The Impact of Cognitive Stimulation and Nutritional Supplements on Early Childhood Development in Colombia

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Sector(s): Health, Social Protection

Fieldwork: Familias en Accion

Location: Colombia

Sample: 1420 children aged 12 to 24 months

Target group: Children under five Mothers and pregnant women

Outcome of interest: Anemia Food security Nutrition

Intervention type: Cash transfers Early childhood development Preventive health Training Conditional cash transfers

AEA RCT registration number: AEARCTR-0001071

Research Papers: Why is multiple micronutrient powder ineffective at reducing anaemia among 12–2..., Impacts 2 years After a Scalable Early Childhood Development Intervention to In..., Using the infrastructure of a conditional cash transfer program to deliver a sc...

Partner organization(s): Colombia National Planning Department (DNP)

Early childhood is an important time for both physical and neurological growth and development, but many children fail to reach their development potential. Researchers introduced an early childhood development program in Colombia to test the effects of psychosocial stimulation and micronutrient supplementation on cognitive, behavioral, and physical growth and development. Psychosocial stimulation initially showed positive effects on cognitive growth, although the micronutrient supplementation had no effect. However, a follow-up study showed that the results on cognitive growth disappeared two years later.

Policy issue

Early childhood is a critical time for cognitive, social, and physical development. For children under the age of five, good nutrition and psychosocial stimulation—physical and emotional engagement—may be especially important for physical and neurological growth. Unfortunately, many children under five fail to reach their developmental potential, due to poverty and the often associated poor nutrition and lack of psychosocial stimulation. Previous research has shown that nutritional supplements early in life can increase a child's income as an adult[1], and that encouraging parents to play with their children more can promote

greater emotional and intellectual development.[2] Yet there is little evidence on how to successfully scale up early childhood development programs while maintaining impact and cost-effectiveness. To address this gap, researchers used the existing administrative capacity and community networks of a national cash transfer program in Colombia to evaluate the impact of a program that trained low-income mothers to provide their young children with psychosocial stimulation, micronutrients, or both.

Context of the evaluation

In Colombia, as in many other countries, children from low-income households often accumulate delays in cognition and language, which can be detected as early as twelve months of age. A 2014 study found that, by age three, the cognitive and language differences between children from middle- and low-income households in Colombia were as large as one standard deviation of a standardized score. In addition, 31 percent of children in the country's lowest socioeconomic category were anemic, an indicator of malnutrition, in 2010. At baseline, in the comparison group in this study, 46 percent of children were anemic and 16 percent were stunted.

Participating mothers were about 27 years old on average and had slightly more than a primary school education.

Researchers tested two early childhood interventions that were implemented through the existing infrastructure of Colombia's largest national welfare program, Familias en Acción. The program provides conditional cash transfers to the poorest 20 percent of Colombian households if their children attend school and regular health check-ups. To promote community participation, beneficiaries periodically elect representatives, "mother leaders," who act as liaisons between them and local program officials.



A trained home visitor reads with mother and children in Colombia

Photo credit: Marta Rubio Codina, Inter-American Development Bank

Details of the intervention

Researchers conducted a randomized evaluation to measure the impact of two early childhood development interventions on cognition and physical health, implemented through an existing national welfare program that could facilitate a cost-effective scale-up of these interventions. They randomly assigned 96 Familias en Acción municipalities near Bogotá to one of four groups: a psychosocial stimulation program, a micronutrient supplement program, both programs, or the comparison group. In each municipality, three mother leaders were randomly selected to administer the programs through home visits. Within each mother leader's constituency (about 50 households), researchers randomly selected five families with children aged 12–24 months to participate in the study, for a total of 1,419 children.

The interventions began in 2010 and lasted 18 months. In municipalities assigned to the stimulation program, home visitors visited mothers every week and demonstrated appropriate play and learning activities for their children using low-cost or homemade toys, picture books, and form boards. In micronutrient municipalities, mother leaders distributed micronutrient supplements to households every two weeks and monitored their use. Municipalities in the third treatment group received both interventions. Home visitors were trained for several weeks by experienced social workers, who also provided home visitors with ongoing support and monitored their performance. 81 percent of scheduled home visits were completed, and 73 percent of scheduled micronutrient supplements were recorded as having been distributed.

Researchers used the Bayley-III scale of infant and toddler development to measure cognitive development. The scale has indicators on cognition, receptive language,[3], expressive language,[4], and motor skills.[5] Researchers also surveyed the mother or head of household to gather socioeconomic data, such as age, education level, and employment status of all household members. measured children's weight, height, and hemoglobin levels.

Data was collected in multiple waves. Before the intervention began, researchers administered the Bayley-III and household surveys to gather pre-intervention baseline data. At the end of the program, which lasted 18 months, researchers again administered both surveys to all children and households who stayed in the program . Two years later, researchers went back to the children who participated in the study and again administered tests and surveys to assess longer-term effects.

Results and policy lessons

The stimulation program had positive impacts on children's cognitive development immediately after the intervention, but these results were not sustained. The micronutrient program did not have child development impacts.

The stimulation program increased children's cognitive development outcomes in the short term. Results collected immediately after the intervention demonstrated that encouraging mothers to interact and play more with their children improved children's cognitive development by 0.26 standard deviations and receptive language by 0.22 standard deviations, relative to children in the comparison communities.

To understand what drove these initial improvements, researchers used the data from the randomized evaluation to model how different factors affected the development of the children in the study. This analysis demonstrated that the improvements in cognitive development were driven by increased parental investment, encouraged by the home visits. Researchers projected that relative to the comparison group, parents in households that received the stimulation program increased play materials and time spent with their children by 20.4 and 33.3 percent, respectively. Results demonstrated that material investments were the primary driver of children's improvement in cognitive skills, and time investments were important in improving socio-emotional skills.

However, these cognitive improvements were not sustained over time. Researchers found no statistically significant improvement in any cognitive and behavioral measures at the two year follow-up: children assigned to the program had no better development

outcomes compared with children in the comparison group. These findings ran contrary to results from other studies, such as those in Jamaica[6], and Pakistan,[7] which found positive medium or long term impacts of similar programs on child development.

The researchers provided several possible explanations for the lack of sustained cognitive impacts. First of all, the short-term improvements captured immediately following the intervention may have been too small to be sustained into the medium term. The evaluation was also conducted over a shorter timeframe and with a slightly wealthier population than the other studies. Furthermore, changes in parenting practices and the home environment were not sustained after the evaluation period. Additionally, the researchers suggested that effects could potentially become apparent later on, as the benefits may accrue over time and become apparent in a later period.

Inadequate resources led to poor program implementation. Researchers modelled this program off a similar one from Jamaica, which showed significant effects on children's cognitive and receptive language skills. However, they were unable to pilot test the program in Colombia first to test and resolve implementation issues and instead immediately launched a large-scale program. Ultimately, staff received limited support due to resource and capacity constraints. Supervisors were supposed to meet with home visitors every six weeks, which was already less than the weekly visits in the Jamaica program. In reality, they only met every nine weeks. The supervisors themselves also had little support after an initial six-week training course.

Micronutrient supplements had no impact on children's outcomes in either time frame. Researchers hypothesized that feeding practices, such as introducing semi-solid foods instead of breastfeeding, could have been a factor. In addition, mothers' iron levels during pregnancy could have impacted how much iron the babies had at birth. The researchers found that mothers who had taken iron supplements for at least four months of pregnancy had higher rates of blood iron than those who did not. This iron supplement intake during pregnancy correlated with the babies being born with higher amounts of iron in their systems.

Attanasio, Orazio, Camila FernÃ¡ndez, Emla Fizsimons, Sally Grantham-McGregor, Costas Meghir, and Marta Rubio-Codina. 2014. "Using the Infrastructure of a Conditional Cash Transfer Program to Deliver a Scalable Integrated Early Childhood Development Program in Colombia: Cluster Randomized Controlled Trial." BMJ 349:g5785. Attanasio, Orazio, Sarah Cattan, Emla Fizsimons, Costas Meghir, Marta Rubio-Codina. "Estimating the Production Function for Human Capital: Results from a Randomized Control Trial in Colombia." NBER Working Paper No. 20965, February 2015.

1. Hoddinott, John, John Maluccio, Jere Behrman, Rafael Flores, and Reynaldo Martorell. 2008. "Effect of a Nutrition Intervention During Early Childhood on Economic Productivity in Guatemalan Adults." 371(9610): 411-416.

2. Walker, SP, SM Chang, M Vera-Hernández, and S Grantham-McGregor. 2011. "Early Childhood Stimulation Benefits Adult Competence and Reduces Violent Behavior." Pediatrics 127(5): 849-57.

3. Receptive language refers to the ability to understand information, both orally and through writing. (Afasic. "More about Speech, Language, and Communication." https://www.afasic.org.uk/about-talking/more-about-speech-language-and-communication/.)

4. Expressive language refers to the ability to express information through speech and writing. This involves putting thoughts into words and sentences in a way that both makes sense and is grammatically accurate. (Afasic. "More about Speech, Language, and Communication." https://www.afasic.org.uk/about-talking/more-about-speech-language-and-communication/.)

5. The Bayley Scales of Infant Development are widely accepted standards used in clinical psychology to measure the development of children aged 0-3. The standards include indicators on levels of cognition, language skills, motor skills, adaptive behavior, and social-emotional skills.

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7. Yousafzai AK, Obradović J, Rasheed MA, Rizvi A, Portilla XA, Tirado-Strayer N, et al. Effects of respon- sive stimulation and nutrition interventions on children's development and growth at age 4 years in a dis- advantaged population in Pakistan: a longitudinal follow-up of a cluster-randomised factorial effectiveness trial. Lancet Glob Health. 2016; 4:e548–58. https://doi.org/10.1016/S2214-109X(16) 30100-0 PMID: 27342433.