Reducing chronic undernutrition through nutrition-sensitive interventions: Lessons from Transform Nutrition

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Introduction

- Transform Nutrition focused on chronic undernutrition. Chronic undernutrition (stunting) is measured by height for age (HAZ). Globally, ~165 million children are stunted.
  - The core idea underpinning anthropometry is that prolonged or severe nutrient depletion eventually leads to retardation of linear (skeletal) growth in children and to loss of, or failure to accumulate, muscle mass.

- Reducing chronic undernutrition has intrinsic value

- It also has instrumental value – that is, it contributes to the attainment of other development objectives. Chronic undernutrition is associated with neurological impairments that persist into adulthood. Poorer cognitive function reduces earnings; individuals undernourished at age 2 are more likely to be poor in adulthood (Hoddinott et al, 2013a)
Stylized facts regarding HAZ

• HAZ deteriorates between 6 and 24m

• While wealth is associated with improved HAZ (Black et al, 2013), social protection interventions that transfer income to poor households typically have limited impacts on HAZ. (TN) and others

• Increases in agricultural production by themselves have little effect on HAZ.
  – Headey and Hoddinott (2016) combine DHS and agricultural productivity data to look at the association between rice yield growth and HAZ in Bangladesh between 1996 and 2011. They find no effect. (TN)

• Bhutta et al (2013) identify the 10 best bet direct nutrition interventions:
  – These have a powerful effect in terms of reducing acute undernutrition (and therefore infant and child mortality); reduction of severe wasting is estimated to be 61%
  – These have only a limited effect on chronic undernutrition, reducing it by around 20%
TN and Chronic undernutrition: Bringing biology and economics together

- Underlying most approaches to chronic undernutrition - both in nutrition and economics - the “food” component is often thought of in terms of energy (and micronutrients)

- The logic is that energy (think “calories”) is needed for cellular growth; absent sufficient energy over protracted periods of time during the first two years of life, growth falters

- But this view might be incomplete
Advances in metabolomics

• Rapid advances are occurring in metabolomics – the study of small molecule chemicals that are the consequence of metabolic processes.

• Improvements in our understanding of mTORs (mechanistic target of rapamycin) is an example

• mTORs are catalytic proteins. They signal (or regulate) cellular processes such as growth and differentiation (anabolic processes). This signaling process integrates information about the availability of nutrients (food sources, oxygen, and growth factors).

• When activated, one type of mTOR, MTORC1 (mechanistic target of rapamycin complex 1) regulates growth in:
  – Chondral plates (ie part of the bone where growth takes place)
  – Skeletal muscle growth
  – Myelination of nervous system
Advances in metabolomics

• A review by Semba et al (2016a) shows that amino acids are essential for the activation of mTORC1. When these are absent, the body represses protein and lipid synthesis and cellular growth and Bone growth is restricted

• Essential amino acids cannot be synthesized from scratch within the human body; these must be obtained via diet. The best sources are animal source foods (meat, poultry, fish, eggs). Plant sources also contain these, but typically in much lower concentrations.

• Other metabolomic work shows that choline is needed for the synthesis of phosphatidycholines; this synthesis is needed for bone formation and cell membrane formation. Eggs are an excellent source of choline. Flesh foods (beef, chicken) are another source as are groundnuts, though the latter contain much less choline than eggs

• In addition, cow’s milk (an important source of amino acids, calcium, iron, and vitamin B-12) stimulates the secretion of insulin-like growth factor I (IGF-I), the hormone that stimulates bone and tissue growth
Examples from TN

- Consider the results from the Transfer Modality Research Initiative (TMRI) RCT (in north Bangladesh, Rangpur) reported in Ahmed et al (2016) (TN):
  - Multiple treatment arms: Monthly cash transfers equivalent to 25% of hh income; Food basket (rice, pulses, fortified vegetable oil) of equivalent value; ½ food, ½ cash payment; Cash plus nutrition BCC
  - RCT runs for 24 months
  - All payments made to mothers of children <2y at baseline
  - High quality BCC; ~95 meetings over two years

- Impact of the cash, food and cash&food treatment arms on child diet:
  - Some small effects of cash on improving diet quality

- Impact of the cash, food and cash&food treatment arms on child anthropometry:
  - Nothing
Examples from TN

• Impact of cash+BCC on child diet:
  – 10.9 percent ↑ in consumption of dairy products
  – 22.8 percent ↑ for flesh foods (meats, poultry, fish)
  – 24.6 percent ↑ for legumes and nuts
  – 36.0 percent ↑ for eggs

• Impact on chronic undernutrition:
  – ↑ HAZ by 0.25SD
  – ↓ Stunting by 7.3 percentage points
Examples from TN

• Second example comes from Hoddinott, Headey and Dereje (2015) who use observational data from Ethiopia to look at associations between dairy cow ownership and chronic undernutrition (TN).

• Ownership is associated with higher milk consumption and with a reduction in stunting of 6 to 13 percentage points, even after controlling for household wealth and other confounding factors.

• But effect disappears for households living close to a food market.

• Results are consistent with Hirvonen and Hoddinott (2017) who find that in Ethiopia, the diversity of pre-school diets (children 6-24m) is associated with diversity of household agricultural production but only when access to food markets is poor (TN).
Looking forward

• Given that chronic undernutrition “matters”, what should future research and intervention design focus on?

• In general, shift towards focusing on:
  – What children eat, not just how much they eat, with particular attention to animal source foods
  – As well as .. Hygiene and sanitation (Dean Spears work, work on environmental enteropathy etc)

• On social protection and nutrition:
  – Are TMRI-type benefits sustainable
  – Are TMRI-type results scale-able

• On agriculture and nutrition:
  – Think more about market access and value chains
  – At least for chronic undernutrition, re-think when it makes sense to encourage smallholders to diversify production
References


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