# Early Childhood Development Pilot in Colombia:

## Home Visiting & Nutrition

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# Funding Agencies

- Economic and Social Research Council (ESRC)
- Inter-American Development Bank (IADB)
- International Growth Centre (IGC)

# Introduction

- There is mounting evidence that that events early on in childhood are critical in shaping the development of people's life

- Investments in health and human capital later on life seem to be much more effective when delivered to people who have already received earlier investments – success builds on success.

- Cognitive deficits among the poor start appearing early on and are almost impossible to reverse.

- We need to understand:
  - How can this be reversed by policy.
  - How do families react to transfers, whether in-kind, monetary or targeted to their children.
  - How are resources allocated within the household.

# Introduction

- We need to understand:
  - How can this be reversed by policy.
  - Can such policy be cost effective enough for full scale implementation
  - Can its positive effects be sustained in the long run?
  - How do families react to transfers, whether in-kind, monetary or targeted to their children?
  - How are resources allocated within the household?

# Early Childhood Development

- Some evidence that ECD interventions in developed and developing countries have both short and long term sustainable effects

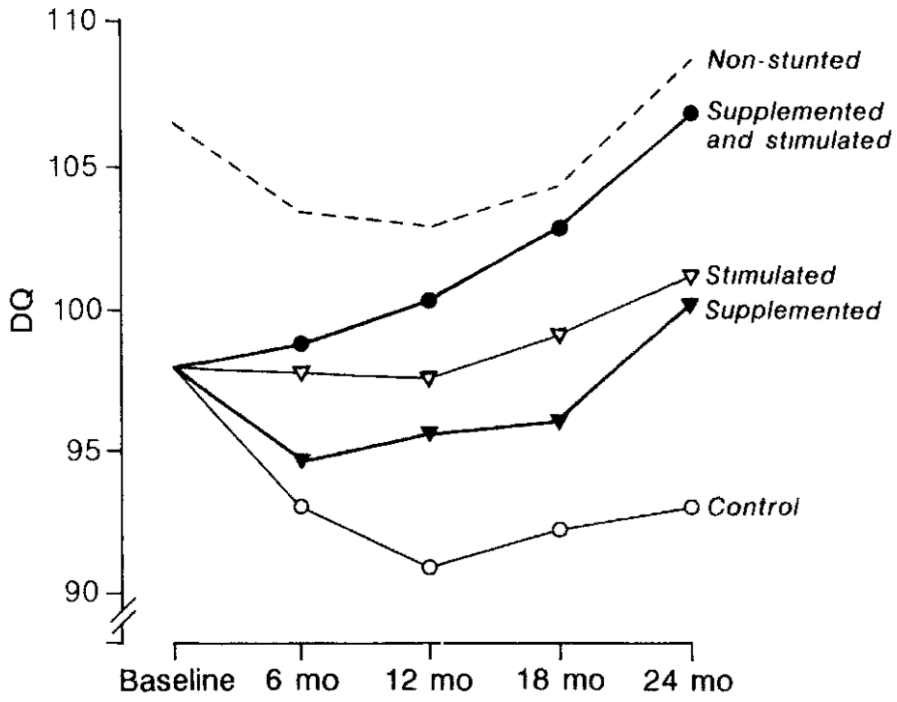
- Some of Grantham-McGregor's work: Jamaican intervention: weekly home visits by community health aides; taught mums to play with child in such a way as to promote development

  1991 Lancet - children at 9-24 months
  2005 BMJ - followed up same children at 17-18 years

- There is also evidence that damage done at an early age on cognitive development is very difficult, if not impossible, to reverse

# Original Jamaican Study

VOL 338: JULY 6, 1991 THE LANCET




**Mean DQs of stunted groups adjusted for initial age and score, compared with non-stunted group adjusted for age only.**

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S. M. GRANTHAM-MCGREGOR C. A. POWELL S. P. WALKER
J. H. HIMES

# Follow-up of Jamaican study: 17-18 years

*Effects of stimulation sustained*

**Table 4** Multiple regression analysis of the effects of early childhood stimulation on psychosocial functioning at age 17-18 years

| Measure | Mean difference (95% confidence interval) | P value |
|---|---|---|
| Anxiety | –2.81 (–5.02 to –0.61) | 0.01 |
| Depression* | –0.43 (–0.78 to –0.07) | 0.02 |
| Self esteem | 1.55 (0.08 to 3.02) | 0.04 |
| Antisocial behaviour*† | –0.11 (–0.44 to 0.23) | 0.53 |
| Attention deficit | –3.34 (–6.48 to –0.19) | 0.04 |
| Cognitive problems or lack of attention | –1.07 (–2.79 to 0.65) | 0.22 |
| Hyperactivity | –0.20 (–1.57 to 1.17) | 0.77 |
| Oppositional behaviour | –1.64 (–3.60 to 0.32) | 0.10 |

*Square root transformation used in analyses.
†Initial weight for height entered in regression.

No long term effects of supplementation

Susan P Walker, Susan M Chang, Christine A Powell, Emily Simonoff, Sally M Grantham-McGregor

BMJ, doi:10.1136/bmj.38897.555208.2F (published 28 July 2006)

# Follow-up of Jamaican study: 17-18 years

*Effects of stimulation sustained*

| | Stimulation | | No stimulation | | Covariates |
|---|---|---|---|---|---|
| | Coefficient (95% CI) | p | Coefficient (95% CI) | p | |
| WAIS* | | | | | |
| Full scale IQ | −0·33 (−0·67 to 0·01) | 0·053 | −0·71 (−1·03 to −0·38) | 0·001 | Mother's PPVT, housing factor |
| Performance IQ | −0·21 (−0·57 to 0·14) | 0·24 | −0·50 (−0·85 to −0·15 | 0·005 | Mother's PPVT, hunger |
| Verbal IQ | −0·34 (−0·67 to −0·01) | 0·047 | −0·70 (−1·02 to −0·38) | 0·001 | Mother's PPVT, housing factor |
| Non-verbal reasoning (Raven's matrices) | −1·61 (−5·35 to 2·14) | 0·40 | −5·23 (−8·86 to −1·60) | 0·005 | Mother's PPVT |
| Visual-spatial working memory (Corsi blocks) | −0·57 (−1·74 to 0·61) | 0·34 | −1·52 (−2·68 to −0·36) | 0·010 | Hunger |
| Auditory working memory | | | | | |
| Digit span forwards | −0·59 (−1·42 to 0·24) | 0·16 | −0·46 (−1·26 to 0·34) | 0·26 | Mother's PPVT |
| Digit span backwards | −0·82 (−1·72 to 0·08) | 0·07 | −1·11 (−1·98 to −0·24) | 0·013 | Mother's PPVT, age |
| Verbal analogies† | −0·25 (−0·48 to −0·02) | 0·036 | −0·48 (−0·71 to −0·25) | 0·001 | Mother's PPVT, mother's occupation, hunger |
| Vocabulary (PPVT) | −5·39 (−13·10 to 2·32) | 0·17 | −12·71 (−20·28 to −5·14) | 0·001 | Mother's PPVT, hunger |
| Reading | | | | | |
| Sentence completion | −2·55 (−6·21 to 1·11) | 0·17 | −6·52 (−10·11 to −2·92) | 0·001 | Mother's PPVT, hunger, sex |
| Context comprehension | −0·97 (−2·59 to 0·66) | 0·24 | −3·29 (−4·89 to −1·69) | 0·001 | Mother's PPVT, hunger, sex |
| Mathematics (WRAT) | −1·81 (−4·25 to 0·63) | 0·14 | −3·41 (−5·81 to −1·03) | 0·005 | Mother's PPVT, mother's education, hunger, sex |

Regression coefficients represent difference between stunted groups (stimulation or no stimulation) and non-stunted group. Covariates (participant's age, sex, hunger, housing factor, mother's PPVT, occupation, and education) offered stepwise before entering dummy variables for stimulation and no stimulation with non-stunted groups as reference. *WAIS IQ in SD scores all other tests in raw scores. †Square-root transformation used in analyses.

*Table 4:* Effect (regression coefficient) of stunting in early childhood in children who did or did not receive psychosocial stimulation on cognitive and educational outcomes at age 17–18 years

Source: *Susan P Walker, Susan M Chang, Christine A Powell, Sally M Grantham-McGregor*

The Lancet Volume 366, Issue 9499, 19 November 2005-25 November 2005, Pages 1804-1807

# Follow-up of Jamaican study: 17-18 years

*Effects of stimulation sustained*

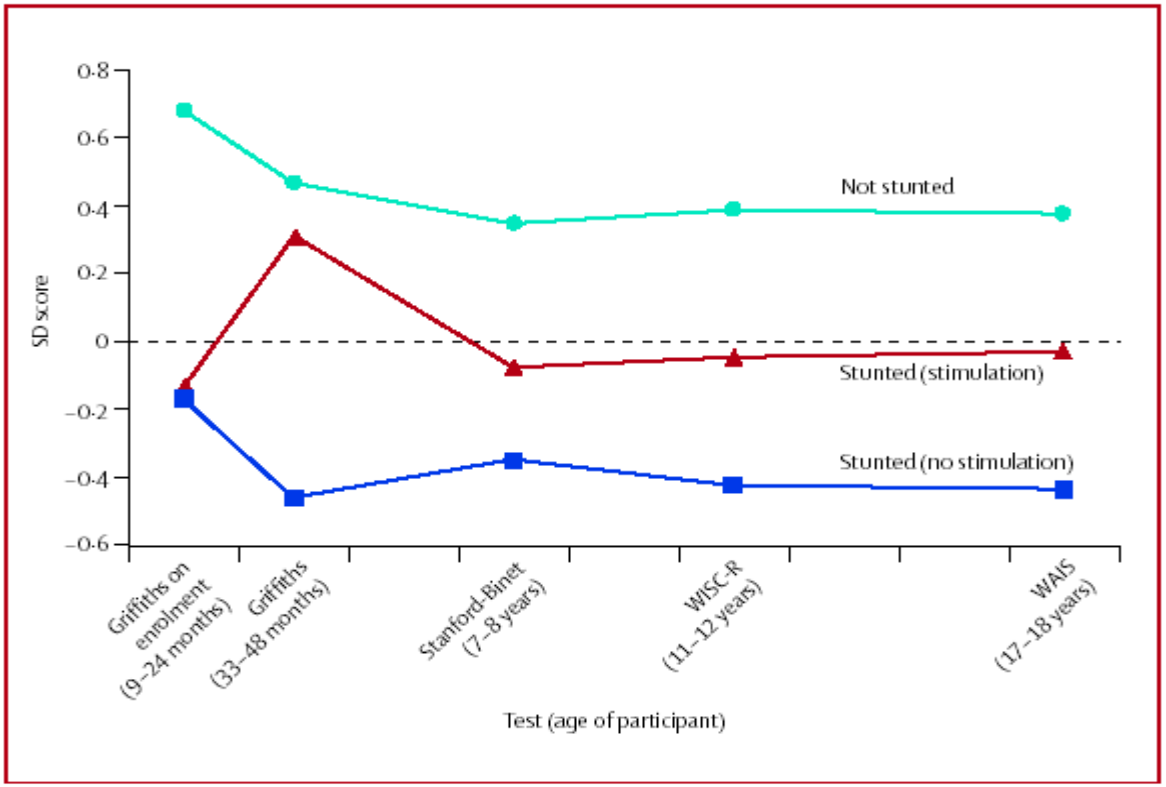



*Figure 2:* IQ (or Griffiths developmental quotient) from enrolment (age 9–24 months) to age 17–18 years

Susan P Walker, Susan M Chang, Christine A Powell, Emily Simonoff, Sally M Grantham-McGregor

BMJ, doi:10.1136/bmj.38897.555208.2F (published 28 July 2006)

# Our Colombian Pilot

- We have now set  an intervention and evaluation by RCT of an ECD, based on the protocol designed by Grantham-McGregor
  - So weekly home visits to mothers and their children
- The distinguishing characteristic is that it builds on local resources and is designed to be scaleable.
  - Draws on the network of Madre Líderes that mediate between communities and the conditional cash transfer programme Familias en Acción.
- The key idea is to see how effective we can be in baseing a child development programme on local resources

# Our Colombian Pilot

- Using local resources is not only cheaper but one can hypothesize that it mobilises local communities and spreads information better on child development

- At the same time the programme introduces a new institution and improves knowledge and understanding for child education.

- Our team has set up alternative branches of intervention and is evaluating the pilot based on a RCT.

# Colombian Pilot: Evaluation Design

- 96 municipalities in 3 geographic areas in Colombia
- Small urban municipalities: 5000 to 50000 population.
- ~1400 children 12 to 24 month in Jan 2010 (baseline)
- 18 month intervention
- Municipalities *randomly* allocated to 4 intervention groups:
  - Home Visits (only)
  - Home Visits + Nutrition
  - Nutrition (only)
  - Control
- Extensive socio-economic, psychometric and anthropometric data collection at baseline & 18 mths after

# Home Visits

- Implemented by *Madres Líderes* (ML)
- 3 MLs per municipality, each to visit ~5 children and their mother (or primary caregiver) on a weekly basis. Visits ~1 hr
- MLs trained to implement curriculum: 2 week workshop initially and 1 week after.
- Workshops (in site) run by trained personnel. The trainers will then act as supervisors/ mentors throughout the programme.

# Grantham-McGregor Curriculum I

- ~150 pages long; laid out on weekly basis (examples later)

- Adapted to Colombian environment – familiar songs; pictures and books reflect children's environment

- Stress importance of praising and positive reinforcement

# Grantham-McGregor Curriculum I

- Emphasis on child stimulation/developmental play
  - Songs; solve and guess puzzles, jigsaws; games (follow instructions); role play
  - Teach mothers how to make toys with waste materials and other objects around the house/community
  - Introduce words and concepts by turning daily activities (dressing, bathing, etc.) into learning experiences
    - Story telling; naming and labeling; conversation; look at picture books

# Grantham-McGregor Curriculum II

## Main objectives

- Promote all aspects of child development: motor, cognitive, socio-emotional, language & creativity
- Improve child self-esteem
- Improve mothers' child rearing skills
- Improve maternal self-esteem and perceptions of her role as mother
- Strengthen mother (caregiver) & child interaction/bond
- Improve child readiness for pre-school

# Example of Weekly Routine: 12 months old, week 3

1. SONG

Sign the following song to the child. Remember to act the actions and motivate the child to copy you.

ROUND AND ROUND

Round and round the garden

Like a teddy bear

One step, two step

Tickle you there

2. BABY LANGUAGE

a. Encourage the baby To do what you say. Choose a simple direction, e.g. “clap hands” and say this while you do the action. Get the baby to do the action at the same time.

Ask the mother what other simple actions (“”bye- bye”, “up-up”) baby can do. Get her to teach baby one at a time.

b. Encourage mother to label baby body parts when bathing him/her.

3. STACKING 3 BOTTLE TOPS

Materials: Top halves of 3 round plastic bottles same size.

Objective: Baby to stack bottle tops and understand on top of

Directions: Allow baby to become familiar with materials by playing with them. Show baby how to stack the bottle tops by placing one on top of the other. Demonstrate and guide baby’s hand until baby can stack them alone. Don’t expect baby to stack tops immediately. Talk about what you and baby are doing as you play.

# Example of Weekly Routine: 24 months old, week 1

1. LANGUAGE: BODY PARTS

First you label and get child to point. Then Help child to label. Then let child label without help.

Teach large parts and face first, then small parts. When using doll, talk about doll's body parts.

2. SORTING & MATCHING

Materials: Stenciled pictures of a fork, knife, comb and cup. (Ask the mother to lend you these same objects from the home).

Objective: Child to match objects to the picture of that object.

Directions: Place the four pictures and have the child name them. Then, give one of the objects (i.e. the cup) to the child and get the child to place the objects on the matching picture. Do this for each object. It might be necessary to guide the child at first.

3. DOLL AND BED – NO CLOTHES

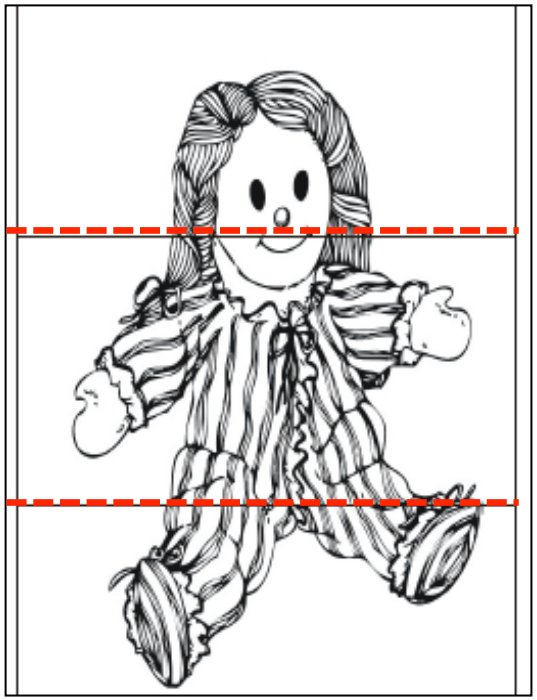
Materials: Large stuffed doll, box, 2 sheets, pillow

Objective: Child to play with doll and name body parts. Child to talk about activities with doll.

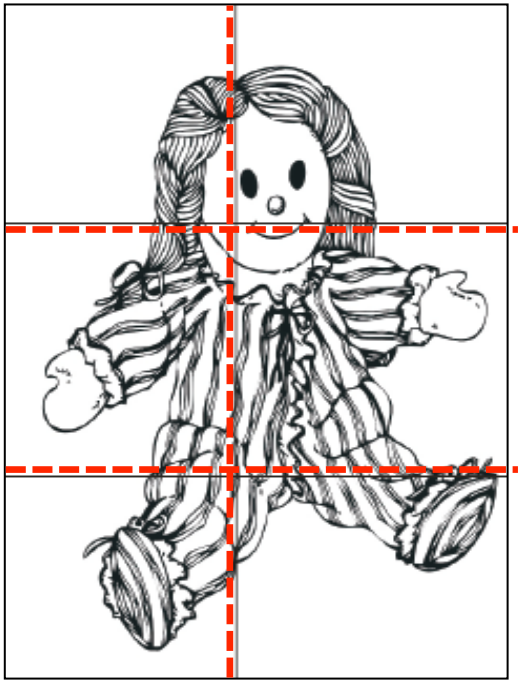
Directions: Repeat month 14 asking child to name his/her body parts and those of the baby (eg. "My nose, my hand, baby nose, baby hand"). Have child put doll to bed. Encourage child and mother to talk about doll and what she/he is doing. Eg. "baby sleep. Baby is cold, pull up the sheet",etc.

# Examples of Materials

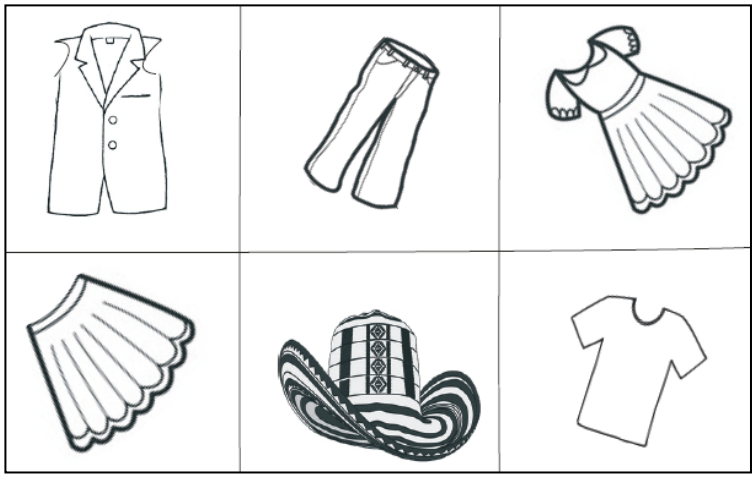
Clown Puzzle
(from 21 months)

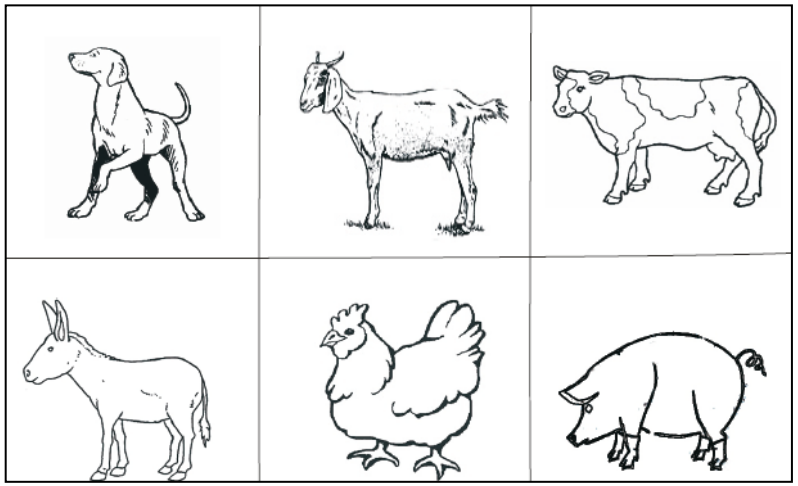


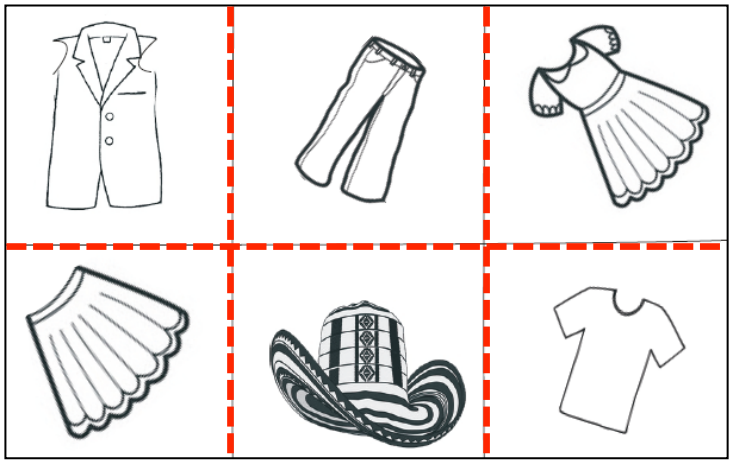
Doll Puzzle
3 pieces (from 31 months)
6 pieces (from 41 months)

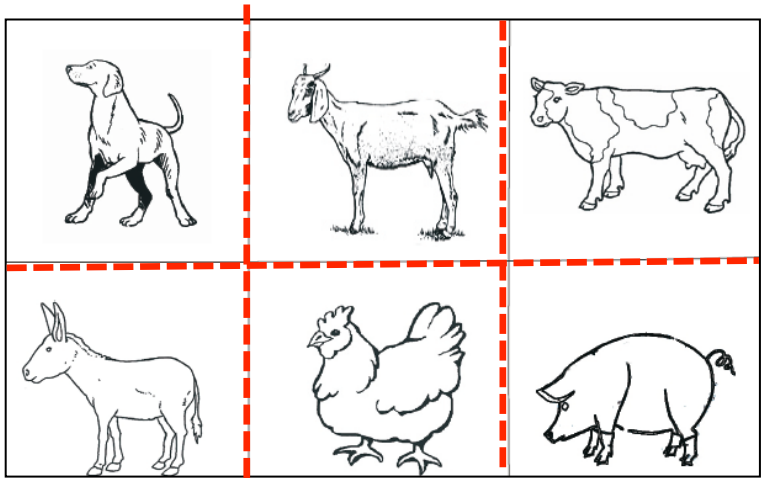


# Memory Lotteries – Sorting & Matching (from 31 months)

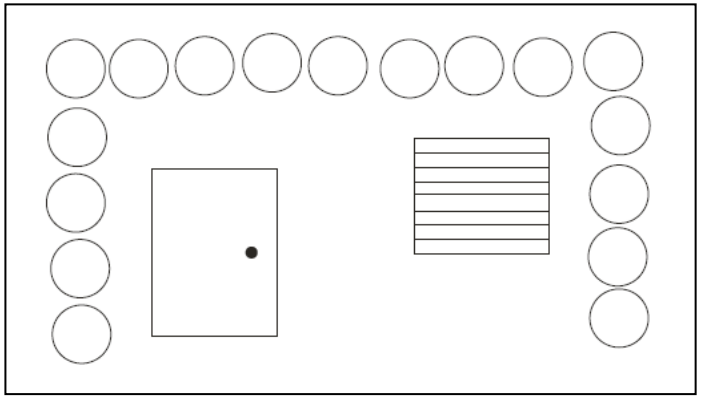




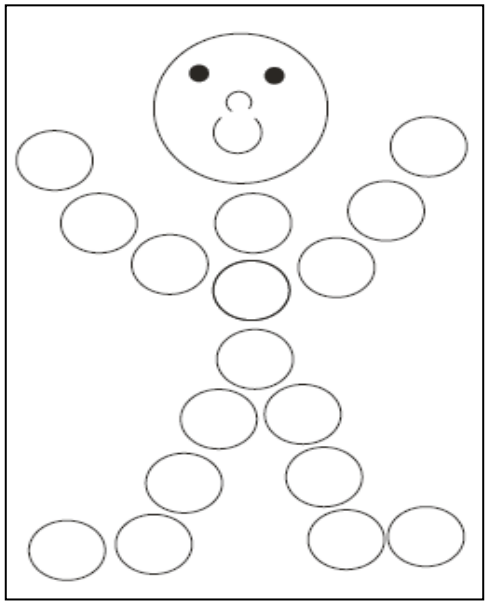




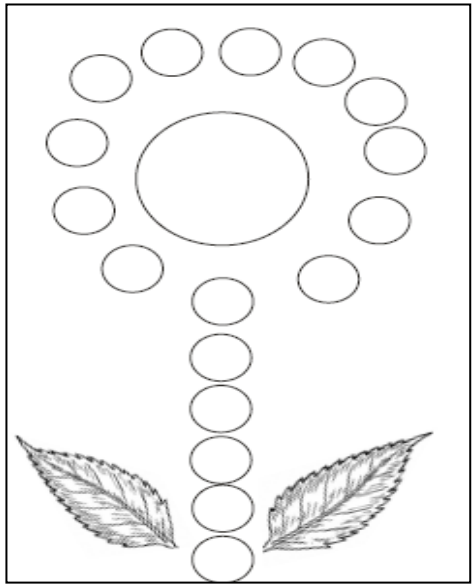
# Bottle Top Patterns



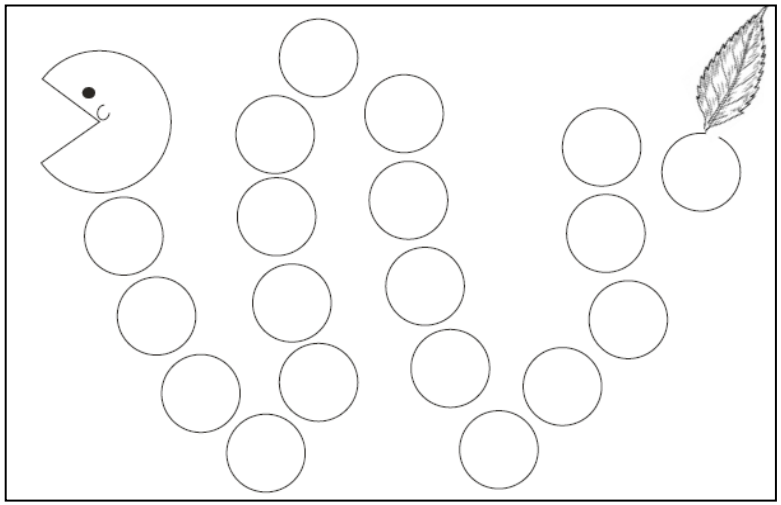
Bottle Top House – 26 month



Bottle Top Man – 30 month

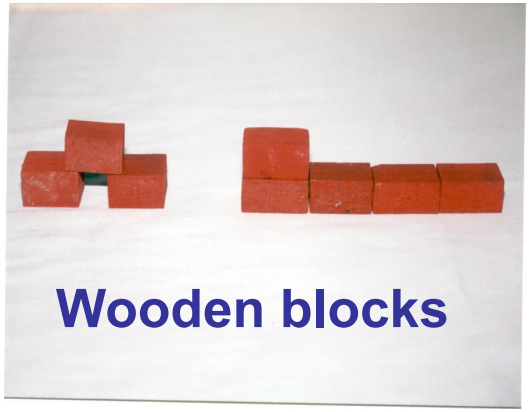


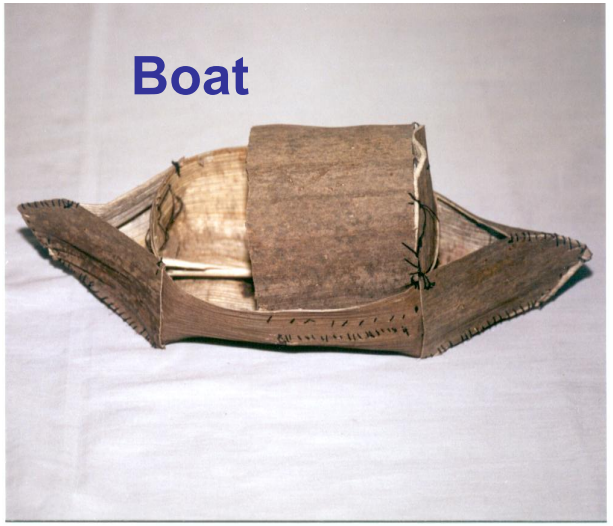
Bottle Top Flower – 33 month



Bottle Top Worm – 36 month

# Homemade Toys

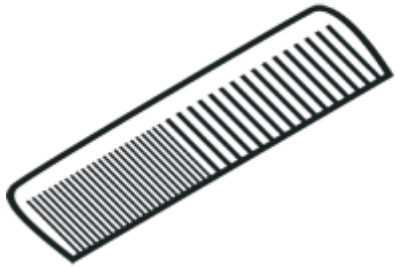



# Books

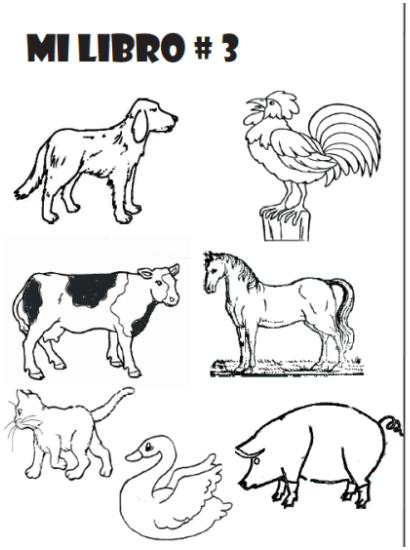

ছবির বই ১
ছবির বই ২
ময়লা শার্ট
পশু পাখীর বই
আমি যা যা করতে পারি
Printed books


Made book - 1a
Made books

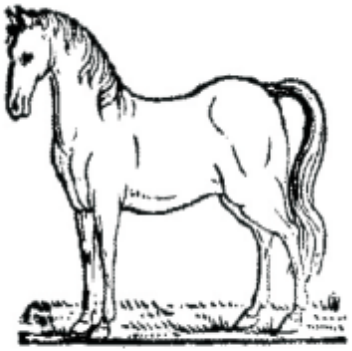
Picture Books – from 20 months

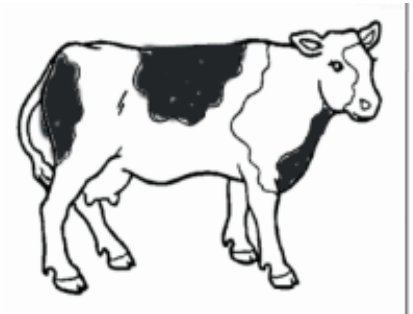
# Picture Books – from 27 months




Gallo



Caballo



Vaca

Cerdo

Perro

Pato

# Nutritional Supplementation

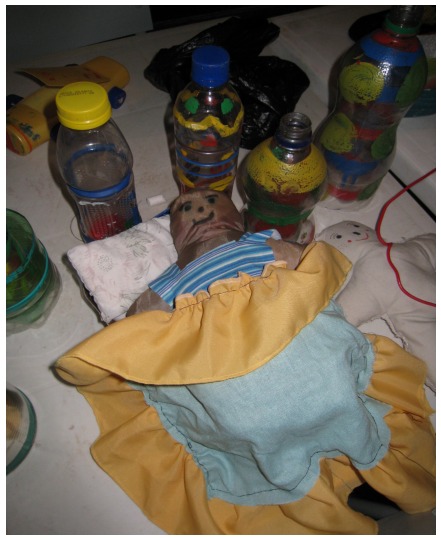
- Provide daily micronutrient supplementation – “Sprinkles” to a subset of the targeted children
- Colorless, tasteless powder administered by being sprinkled on semi-humid food (rice, for example)
- These provide iron, zinc and vitamins A and D
- Provide supplements to all children below 5 in the household to avoid reallocation.
- ML will deliver the supplements to the house and monitor intake

# Sprinkles



Purchased from India.

# Toys from scrap materials during training



# Home Visits

# 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 intervention (train facilitators) as baseline data is collected.

# Child Questionnaire

- Motor and Cognitive Development: Bayley Test
- Socio-emotional Development: Bates Temperament Test
- Language Development: McArthur Test
- Nutritional Status - 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 & Maternal Self-Efficacy
- Parenting Practices & the Home Environment

# Home Visitor Questionnaire

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

# Some Baseline Results

- Characteristics of treatment and control are vey well balanced
- Self-reported literacy is high but level of education is very low

| Mother's variables | | Control | Home Stimulation | Nutrition + Home Stimulation | Nutrition | Total |
|---|---|---|---|---|---|---|
| Age | N | 337 | 356 | 354 | 348 | 1395 |
| | Mean | 26.09 | 26.54 | 26.40 | 26.01 | 26.26 |
| | Std. Error | 0.38 | 0.36 | 0.35 | 0.33 | 0.18 |
| Employed or self-employed | N | 337 | 356 | 354 | 348 | 1395 |
| | Mean | 47.18% | 43.82% | 46.33% | 44.83% | 45.52% |
| | Std. Error | 2.72% | 2.63% | 2.65% | 2.67% | 1.33% |
| Years of education | N | 337 | 356 | 354 | 348 | 1395 |
| | Mean | 7.46 | 6.98 | 7.40 | 7.32 | 7.29 |
| | Std. Error | 0.20 | 0.19 | 0.19 | 0.20 | 0.10 |
| Literacy | N | 337 | 356 | 354 | 348 | 1395 |
| | Mean | 96.74% | 95.22% | 97.74% | 96.84% | 96.63% |
| | Std. Error | 0.97% | 1.13% | 0.79% | 0.94% | 0.48% |
| Number of children | N | 339 | 356 | 354 | 348 | 1397 |
| | Mean | 2.19 | 2.54 | 2.28 | 2.26 | 2.32 |
| | Std. Error | 0.08 | 0.09 | 0.08 | 0.08 | 0.04 |
| ==1 if mother goes to school/university | N | 337 | 356 | 354 | 348 | 1395 |
| | Mean | 12.17% | 9.55% | 11.58% | 7.18%* | 10.11% |
| | Std. Error | 1.78% | 1.56% | 1.70% | 1.39% | 0.81% |

# Some Baseline Results
# Mother's Health

- Both anaemia and depression are prevalent amongst mothers
- Mothers are on average overweight
- High prevalence of depression

| Mother's variables | | Home Stimulation | Nutrition + Home Stimulation | Nutrition | Control |
|---|---|---|---|---|---|
| Anaemia | Mean | 23.42% | 19.71% | 22.29% | 20.12% |
| | Std. Error | 2.32% | 2.16% | 2.29% | 2.23% |
| BMI | Mean | 25.29 | 24.99 | 24.59 | 25.16 |
| | Std. Error | 0.27 | 0.26 | 0.24 | 0.26 |
| CESD 10 | Mean | 8.41 | 8.91 | 9.57 | 9.36 |
| | Std. Error | 0.30 | 0.29 | 0.30 | 0.31 |
| Depressed | Mean | 38.44% | 42.35% | 44.88% | 46.44% |
| | Std. Error | 2.67% | 2.68% | 2.73% | 2.78% |

# Baseline Results
# Child Health

- There are clear nutritional deficiencies
- Substantial stunting relative to international standard 83% of a standard deviation)
- Weight deficiency, but BMI above international standard

| Z-scores | | Control | Home Stimulation | Nutrition + Home Stimulation | Nutrition |
|---|---|---|---|---|---|
| Weight for age | Mean | -0.26 | -0.16 | -0.18 | -0.17 |
| | Std. Error | 0.05 | 0.06 | 0.05 | 0.05 |
| Lenght (height) for age | Mean | -0.83 | -0.73 | -0.74 | -0.58* |
| | Std. Error | 0.06 | 0.06 | 0.06 | 0.06 |
| BMI for age | Mean | 0.35 | 0.39 | 0.37 | 0.25 |
| | Std. Error | 0.05 | 0.06 | 0.05 | 0.05 |
| weight/lenght for age | Mean | 0.20 | 0.25 | 0.23 | 0.15 |
| | Std. Error | 0.05 | 0.06 | 0.05 | 0.05 |

# Baseline Results
# Child Health

- Substantial levels of diarrhea
- 41% of children are anaemic

| Variable | | Control | Home Stimulation | Nutrition + Home Stimulation | Nutrition |
|---|---|---|---|---|---|
| Diarrhea (last 15 days) | Mean | 37.01% | 34.47% | 33.33% | 37.93% |
| | Std. Error | 2.64% | 2.54% | 2.51% | 2.60% |
| Stunting | Mean | 12.24% | 11.11% | 10.73% | 8.33% |
| | Std. Error | 1.79% | 1.68% | 1.65% | 1.48% |
| Wasting | Mean | 0.60% | 2.84%* | 1.41% | 1.15% |
| | Std. Error | 0.42% | 0.89% | 0.63% | 0.57% |
| Undernourishing | Mean | 2.69% | 4.56% | 3.95% | 1.44% |
| | Std. Error | 0.88% | 1.11% | 1.04% | 0.64% |
| Anaemia | Mean | 41.49% | 41.31% | 38.98% | 41.67% |
| | Std. Error | 2.70% | 2.63% | 2.60% | 2.65% |

# Baseline Results

- Large drop in cognition relative to US benchmark with age.
- By age 2 children have lost 60% of a standard deviation in the cognitive component relative to US.

| | Congnitive | Language | Motor |
|---|---|---|---|
| | b/se | b/se | b/se |
| Gender (==1 if male) | -0.872 | -4.429*** | -1.057 |
| | (0.58) | (0.7) | (0.76) |
| Age | -0.698*** | -0.346** | 0.444*** |
| | (0.1) | (0.11) | (0.11) |
| Kid is anaemic | -1.395* | -0.945 | -0.522 |
| | (0.57) | (0.65) | (0.83) |
| Kid is wasted | -1.707 | -1.68 | -3.189 |
| | (2.94) | (2.72) | (3.33) |
| Kid is stunted | -2.945** | -3.007** | -2.914* |
| | (0.94) | (1.08) | (1.35) |
| kid is undernourished | -2.952 | -0.999 | -3.539 |
| | (2.76) | (2.48) | (2.97) |
| Years of education Mother | 0.325*** | 0.430*** | 0.228* |
| | (0.09) | (0.09) | (0.1) |
| Factor: Utilities | 0.572 | 0.208 | -0.028 |
| | (0.31) | (0.41) | (0.41) |
| Factor: Possesions | 0.468* | 0.427 | 0.664** |
| | (0.18) | (0.25) | (0.23) |
| Number of children under 6 years | -1.022* | -2.507*** | -1.246** |
| | (0.44) | (0.52) | (0.43) |
| Weight at birth | 0 | 0 | 0 |
| | (0) | (0) | (0) |
| Was he breastfed? | 4.187* | 0.953 | 3.392 |
| | (2.1) | (1.78) | (2.58) |
| constant | 101.981*** | 99.237*** | 83.833*** |
| | (3.78) | (4.63) | (5.33) |

# Discussion

- The treatment and control samples are very well balanced in all dimensions
- There are important features in the data that demonstrate health and nutritional deficits
- A key result is the decline of relative cognitive ability with age, indicating the possible impact of bad nutrition and low stimulation in such a deprived population

# Analysis

- The experiment will answer directly whether this programme proved effective.
- However it will also provide us with data to look more closely at what changes are happening within the household as a result of the intervention:
  - Crowding in (or out) of resources
  - Time use and expenditures on children
  - Education of older siblings
- It is important to understand whether such interventions change investments in children. This will help us understand sustainability.

# Our future plans for India

- We have designed an enhanced version of this intervention to implement in India
- The new intervention will include a group intervention and an incentive for mothers to participate.
- We are now raising funds for this new exciting experiment

# Conclusion

- From a policy perspective we have a huge opportunity to learn about policies that can brake the intergenerational cycle of poverty.

- From a scientific point of view we can advance our learning about the effectiveness of policies based on community resources and the way they interact with household investments in children.