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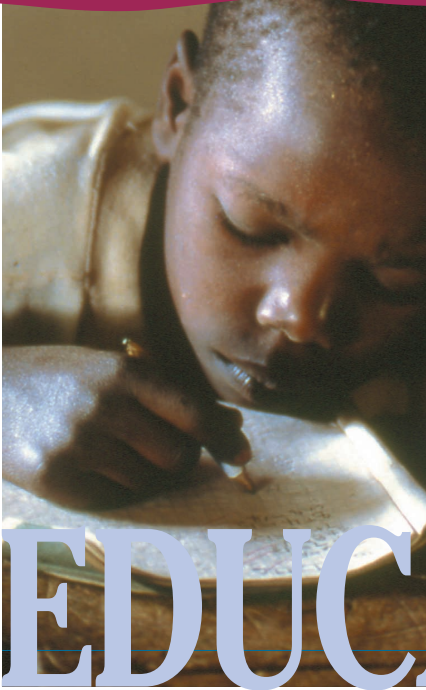
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# Nutrition and Education

MATTHEW JUKES, JUDITH MCGUIRE,  
FRANK METHOD, AND ROBERT STERNBERG

## EDUCATION

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**No nation** can afford to waste its greatest national resource: the intellectual power of its people. But that is precisely what is happening where low birth weight is common, where children fail to achieve their full potential growth, where micronutrient deficiencies permanently damage the brain, and where anemia and short-term hunger limit children's performance at school. Increasingly in this world, it is intellectual resources, not natural or physical resources, that determine national power. How can a nation compete internationally when 20–50 percent of its population is intellectually compromised? Since the child survival revolution has saved so many children's lives, it is now time to focus on the quality of life and health of the survivors.

### Good Nutrition Is Essential If Learning Is to Occur

Investing in nutrition is a necessity, not a luxury, in today's world. A quick review of the evidence demonstrates the importance of nutrition to intellectual and educational power.

Thirty-six percent of children under five are growth retarded (that is, their height-for-age is low). This figure may rise to around 50 percent for school-age children. Growth retardation is associated with a substantial reduction in mental capacity and adverse school performance, even in

mild to moderate cases, and ultimately leads to reduced work productivity.

An estimated 1.6 billion people worldwide are iodine deficient. Iodine deficiency is associated with an average 13.5 point reduction in IQ for a population. Deficiency in school children leads to reduced cognitive function while deficiency during fetal life can have profound and irreversible effects on the child's mental capacity: "cretinism" due to iodine deficiency is still found in mountainous and floodplain areas of the world.

Seventeen percent of infants are born with low birth weight (under 2.5 kilograms), resulting in poorer cognitive performance during infancy, although this effect is overshadowed by that of malnutrition. In the longer term, children born with a low birth weight have a poor attention span in school.

Fifty-three percent of school-age children suffer from iron-deficiency anemia. Reduced cognitive abilities, on the order of 1 standard deviation, are associated with anemia in both infants and school-age children with similar reductions in school performance.

When children go to school without breakfast, their performance goes down by around 0.1 standard deviations (4 percentiles) but only if they are malnourished or from poorer backgrounds.

Nutrition affects school performance indirectly as well. Undernourished children (low height-for-age) tend to be enrolled later in school than better-nourished children. This could be because parents deem shorter children to be younger, because they do not believe the children are physically large enough to attend school, or perhaps because they are investing more in the better-nourished children. In any case, late enrollment compounds the problems of intellectual impairment caused by nutritional deficits.

There is ample evidence that increased height, working both through physical capacity and through learning capacity and school performance, results in increased adult wages and productivity. One analysis of U.S. data finds that an increase in birth weight of one pound leads to an increase of 7 percent in lifetime earnings. Another study in Brazil finds that a 1 percent increase in height results in a 2.4 percent increase in adult male earnings. The impact of the nutrition-related cognitive improvements alone is 1.3:1.

### Improving Educational Performance through Nutrition

How can these problems be resolved? The first three years of life, plus life in the womb, are the most important periods in terms of mental, physical, and emotional development. It is during these critical windows of time that basic human capital is formed. Most growth failure occurs between 6 months and 24 months of age. Early damage due to anemia, iodine deficiency, and chronic malnutrition can only partially be reversed in later life. Preventive programs, therefore, must be accorded high priority.

Health, family planning, and nutrition programs for women before and during pregnancy are critical to assure that mother and infant leave the childbirth experience in optimal physical and mental condition.

After birth, growth promotion and development programs, integrated early childhood programs, and parent education are critical—and cost-effective. The return on investment in growth promotion and micronutrient programs varies from 7:1 to 84:1, and early childhood development programs are calculated to have a benefit-cost ratio of around 2:1. Trials of preventive protein supplementation and of iron supplementation in the first two years of life have found considerable benefits to children's intellectual development up to 10 years later. Targeted fortification of weaning foods is cost-effective and has been credited with eradicating most anemia in Sweden and the United States. Food fortification programs (salt iodization and iron fortification of staple foods) are inexpensive and effective in addressing most of these micronutrient deficiencies in the whole population.

Remedial efforts targeted at older children such as preschool programs, school health and nutrition programs, and adolescent interventions do help children do better in school, but because of an absence of interventions earlier in life, children often enter school as “damaged goods.” Including psychosocial stimulation in remedial supplementation programs, in addition to nutritional supplements, may be critical. Years of malnutrition have a cumulative effect that needs to be reversed, and a combination of nutritional and psychosocial interventions can have a greater effect on cognitive development and physical growth than either intervention alone.

There is much debate about whether schoolchildren, particularly adolescents, can catch up in their physical growth or in their mental capacity. Although it is likely that children are most vulnerable to the effects of nutritional deficits in the first few years of life and that some of these effects may be irreversible, much can still be done to improve the learning potential of malnourished schoolchildren. Undernutrition is widespread among schoolchildren (particularly in South Asia and Africa), and their nutritional status often deteriorates during their school years. Little is known, however, about how to reverse such deterioration. Anemia is a particularly pervasive problem of schoolchildren. Deworming and iron supplementation or fortification programs will help them work at their best. School feeding—particularly breakfasts or morning snacks—can help hungry children stay attentive, but the high cost of such programs demands a high degree of targeting and additional research to improve their impact on undernutrition.

## Conclusion

Undernutrition limits national intellectual potential. It has major effects during the period from conception through the second birthday. Irreversible damage to the physical, mental, and social development of the child occurs during this period. Early health, nutrition, and psychosocial stimulation can prevent malnutrition and its impact on learning. This powerful synergy between psychosocial stimulation and nutrition suggests that integrated attention to the young child is critical and that early childhood is the most cost-effective period for investment in education. Later interventions with schoolchildren are useful remedial measures where children have suffered early insults and continue to suffer from malnutrition. Great effort should be made to prevent malnutrition before the second birthday as a high-priority investment in educability and economic growth.

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*Matthew Jukes is a developmental psychologist at the Partnership for Child Development, Oxford University. Judith McGuire is a consultant at the World Bank. Frank Method is director of the Washington, D.C., office of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). Robert Sternberg is IBM Professor of Psychology and Education at Yale University. For further information please contact the authors at m.jukes@ic.ac.uk, jmcguire@worldbank.org, unesco1@cais.com, or robert.sternberg@yale.edu.*

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