

NOTES

CHILD & YOUTH DEVELOPMENT



Supplementing Nutrition in the Early Years: The Role of Early Childhood Stimulation to Maximize Nutritional Inputs

This note presents the evidence on the role that simple early childhood stimulation inputs can play when they accompany nutrition inputs, and how the joint intervention is crucial to the development of young children - which lays the foundation for their capacity to learn and to lead healthy and productive lives. This note also provides examples of how early childhood stimulation can easily be integrated into current policies and programs at relatively low marginal costs.

Early childhood stimulation is defined as providing young children with constant opportunities to interact with caring figures and to learn about their environment from the earliest age. In practice, stimulation is about parents and other caregivers being responsive to the emotional and physical needs of their children from birth onward, playing and talking with them (even before children can respond verbally), and exposing them to words, numbers, and simple concepts while engaging in daily routines. As children get slightly older, the effect of these nurturing family interactions can be reinforced through teacher-led activities in the context of preschools or other center-based early childhood services.



VOLUME III, NUMBER 1
MARCH 2009

There are over 3 billion people under the age of 24 in the world today, comprising 47% of the world's population. Nearly 90% live in developing countries and the challenges they face—poor health, low quality education, lack of marketable skills, high rates of unemployment, early pregnancy, social exclusion, and the highest rates of new HIV/AIDS infections—are costly to themselves and to society at large. Client demand for policy advice on how to tap the enormous potential of the world's children and youth is large and growing. This series aims to share research findings and lessons from the field to address these important cross-sectoral topics.

www.worldbank.org/childrenandyouth

Adequate nutrition is a necessary precondition for survival and development in the early years

156 million children below the age of five are stunted.¹ While these numbers represent 28% of all children under five in the developing world, the prevalence is even higher in Sub-Saharan Africa and South Asia (i.e., 61% and 52% of children, respectively).

It is critical for the development community to help governments and NGOs address the nutritional needs of expectant mothers and young children. World Bank President Robert Zoellick has said that "malnutrition is the largest risk factor for children under the age of five and the underlying cause of an estimated 3.5 million of their deaths each year."² For those who survive, malnutrition has dire repercussions on their overall development over time. Stunted children, when compared to non-stunted children, are less likely to enroll in school at the right age and more likely to attain lower achievement levels or grades for their age. They also tend to have poorer cognitive ability or achievement scores.³ In turn, research indicates that "[Guatemalan] boys who received nutritional supplementsⁱ during their first two years earned on average 46 percent higher wages as adults."^{4,5}

Improving the diets of pregnant women, infants, and toddlers to reduce stunting, iodine deficiency and iron deficiency anemia through food supplementation and/or interventions to promote behavioral changes among expecting mothers and parents of young children (as in the Buen Inicio program in Peru or the AIN model in Central America, for example) is rightly a priority for the World Bank and other development agencies. The focus on proper nutrition in the early years is even more critical in the current context of rising food prices worldwide, to ensure that the most vulnerable children and families do not suffer even further.⁶

But young children will not reach their full potential through nutrition alone

Stimulation is a critical input to maximize the impacts of nutritional interventions. Children who are stunted or otherwise malnourished will benefit from effective nutritional interventions, especially before the age of two, but they cannot catch up to well-nourished children in overall human development (including growth, cognitive, language, social, and motor development) if they do not receive proper stimulation in the early years.⁷

Early childhood stimulation and physical growth. In some cases, children who have access to adequate nutrition fail to eat and/or to grow properly because of the lack of stimulation and attention they experience at an early age. This condition may be called "failure to thrive" when children refuse to eat

ii Attachment theory posits that children whose parents are not responsive to their emotional needs from birth on tend to be more insecure and less likely to form positive relationships and to develop well in early childhood and beyond.

i The nutritional supplement (Atole) consisted of dry skimmed milk, vegetable protein, and sugar. It was given twice a day to participating children.

and, as a result, do not grow properly.⁸ Or it may be called "deprivation dwarfism" when children eat but still fail to grow because the emotional and stimulation deprivation they face depresses the endocrine system and inhibits the production of pituitary growth hormones, a substance known to be essential for the normal growth and development of body cells.⁹

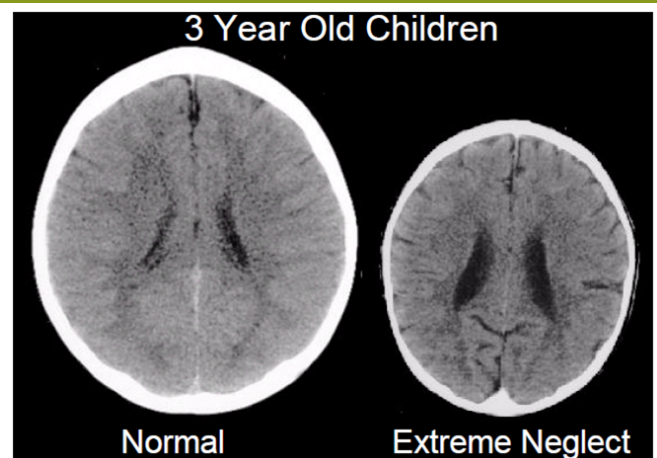
These conditions occur everywhere, including in developed countries, but they may be particularly prevalent in conflict or post-conflict societies, in HIV/AIDS affected communities, or in extremely poor environments, where caregivers are so preoccupied with daily survival that they develop stress and depressive symptoms that interfere with their capacity to create the nurturing and stimulating environment needed for their children to thrive.^{ii,10} Repeated anecdotal evidence from NGO-run feeding centers in emergency situations (e.g., famines, conflicts, etc.) shows that malnourished infants and toddlers often fail to benefit from the feeding supplements they receive and to gain weight when their mothers are emotionally disengaged.

Early childhood stimulation and brain development.

Proper nutrition is needed in-utero and during the first few years of life for brain development to take place and for certain areas of the brain to function normally in later life - thus making it possible for children to learn and to eventually lead healthy, productive lives.

Yet, the human brain cannot develop to its full potential through nutrition alone. Early childhood stimulation also plays a critical role in the process of brain formation and development, mainly by supporting the multiplication of synapses and the myelination process, all of which allows for more complex and faster neural transmissions.¹¹ In turn, parental neglect (i.e., lack of proper care and stimulation) in the early years can lead to dramatic abnormalities in brain development, as shown in Figure 1.ⁱⁱⁱ

Figure 1: Abnormal Brain Development Following Sensory Neglect in Early Childhood.¹²



Source: Perry (2004) – cited in Heckman (2008)

iii The scan on the left is an image from a healthy three year old with an average head size (50th percentile). The image on the right is from a three year old child suffering from severe sensory-deprivation neglect. This child's brain is significantly smaller than average (3rd percentile) and has enlarged ventricles and cortical atrophy).

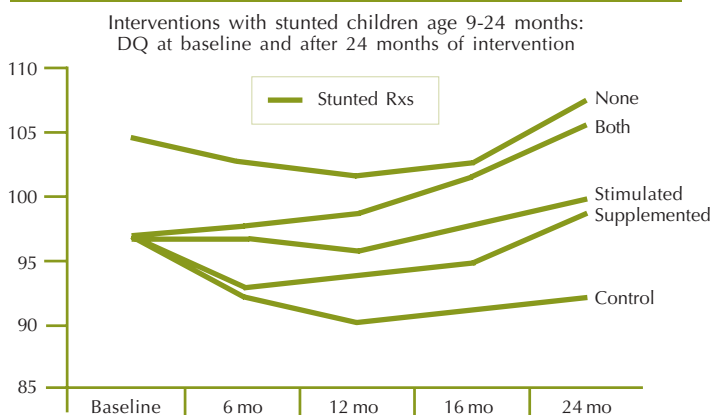
The cumulative benefits of early childhood nutrition and stimulation have been empirically proven in several contexts

The good news is that delays in children's growth and development can be prevented (and sometimes reversed) through proper care in the early years, which requires adequate nutrition and stimulation. Evidence from Jamaica shows the synergistic effects of integrating nutrition and stimulation. In the study, stunted children ages 9 to 24 months were randomly assigned to nutrition only, stimulation only, nutrition and stimulation, and control group.^{iv} After the 2 years intervention, the benefits from a combination of nutrition supplements and stimulation were additive, and the children receiving both treatments caught up to the non-stunted control group in IQ (see Figure 2).¹³

Long term follow-ups at ages 7-8, 11-12, and 17-18 showed that the children who had received the stimulation intervention had better cognitive, education, and psychosocial functioning over time than those who did not. Stunted children who received stimulation had significant benefits to cognition at age 11 years and again at age 17 years. In turn, while stunted children who received the nutrition intervention (but no stimulation) also had benefits to cognition at age 7, these effects were no longer present at ages 11 years and 17 years.¹⁴

Similar results were found among Vietnamese children. The study indicated that children who received both a nutrition intervention between the ages of 0 and 3 and a stimulation intervention from age 4 to 5 did significantly better on a cognitive test at age 6 than children who had received the nutrition intervention only.^{v,15} The difference in scores was greater among stunted children, thus indicating that

Figure 2: DQ or IQ scores of stunted children receiving either a nutrition supplement only, early stimulation only, or both.



Source: Grantham McGregor et al. (1997)

iv Supplementation comprised 1 kg of milk-based formula per week. Stimulation comprised weekly 1-h home visits by community health workers, with the objective of improving mother-child interactions through play.

v The nutrition intervention included bi-monthly growth monitoring sessions and monthly meetings where parents learned about nutrition and health-seeking behaviors and how to feed their children locally available nutritious foods. The stimulation intervention included quality preschool services and monthly meetings with mothers and fathers (separately) on topics related to early childhood stimulation.

stimulation in the first 5 years of life can play a protective role against the negative cognitive effects of growth failure.

Integrating early stimulation into policy and programming is not difficult

The most effective early child development programs provide direct learning experiences to children and families, are targeted toward younger and disadvantaged children, are of longer duration, quality, and high intensity, and are integrated with family support, health, nutrition, and educational systems and services.

In practice, integrated early child development programs can take many forms. Stimulating activities for young children can be integrated with nutrition interventions and promoted through:

- Home visiting and parental/caregiving support, in which qualified health or social workers can observe parent-child interactions and provide simple advice (and/or demonstrate positive behaviors) on how to engage the child in opportunities for physical, cognitive, and socio-emotional growth through play-based interactions.¹⁶
- Parenting information in the context of growth-monitoring follow-up, where suggestions on quality parent-child interactions and stimulation can supplement the nutrition supplementation and health/hygiene advice already given (e.g., by encouraging mothers to smile at and talk to their babies while breastfeeding, and to engage older children in simple games that promote their overall development)¹⁷
- Parenting information delivered in group meetings at the community level. For instance, community members may be asked to identify a few successful mothers among themselves (i.e., mothers who have managed to raise well-adjusted children under the community constraints experienced by all) and to have them explain and demonstrate their child-rearing practices to others.¹⁸
- Quality center-based activities for young children, in which trained ECD staff or volunteers engage young children in stimulating activities for a few hours a day - ideally with the active involvement and participation of families.¹⁹

All the above interventions can be implemented in and by themselves, or in combination with one another (e.g., center based services every day + parenting meetings once a month). The relative feasibility and cost-effectiveness of various options may vary from context to context, depending on the types of services and infrastructures already in place,^{vi} but any intervention that promotes both the nutritional needs and the cognitive and socio-emotional needs of children is likely to be highly cost-effective, as documented below.

vi Several impact evaluations are currently under way to address this question. For instance, an impact evaluation of ECD services in Cambodia is assessing the relative cost-effectiveness of three types of interventions: (i) community led center-based activities for children ages 3 to 5 + monthly parenting sessions for parents of children ages 0 to 5; (ii) school-led center-based activities for children ages 3 to 5 + monthly parenting sessions for parents of children ages 0 to 5; and (iii) exchanges of parenting information/best practices for parents of children ages 0 to 5 through community meetings with "core" mothers who have been identified as particularly successful and knowledgeable.



And it is likely to be cost efficient and effective

When nutrition interventions (such as food and micronutrients supplements and information about breastfeeding, healthy food, and safe cooking practices) are already provided to expectant or new mothers and young children, the marginal cost of adding a stimulation component (e.g. via parenting information given in the context of growth monitoring visits) can be quite low.

When integrated early child development programs are developed from scratch, the costs may be a bit higher (e.g., US\$15 per child per year in Indonesia), but the benefits of such integrated approaches in terms of improved health (including nutrition) and increased schooling are usually well worth the initial investment. For example, a cost-benefit analysis of the high quality U.S.-based Abecedarian project indicated an average benefit-cost ratio of 4 to 1,²⁰ and a similar

study of the Indonesia Early Childhood Development Project projected a ratio of 6 to 1.^{vii,21}

In summary, stimulation is a key ingredient to getting the most out of nutritional interventions, so that young children do not only survive the first five years of life but also grow to receive an education and to become contributing members of society. Addressing both the nutritional and the stimulation needs of young children prevents (or reverses) stunting, improves school readiness, and helps children growth to their full potential in life. While more studies are needed to improve our knowledge about which specific early childhood interventions and combinations of interventions are promising in terms of their impact and cost-effectiveness in various settings, the evidence-base currently available indicates that stimulating activities for young children can be added to nutrition interventions at relatively low marginal costs, thus making integrated early childhood interventions highly cost-effective.

vii Benefits were measured in terms of increased education over the medium-term and improved labor-earnings over the long-term.

References

1. Grantham-McGregor, S., Bun Cheung, Y., Cueto, S., Glewwe, P., Richer, L., Trupp, B. and the international Child Development Steering Group (2007). Developmental Potential in the first 5 years for children in developing countries. *The Lancet*, 369, 60-70
2. Robert Zoellick. A challenge of economic statecraft. Speech delivered at the Center for Global Development, Washington D.C., April 2, 2008.
3. Ibid 1
4. Ibid 2
5. Hoddinott, J., Maluccio, J., Behrman, J.R., Flores, R., & Martorell R. (2008) Effect of a nutrition intervention during early childhood on economic productivity in Guatemalan adults.
6. Klotz, C., de Pee, S., Thorne-Lyman, A., Kraemer, K., and Bloem, M. (2008). Nutrition in the perfect storm: Why micronutrient malnutrition will be a widespread health consequence of high food prices. *Sight and Life*, Vol 2 (2008).
7. Black, M., Walker, S., Wachs, T., Ulkuer, N., Gardner J., Grantham McGregor, S., Lozoff, B., Engle, P., and Cabral de Mello, M. (2008). Comment: Policies to reduce undernutrition include child development. *The Lancet*, 371, 454-455.
8. Lozoff, B. (1989). Nutrition and behavior. *American Psychologist*, 44, 231-236
9. Tanner, J.M.(1990). Fetus into man: Physical growth from conception to maturity (2nd Ed.). Cambridge, MA. Harvard University Press.
10. Walker, S., Wachs, T., Gardner, J., Lozoff, B., Wasserman, G., Pollitt, E., Carter, J., and the International Child Development Steering Group (2007) *The Lancet*, 369, 145-157.
11. Nelson CA, de Haan M., Thomas KM (2006). Neuroscience and cognitive development: the role of experience and the developing brain. New York: John Wiley.
12. Perry, B.D. (2004). Understanding traumatized and maltreated children: The Core Concepts" Video presentation. Cited in Heckman, J. (2008). Schools, Skills, and Synapses. IZA discussion paper series No 3515
13. Grantham McGregor, S.M., Walker, S.P., Chang, S.M. & Powell, C.A., (1997). Effects of early childhood supplementation with and without stimulation on later development in stunted Jamaican children. *American Journal of Clinical Nutrition*, 66, 247-253.
14. Walker, S.P., Chang S.M., Powell, C.A., Grantham McGregor S.M.. Effects of early childhood psychosocial stimulation and nutritional supplementation on cognition and education in growth-stunted Jamaican children: prospective cohort study. *Lancet* 2005, 366, 1804-1807.
15. Watanabe, K., Flores, R., Fujiwara, J., and Huong Tran L.T.(2005). Early childhood development interventions and cognitive development of young children in rural Vietnam. *The Journal of Nutrition*, pp. 1918-1925
16. See an example of this type of intervention in Jamaica, as documented in: Meeks Gardner, J., Walker, S. P., Powell, C. A. & Grantham-McGregor, S. (2003) A randomized controlled trial of a home-visiting intervention on cognition and behavior in term low birth weight infants. *J. Pediatr.* 143:634-639.
17. See an example of this type of intervention in the Indonesia Early Childhood Development Project – in which local health posts (i.e., posyandus) can be used to deliver integrated ECD services
18. See an example of this type of intervention in Home Based Education Programs (HBEP) implemented in Cambodia as part of an FTI Catalytic Fund (2008-2010) – in which “core mothers” share their experience with other mothers
19. See examples of Bank-supported center based ECD activities in Cambodia, Indonesia, Jordan, Armenia, and Jamaica, among others.
20. Campbell, F.A., C.T. Ramey, E.P. Pungello, S. Miller-Johnson, and J.J. Sparling, 2002. “Early childhood education: young adult outcomes from the Abecedarian Project.” *Applied Developmental Science* 6 (1): 42-57.
21. World Bank (2006). Project Appraisal Document for an Early Childhood Development Project in Indonesia. Washington D.C.



Children & Youth Unit, Human Development Network, The World Bank
www.worldbank.org/childrenandyouth

This note was prepared by Sophie Naudeau (Human Development Specialist, HDNCY). The author wishes to thank Ian Walker (Lead Social Protection Specialist, LCSHS), Felipe Barrera (Senior Economist, HDNED), Darren Dorkin (Senior Operations Officer, HDNHE), Mary Eming Young (Lead Specialist, HDNCY), Wendy Cunningham (Unit Coordinator, HDNCY), and Mattias Lundberg (Senior Economist, HDNCY) for their valuable comments. Photo credit: Shehzad Noorani. The views expressed in these notes are those of the author only and do not necessarily reflect the view of the World Bank.