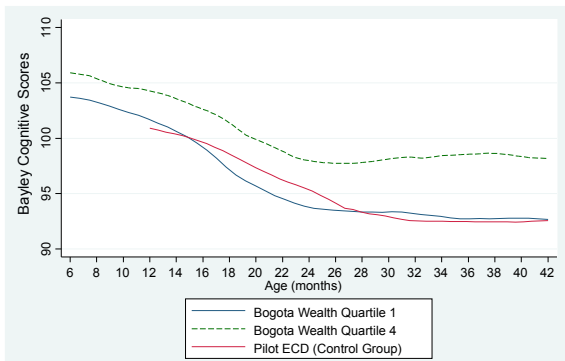
# Baseline Characteristics

	Control (n =318)	Stimulation (n =318)	Supplementation (n =308)	Both Interventions (n=319)
<b>Child Characteristics</b>				
Age in months	18.27 (4.02)	18.07 (3.76)	17.96 (3.60)	18.01 (3.73)
Male	49.69%	46.86%	53.90%	51.10%
Premature	19.13%	13.53%	17.56%	11.64%+
Birthweight in g	3222.48 (554.20)	3266.94 (476.39)	3244.75 (499.36)	3247.15 (514.63)
Stunted: Z-score height-for-age < -2SD	15.86%	13.56%	10.49%+	13.65%
Anaemic	46.13%	47.47%	45.57%	44.59%
First-Born	42.14%	35.85%	42.21%	36.05%
<b>Maternal Characteristics</b>				
Age	27.63 (6.96)	28.34 (6.95)	27.50 (6.23)	27.92 (6.55)
Education in years	7.70 (3.51)	7.21 (3.41)	7.41 (3.53)	7.48 (3.43)
Married	68.63%	70.06%	69.54%	65.81%
Divorced	8.82%	11.46%	17.22%	13.42%
Single	22.55%	18.47%	13.25%	20.77%
Depression Score: CES-D 10	9.43 (5.54)	8.38 (5.60)	9.51 (5.47)	8.82 (5.24)
<b>Household Characteristics</b>				
Household Size	5.22 (2.20)	5.38 (2.31)	5.23 (2.15)	5.22 (2.17)
Crowding: number of rooms over household size	0.60 (0.30)	0.57 (0.29)	0.59 (0.27)	0.62 (0.32)
Home Ownership	33.96%	38.99%	40.26%	36.05%
Wealth Index	-0.08 (0.92)	0.04 (0.98)	0.07 (1.06)	0.03 (1.04)
<b>Home Environment</b>				
Play Materials - Number of Varieties	3.34 (1.59)	3.41 (1.51)	3.19 (1.61)	3.10 (1.47)
Play Activities Over Last 3 Days - Number of Varieties	3.69 (1.76)	3.70 (1.71)	3.71 (1.65)	3.62 (1.67)

## Wealth Gap - Age and Cognition

This descriptive graph shows how the gap in cognitive development between the median (top) and lower decile (bottom) of the wealth distribution increases with age

### Comparison with Bogota Study Data on Wealth Gradient



Source: Attanasio, Sally Grantham-McGregor, Meghir, Rubio Codina and Varela - (JHR)

# Attrition

- **Sample Loss between household survey and Bayley test Baseline: 9 children (0.62%).**
- Attrition between survey rounds (18 months): Household Survey: 3.52%.
- Spatial correlation is about 0.04 or less (depending on the outcome).

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## Results of the intervention - Cognition

Bayley-III Scores	N	$\beta$	Stimulation		D <sup>2</sup>
			95% CI	P value <sup>1</sup>	
Cognition	1,263	1.139	(0.538 to 1.776)	0.002	0.260
Receptive Language	1,263	0.776	(0.270 to 1.332)	0.032	0.218
Expressive Language	1,263	0.455	(-0.286 to 1.250)	>0.50	0.084
Fine Motor	1,262	0.567	(-0.060 to 1.247)	0.34	0.122

- P-values from Romano and Wolf stepdown procedure. 12 hypotheses tested.
- No effects of Nutrition or of the interaction of the programs

## Mother reported outcomes

### Effects on Expressive Language : MacArthur-Bates (maternal report)

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	NUMBER WORDS CHILD CAN SAY		
	All	12-18 mths	18-24 mths
Stimulation Only	4.238*	1.232	5.266*
	(2.116)	(2.754)	(2.592)
Mean Dep Var (Controls)	55.46	48.04	61.20

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n =1325; \*significant at 5%

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	NUMBER OF COMPLEX SENTENCES		
	All	12-18 mths	18-24 mths
Stimulation Only	0.365	0.0582	0.275
	(0.381)	(0.526)	(0.533)
Mean Dep Var (Controls)	5.43	4.53	6.69

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n =1325



## Parental Investments

### First Hint at Mechanisms: Increased Parental Investment in Children

	Home Made Toys	Bought Toys	Play Materials	Play Activities (previous 3 days)	Books for Adults
<b>Stimulation</b>	0.914** (0.180)	0.284* (0.134)	0.556** (0.128)	0.564** (0.152)	0.0188 (0.081)
<b>Stim + Micronutr</b>	0.719** (0.189)	0.167 (0.133)	0.452** (0.137)	0.731** (0.153)	0.140 (0.087)
<b>Micronutrients</b>	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%

## New experiments

- Reported above is our initial experiment
- Since then We have designed and implemented three more interventions:
  - ① Home Visiting in the urban slums of Cuttack (Odisha) for 1 year olds (Private Donation and the Waterloo Foundation)
    - Data being analyzed.
  - ② Center based intervention with home visiting in Colombia (FAMI) Grand Challenges Canada
    - Data being prepared
  - ③ Group based and Home visiting in rural Odisha (NIH funded)
    - Ongoing

# Group based and Home visiting in rural Odisha

- The key innovation are the group based stimulation sessions
- We are bringing together mothers with their children and introducing activities in a playgroup setting
- We will be comparing to home visits and to the control
- Also nutrition education to achieve improved nutrition with local materials

## ECD versus pre-School versus both

- Following this our next project (subject to funding) will randomize the children at the end of ECD to high quality structured pre-school
- This project will allow us to investigate formally the importance or otherwise of starting early.
- Experimental arms
  - ① Intervention from 1-5
  - ② Intervention from 3-5 only
  - ③ Intervention from 1-3 only
  - ④ No intervention