Early-Life Undernourishment in Developing Countries: Impacts over the Life Cycle and Determinants based on Guatemalan INCAP Data

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1. Context of the study

An estimated 250 million pre-school age children in the developing world fail to reach their development potential due to stunting. Linear growth retardation can occur during pregnancy or after birth, resulting in small babies. Its occurrence in the first thousand days of life (gestation period and first two years) has been associated with lifelong disadvantage. However, despite the large human and productivity cost, there is little empirical evidence of longer-run effects. A major aim of this research is to investigate longer-run impacts of early life nutritional deficiencies such as stunting.

2. The Guatemalan INCAP Data

The INCAP nutritional supplementation trial data consisted of a randomized supplementation trial that took place between 1969 and 1977 in four villages in El Progreso, Guatemala. Two villages (one large and one small) received Atole, a high-protein energy supplement, while the other two villages (one large and one small) received Fresco, a less nutritive drink. Supplements were available to all children twice daily throughout the study at central locations in each village. The original study enrolled all children under age of 7 in 1969, as well as newborns between 1969 and 1977.

3. Impacts and results of the program

The impacts of exposure to improved nutrition during the first 3 years of life were:

- Educational impacts: increased school attainment level among girls, and improved reading scores and cognition skills among men and women.
- Economic activity in adult life: improved wage rates (income/hour) for men, but not women.
- Intergenerational effects: women exposed to the program show significant increases in their babies’ birth weight, height and head circumference.

The main results of the program are the positive effect of proteins on height and weight growth and the relevance of the quality of the proteins contained in the diet. INCAP shows that protein deficiencies are the key constraint, not that of calories. A policy implication of this is that poor children should consume protein-rich food after no longer being breastfed.

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Estimates of impact of better supplementation in early life
Percentage of children below 3 years old with severe stunting (<-3 Z)

Graph 1. From Jere Behrman’s presentation

4. Conclusions

Undernutrition is a major but underemphasized problem. Economic and demographic theories and empirical evidence suggest that human capital is important for economic growth and for the demographic transition.

Inequality in human capital starts early in the life cycle due to unequal investments, and tends to persist. Dynamic complementarities imply that greater human capital early in life leads to higher returns to investments later in life. Moreover, there are significant associations between early life undernourishment and outcomes over the life cycle.

Causal effects of a protein-rich nutritional supplement in the INCAP study persist for thirty years after being exposed to this treatment during the first 24 months of life. Causal effects of reducing stunting based on the INCAP study are found in various areas including education, labor market outcomes, marriage market outcomes, poverty, consumption, intergenerational effects and health. Estimates suggest that protein is particularly important for early-life height growth and weight gains in undernourished populations.

Estimates suggest that, in some contexts, the benefits of early-life nutritional interventions substantially exceed the costs. Emphasis on first thousand days is relevant since that period is a critical window of opportunity, although investments after that window also may have high rates of return.

Human capital is multidimensional. Despite the fact that there are synergies among components, investment returns are likely to differ across contexts. Current resources are low for early life compared to later years. However, returns may be higher for investments during the first two years of life.