Brain Development & Nutrition

At a Glance:
During pregnancy, infancy and early childhood, adequate nutrition and appropriate stimulation are crucial for optimal brain development of the child. This brief will examine nutrition in particular. The early years lay the foundation for the development of cognitive, motor, and socio-emotional skills used throughout life. Damage resulting from undernutrition in-utero and early childhood leads to loss of cognitive potential, resulting in lower school performance, lower adult wages and poor health outcomes. Preventing undernutrition, and providing nutritional and psychosocial stimulation for those that are undernourished, will reduce possible deleterious effects and help children succeed in school, assist communities to thrive, and enable nations and economies to prosper.

What it is
Ninety percent of brain development occurs in the first five years of life with the majority happening during the first 1,000 days—beginning in the first days of pregnancy until the age of two.

Therefore, adequate nutrition, the building block for healthy brain development, is especially important given that prolonged undernutrition or an episode of moderate-to-severe malnutrition would have devastating consequences.

This brief is one of a series on “Investing Early for Success in School” developed by the members of the Basic Education Coalition’s Early Childhood Education Working Group. The aim of this series is to educate donors and policy makers about the connection between children’s early development and their long-term academic achievement, and to present evidence and recommendations on cost-effective, high-impact interventions to help children achieve their developmental potential.
during these early years can hinder cognitive development, impede IQ and school success, and hamper economic achievement later in life.\textsuperscript{3,4,5}

**Why it matters**

Undernutrition leads to stunting, wasting, and deficiencies of essential micronutrients. This is alarming because stunting, or being too short for one's age, results in irreversible developmental outcomes for children and compromises the cognitive development and physical capabilities of 165 million children under age five worldwide.\textsuperscript{6} Likewise, lack of protein-energy and micronutrients, which are essential building blocks for proper brain development, cause structural damage to the brain “impairing infant motor development and exploratory behavior.”\textsuperscript{7}

Undernutrition of children under five years of age not only directly affects their ability to thrive, but also limits a nation’s prospects for economic growth. On a macro level, based on global economic loss modeling, undernutrition decreases a country’s economic advancement by at least 8\% as a result of direct productivity losses, poorer cognition, and reduced schooling.\textsuperscript{8} It is unlikely that individuals, communities and countries will be able to break out of poverty and sustain economic advances without ensuring adequate nourishment.\textsuperscript{9}

Undernutrition of infants and young children matters because it is part of a deleterious cycle – it both contributes to and is a direct result of poverty, food insecurity, low education (especially of women), inadequate maternal and childcare, gender inequality and weak economies.

**Evidence**

The scientific literature "suggests an association between stunting and present or later cognitive ability or school performance in children from low-income and middle-income countries."\textsuperscript{10} For example, school-age children who suffered from early childhood protein energy malnutrition, particularly during the first two years of life, have been found to have lower IQ levels, cognitive function, school achievement and participation, and greater behavioral problems than matched controls.\textsuperscript{11} Micronutrient deficiencies in the early years can also have devastating consequences for a child’s developmental trajectory; iron, vitamin A, iodine and zinc all play particularly important and complex roles in cognitive development and in reducing susceptibility to a variety of diseases.\textsuperscript{12}

Stunting is related to late school enrollment, higher grade repetition and school absence, and long-term negative cognitive outcomes. Longitudinal studies of children from “Brazil, Guatemala, India, the Philippines and South Africa associated stunting with a reduction in schooling, where adults who were stunted at age two completed nearly one full year less of school than non-stunted individuals.”\textsuperscript{13} A study in the Philippines found that children who were severely stunted before age two were more likely to enroll in school late, to repeat a
grade and to be absent from school. The 40-year Barbados Nutrition Study evaluated IQ and academic skills in adults who experienced moderate-to-severe infantile malnutrition against a healthy control group. The primary findings from this longitudinal study showed that although the previously malnourished children had caught up to their healthy peers in physical growth, their cognitive development remained behind, evidenced by “lower IQ, more attention problems, and lower grades in school.”

But, there is hope. Ongoing research is establishing that “nutritional supplementation in conjunction with psychosocial stimulation result in greater improvements in child development than either intervention alone.” In particular, a study of adults who had participated in a 1986-1988 randomized control trial in Jamaica on low-cost early childhood interventions for 9-24 month stunted children found that the treatment group earned 25% more as adults than the control group. For this trial the treatment received nutrition support combined with two years of early childhood home visits, parent-child interactions and cognitive and social stimulation. The results of these findings clearly demonstrate the value and long-term economic benefit of an integrated approach to treating undernutrition. Based on these and other findings, the World Health Organization recommends the use of “structured activities to promote cognitive development as a component of the treatment of early childhood malnutrition, in addition to nutrition and healthcare.”

Experts in the development field know how to prevent and treat undernutrition. They also know how and why undernutrition impacts cognitive development and its long-term individual and societal effects. Through the implementation of evidence-based policies, infants and young children in low-income countries can thrive, leading to long-term benefits for their communities, countries and economies.

Policy Recommendations:

- Improve early identification of undernutrition and under-five cognitive delays
- Strengthen and integrate globally-recognized community-based nutrition interventions
- Integrate health/nutrition/WASH programming with community-based or formal early childhood development activities
- Continue research and standardize a globally-recognized undernutrition treatment program that integrates nutritional supplementation and psychosocial stimulation
• **Continue to advocate for prevention of malnutrition in children under 5 through evidence-based maternal and child health interventions**, such as education for adolescent girls, reduction of adolescent marriage and pregnancy, WASH, and promotion of exclusive breastfeeding and complementary feeding.

• **Continue to research, assess and program at the nexus of education and health/nutrition/WASH**

• **Advocate for programs and policies to holistically incorporate actions to address the underlying determinants** of undernutrition including poverty, food insecurity, low education, inadequate maternal and child care, gender inequality, and the lack of access to high-quality health care, hygiene, and sanitation services.

*in alignment with WHA Global Nutrition Targets 2025*

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### References:


13 WHO. (2014).


15 Waber et al. (2014).


19 Gertler, et. al. (2015).