

## REVIEW ARTICLE

# Capability poverty by deficits in net dietary intake at early age – neglected by the Rangarajan poverty line

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## Abstract

**Introduction:** The Rangarajan Expert Group set up to improve the methodology for measuring poverty fails to: (i) shift from uncertain assessments of calorie - consumption poverty to use of 'direct' determinants of deficits in net dietary intake, indicating risk of capability poverty; [1,2] (ii) include vegetables and fruit as an additional food category; and (iii) consider inequity in child nutritional outcomes. The 2014 poverty line includes raised expenditure on calories, meat, protein and fats and four non-food categories. The report avoids the issue of disparities in social protection that drive capability poverty. It concludes that its normative food basket does offer "a basis for optimism on associated nutrition-status outcomes". **Rationale:** Inferior nutrition status, compounded in the lowest wealth groups, argues for use of 'direct' indicators of net deficits in nutritional intake in poverty assessments, such as the growth curve of children and measurements of anaemia. [3,4] **Objective:** Where, and how, do diseases and poor nutrients, contribute to rising deficits in net dietary intake? In 20 of 106 districts, in six states, from the 2002-04 LDHS-2 to the 2011 Hungama survey, child underweight (<-2SD, 5y) increased by more than 5 percentage points. [5] **Why?** **Methods and results:** Literature confirms socio-economic rationale of addressing capability poverty indicated by child chronic undernutrition. [6,7,8] Iron-poor vegetarian diets, limited coverage of iron supplementation to young children and of food fortification in low-income settings, argue for raised intake of fruit and vegetables. [9] **Conclusion:** Capability poverty, driven by nutritional deficits at early age, perpetuates socio-economic disparities. Will location-specific determinants be addressed of rising deficits in net dietary intake at early age? Will iron - rich vegetables and fruits become an additional food group in a revised poverty line?

### The New Poverty Line

*"Because height reflects early life health and net nutrition, and because good early life health also helps brains to grow and capabilities to develop, widespread growth faltering is a development disaster". [10]*

## Key Words

Poverty line; Anaemia; NFHS; DLHS

## Introduction

The new poverty line proposed by the Rangarajan Expert Group in June 2014 has three components: (a) the food poverty line that is based on the average requirements of calories, fat and protein; (b) normative requirements of the basic non-food expenses of clothing, housing, mobility and

education based on the median fractile values; and (c) observed other non-food expenses of the "fractile" classes that meet the nutrition requirements. It anchors non-food expenditures to a normative basket based on the median non-food expenditures, (clothing, conveyance, education); it adds 'behaviourally' determined additional non-food expenditure. It avoids reference to out-of-pocket

spending on health even though catastrophic health care expenditure is recognized as a major cause of debt of low-income families. [11]

The new poverty line's has positive and negative features. It permits raised consumption of calories, protein and fats, and of selected non-food items, yet in spite of its wider brief, its lens does not extend beyond expenditure - based poverty. [12] It returns to earlier practice relating poverty measurement to nutrient consumption. Imperfectly, it addresses deficits in net dietary outcome indicators including food-based origin of micronutrient and iron intake deficiencies.

### **Orientation for a new poverty line?**

In view of persistent child undernutrition, and rising anaemia, the point in time has arrived for shifting perspective from calorie-consumption poverty to nutrition outcomes that indicate impaired human capabilities with risk of perpetuated poverty. Deficits in net dietary intake indicated by objective measurements of height-for-age avoids monetary conversion with uncertain estimates of consumption poverty. "There is a strong case for paying attention to food intake such as consumption of essential vitamins and minerals and for shifting the focus away from food intake towards more 'direct' indicators of the nutrition status of the population. Looking at calorie intake, or for that matter other specific nutrition inputs, independently of other relevant variables, is an exercise of limited value for assessing what matters, which is nutritional outcomes." [13] A range of demands such as the epidemiological environment and activity levels contribute to deficits in net dietary intake. A diet poor in micronutrients, and deficient social protection, operate to reduce net dietary intake. Deficient social protection, such as for sanitation, hygiene practices, vaccinations, food intake and micronutrient supplements, by raising exposure to disease, contribute to anthropometric failure.

Pregnant women with limited dietary intake of calories, protein, vitamins, and micronutrients risk giving birth to underweight and stunted children. [14] About 22 percent of infants born in India are of low birth weight. Underweight and anaemic mothers risk giving birth to children with anthropometric failure. One third of women (35.6 percent) suffer from chronic energy deficiency

(BMI<18.5). Half (53.5 percent) of mothers with stunted children were underweight (BMI<18.5) in the FHNS-3. The New Delhi Birth Cohort survey revealed that at 6 months of age, 28 percent of underweight and stunting, and 22 percent of wasting were attributable to low birth weight. [15] A Cochrane review of daily iron supplementation to women during pregnancy reported a 70 percent reduction in anaemia at term, a 67 percent reduction in iron deficiency anaemia (IDA) and 19 percent reduction in incidence of low birth weight. [16] Effectiveness of multiple micronutrient supplements in context of energy deficient mothers in India, improving birth weight and pregnancy outcomes, need further review. [17] Early child growth faltering, determined by net deficits in dietary intake, is generated through several pathways, beginning with mother's inferior nutritional status prior to conception proceeding in utero and beyond. It is associated with impaired human capabilities, bodily harm and risk of intergenerational transmission of undernutrition. [18] The Rangarajan Committee report does not contribute to transparency about risk of adverse transition in this direction.

### **Extended food poverty line that excludes vegetables and fruit**

A balanced diet contains a reasonable proportion of fruits, vegetables, as well as protein products and fats, (not just calories from cereals). The Rangarajan report refers, albeit imperfectly, to Bhargava (2011). A rise in the index of diversity of food consumed (in terms of number of different food groups consumed such as cereals, pulses, vegetables, milk, eggs, etc. consumed per day) has a statistically significant impact on anaemia among children; "the shift in consumption pattern across expenditure classes towards a more diversified diet would, *ceteris paribus*, have a favourable impact on child nutrition outcomes." [19] Yet, the report does not refer to Bhargava's finding of positive impact of higher food consumption diversity, particularly on children's height, elasticity (0.301\*\*) almost twice that for DPT vaccinations (0.164\*\*); dark green leaf vegetables, and fruits, in this analysis comprised two separate of seven food groups. The importance of food diversity augments: an analysis of multi-sectorial determinants confirms that for children aged more than 12 months, food diversity with intake of five or

more food groups is associated with less stunting prevalence. [20] While the Rangarajan food groups include protein products, such as meat rich in micronutrients, the Committee does not consider barriers that thwart raised intake of meat products. It does not explore in depth the contribution of food based poverty, given inadequate facility-based iron supplementation, to rising anaemia prevalence and to stunting.

### **Rising anaemia prevalence**

Rising anaemia prevalence among women and children from NFHS-2 to NFHS-3 attests to an uncontrolled health problem at population level despite an anaemia policy framework since the 1970s. Anaemia is associated with lower wealth status and lower education. Over the 7-year period, anaemia of women increased significantly from 51.3 percent to 56.8 percent; mean HB of women of reproductive age declined from 11.7 to 11.5 g/dl. [21, 22] Prevalence of any anaemia of children in rural areas increased from 75.3 percent (NFHS-2) to 80.9 percent (NFHS-3), rising from 70.8 percent to 72.2 percent in urban areas (comparison applies to the last two children in the 6 to 35 months of married women). [23] Infectious and parasitic diseases may cause about half of the anaemia burden and iron amenable anaemia the remainder. [24] The main causes of anaemia in India are low dietary intake, poor availability of iron, chronic blood loss due to hookworm infestation, and malaria. [25] The most common group among the causes for anemia is malnutrition; among that group iron deficiency makes up the bulk of it. Rapid improvements in anaemia have been documented for countries such as Thailand and Vietnam ascribed more to improvements in diet and control of infectious diseases than to direct supplementation, although widely practiced. [26] Countries transitioning to higher income and more diversified diets that include more animal products and fruits and vegetables are likely to decrease anaemia prevalence.

Inadequate dietary intake of bioavailable iron in India, in spite of high economic growth rates, is likely to reflect dominance of vegetarian diets and low socio-economic status. Indian women have a sustained low intake of iron. Their iron intake is

around half of the recommended daily allowance. Most staple foods are not fortified with iron. Vegetarian diet significantly influences the development of iron-deficiency anaemia in India via avoidance of meat and intake of low quality and quantity of iron-rich foodstuff. [27] About 75 percent of vegetarians do not consume meat or eggs. The majority of vegetarians subsist on inadequate quantities of iron-poor staples such as lentils, wheat bread, green peppers and rice. Vegetarians are recommended to increase dietary iron by 80 percent to compensate for a lower iron availability of 10 percent from a vegetarian diet compared with 18 percent from an omnivorous diet. Raised intake is restricted when sixty percent of women do not consume fruits even once a week (NFHS-3).

Excluding spending on fruits and vegetables in the new poverty line neglects risk of rising prevalence of NCDs (cardiovascular, circulatory diseases and cancer), of a diet deficient in fruit and vegetables. Diet low in fruits and vegetables, together with iron deficiency and child underweight, belong to the group of twenty leading risk factors for disease in the South Asia region. [28] In India, the National Nutrition Monitoring Bureau found intake of green leafy vegetables and other vegetables rich in micronutrients like beta-carotene, folate, calcium, riboflavin and iron grossly inadequate. Disease prevention by including spending on fruits and vegetables in a revised poverty line needs to be considered as part of wider efforts.

### **Inequity in consumption of iron rich food and supplements**

Consumption of protein, vegetables and fruit is most deficient in the lowest wealth category. Of women, age 15-49, daily consumption estimates suggest that between half and one third consume insufficient vegetable and animal protein and dark green leafy vegetables; in this group close to 90 (87.8) percent do not consume fruit, where C-vitamin enhances iron uptake (NFHS-3). Of children aged 0-35 months in rural areas, living with their mother, 13 percent consumed (last 24 hours) foods rich in iron. In the lowest wealth quintile, 10 percent of children consumed foods rich in iron, relative to 15 percent for the middle wealth category. High prices of vegetables and fruits, relative to other food groups,

limits consumption in poorer households. For vegetables and fruits, price increases 2010-2014 (May 2014) in rural India exceeded those for all other groups; while in urban India, the increase was highest for fruits. [29] While income and price elasticity estimates vary with analytical approach, price increases for this food-group, when combined with high elasticity relative to that of cereals, restricts demand particularly in low-income groups. [30]

Uncertainty about safety, optimum approach and delivery for iron supplementation to young children in low-income settings, argues for raised intake at household level of fruit and vegetables. [31, 32] Of children, age 6-59 months, in the lowest household wealth category, in 2004-05, 2.2 percent were given iron supplements, in last 7 days, relative to 4.3 percent of children belonging to the middle category (NFHS-3). Of children aged 6-59 months, 14.4 percent of those in the lowest wealth categories were given vitamin A supplements in last 6 months, compared to 22.8 percent in the highest category. Of children in rural areas, 3.8 percent were given supplements during last 7 days, relative to 7.0 percent of children in urban areas. With almost all children in the lowest wealth quintile in the rural areas not receiving iron rich food, and with uncertain rationale of iron supplementation to children, the Rangarajan poverty line - by not providing for intake of vegetables and fruits - discards one pathway towards diminished food-based iron deficiency.

### **Bidirectional causality?**

Causality between anaemia and socioeconomic status is most likely bidirectional. Reduced iron deficiency anaemia is likely to raise worker productivity directly, as well as reducing prevalence of low birth weight with impaired child development. [33] Ministry of Health guidelines refer to adverse impacts for cognitive performance, behaviour and physical growth of infants, preschool and school age children and for labour productivity of adolescents and adults. [34] While evidence from recent randomised trials of the association between anaemia and cognitive development in children remain inconclusive, [35, 36] morbidity associated with chronic anaemia translates into loss of productivity from impaired work capacity, and higher susceptibility to infection. [37]

Including vegetables and fruit in the new poverty line is justified as part of intensified efforts to address high prevalence of iron deficiency/iron deficiency anaemia (ID/IDA). Including vegetables and fruit in a revised poverty line has merit as part of national promotion of affordable culturally acceptable intake of iron rich nutrients of green leafy vegetables and fruit with uptake-enabling C-vitamin? Can the National Horticultural Mission contribute in propagation? Addressing deficits in nutritional intake at pregnancy, and early age, supported by food system changes, whilst promoting raised intake of green leafy vegetables and fruit, has merit compared to health system costs associated with rising prevalence of NCDs in later life.

### **Multidimensional Poverty**

A calorie-consumption basket with new norms for calories and inclusion of proteins, fats and non-food expenditure is not a sufficient prerequisite for satisfactory child nutrition status outcomes. The Committee did not pursue the invitation in its TOR "To ...examine whether the poverty line should be fixed solely in terms of a consumption basket or whether other criteria are relevant....". The Committee restricts discussion to need to be (at least minimally educated), to escape avoidable diseases, and to be adequately sheltered. The Committee fails to consider evidence over the last two decades that chronic undernutrition has adverse neurological consequences. Experienced in early life they have long-term consequences. Chronic undernutrition damages the occipital lobe and the motor cortex. [38] Kar, Rao and Chandramouli find that in Indian children 5-7y and 8-10y, stunting affects the development of higher cognitive processes such as tests of attention, working memory, learning and memory and visuo-spatial ability. [39] The Committee neglects risk of permanent impairment of neurocognitive and motoric capabilities, bodily harm, adult disease and reduced adult productivity, associated with net deficits in dietary intake, indicated by child growth faltering that endures beyond age 3. Addressing multidimensional poverty begins by addressing the injustice that occurs when children's parental environment predicates survival, learning, adult productivity and health.

The Committee acknowledges the importance of 'net nutrition' by referring to the negative impact of

the disease environment, accentuated by common practice of open defecation in reducing net dietary intake as shown by Coffey, Deaton, Spears et al. (2013). But with focus on expenditure-based poverty, the report avoids the issue of net deficits in dietary intake, whether caused by inadequate diets or a heavy burden of disease, or both. It neglects deficient primary health care coverage contributing to higher stunting prevalence. It neglects evidence by Bhargava (2011) of positive impact on child nutrition of utilizing government facilities, corroborated by Imai, Annim and Gaiha (2012) 40 that access to health-related facility and environment are related to lower prevalence of child undernutrition. It does not advance knowledge when it assumes that necessary social services are available or will materialize. It concludes that its normative food basket does offer “a basis for optimism on associated nutrition-status outcomes”.

#### **Neglecting direct indicators of dietary deficits – no small matter**

The Committee did not incorporate indicators for child undernutrition and anaemia. It did not shift attention from uncertain estimates of static consumption poverty to reduce prospects of intergenerational transmission of poverty. It did not elaborate on determinants of multidimensional poverty that reduce adult productivity and prospects for an inclusive economic growth. It did not consider risk of irreversibly impaired human capabilities, by child undernutrition, caused by inadequate dietary intake and disease at early age. Child undernutrition, disproportionately concentrated in low socioeconomic groups, may contribute to and perpetuate poverty. Longitudinal studies from India, Brazil, Peru and Vietnam show associations between early height-for-age and cognitive or language ability at 5 years. [41] Low levels of cognitive development in early childhood strongly correlate with low socioeconomic status (as measured by wealth and parental education) as well as malnutrition. Developmental delays in early childhood accumulate quickly over time in a range of low income settings. Delays in children's development accentuate without psychosocial stimulation. Much evidence suggests that in the absence of early childhood development interventions, poor children are likely to show serious signs of developmental delays by the

time they enter primary school, and to “play catch-up” for the rest of their lives. [42]

The Committee did not consider insufficiency in net dietary intake, in early age as marker for impaired human capabilities, less schooling, likelihood of far lower wages and being substantially poorer in later life. Ray and Sinha (2014) object to defining a “poor” household solely on the basis of its per capita monthly expenditure vis-à-vis a poverty line expenditure cut-off without considering access to a wide set of dimensions on which there is information available in India today, some in the NSS itself. They point to that while “debate rages between economists as to which is the “correct” approach in estimating consumption poverty, the rates of stunted and wasted children in India refused to show much improvements unlike in other Asian countries such as China and Vietnam. Another discussion concerns contrarian assertion that Indian children may be genetically short? The Committee does not discuss evidence that disproves assertion [43,44,45] Children in Bangladesh are taller than in West Bengal when wealth is accounted for; yet this gap is fully accounted for by differences in open defecation in combination with differences in women's status and maternal nutrition. [46]

Aggregate national data reveal little reduction in child undernutrition. Of 127 million children in India under 5 years of age (2008), 48 percent were stunted (height-for-age) and 43 percent were underweight (weight-for-age) (<-2SD Z-scores); average annual rate of reduction 1999-2000 to 2004-05 in underweight was 0.9 percent. High prevalence occurs across wealth categories with starkest burden in the poorest quintile. For children under five years of age, NFHS-3 prevalence was 59.1 percent in the lowest wealth quintile, 48.9 percent for the middle and 25.3 percent for the highest quintile. Adverse outcomes are magnified for the Indian economy since cohorts of stunted children successively are entering the labour force.

#### **Capturing benefits**

Protecting mental and motoric capabilities of young children represents an economic growth-oriented pathway in public resource use – superior to general income and food security support – in lifting the next generation out-of-poverty. Scaled-up proven nutritional interventions to avert stunting are likely



to be some of the best investments for wealth creation and inclusive economic growth that India can make. Hoddinott et al. 2013 estimate direct cost of stunting with a life cycle approach (Figure 1). [47, 48] Treating stunting as endogenous, an individual stunted at age 36 months, as an adult, could have 66 percent lower per capita consumption. They assume prevention of one third of stunting with 10 proven interventions; uplift in income of 11 percent occurs due to longer duration of schooling. Benefit: cost ratios for India remain high even when income growth is halved and future benefit streams are discounted at rates higher than 5 percent.

### Addressing malnutrition in India?

While praising advocacy to address all forms of malnutrition for post-2015 sustainable development, Indian scientists find that assumptions underlying priorities for interventions with micronutrients to need review. [49] Inclusion of fortified 'Ready-to-use – therapeutic foods (RUTF)', and micronutrient powders for children with severe acute malnutrition (SAM), implies purchase of commercially marketed micronutrients; yet improved local foodstuffs may be made available through community management. With indirect reference to positive impact reported by Bhutta et al 2013, of addition of antibiotics to micronutrient powders another issue emerges. Investments to address under provision of public goods, such as for sanitation, hygiene and female literacy that remove structural causes to disease, are preferable to palliative intake of antibiotics

The case for policy change in India extends, beyond investment returns, to human rights driven institutional reforms to ensure coverage of equitable interventions. With public health expenditure in India at about 2 percent of GDP, the case for raised public spending on RMNCH with crosscutting nutrition interventions extends - beyond returns on investment - to social justice. [50] In turn, accountability at subnational level for equitable coverage of social protection cannot exist without data. Do fault lines for transparency originate in the federal structure, where states are responsible for implementing health reforms whilst the Union Government is main provider? NSS-data do not yet include anthropometric 'direct' indicators of

nutritional status. Little transparency of nutritional status and determinants for deprived population groups thwarts policy response.

### Rising child underweight

Findings of the unique 2010-11 Hungama survey contributed transparency. Executed by the NGO the Naandi Foundation in Hyderabad, it comprised 106 focus districts (FD) in six states Bihar, Jharkhand, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh, sampling about 103 500 children under 5y, 69 000 mothers and 3000 Anganwadi Centres, bear witness to inequities. [51] It was the first survey at district level after the 2002-04 DLHS-2. The survey of 106 FDs found that 59 percent were stunted and 42 percent were underweight (<2SD). Child underweight for the entire sample declined at an annual average rate of 2.9 percent from 2002-04 (DLHS-2) to 2010-11. But in 20 FDs, underweight prevalence rose by more than 5 percentage points from 2002-04 to 2010-11. Anaemia prevalence potentially contributing to child undernutrition was not covered. Scant services for sanitation, hygiene, maternal nutrition knowledge, and rising child underweight in 20 of 106 focus districts across these six states - reveal the under provision of social protection.

### Is the public conscious of cost of capability poverty?

The Rangarajan Committee - if it had considered chronic maternal and child undernutrition and anaemia jointly with an enhanced consumption based poverty line - would have raised awareness of human capability poverty. Shifting from the confines of food-basket expenditure poverty, to broader perspective where anaemia, and stunting prevalence in children less than 24 months reflects deficits in net dietary intake, is part of efforts to raise consciousness of the extraordinary high socioeconomic costs of associated capability poverty. An assessment of layered determinants of child stunting in India suggests that when many single interventions show only limited health impact, ultimately the impact of any intervention is influenced by the combined effect of multiple groups of interventions. [52] A revised poverty line that takes into account impact of nutritional deficits at early age in perpetuating poverty, merits becoming part of national strategy, executed at state level, to

reduce inequity in nutrition outcomes, whilst promoting inclusive economic growth.

## Conclusion

Can India afford not to raise consciousness about perpetuated poverty generated by nutritional deficits at early age? The Rangarajan Report - in spite of its brief to address the methodology of poverty measurement – avoids discussing capability poverty that originates with deficits in net dietary intake at early age. It remains with uncertain estimates of calorie consumption poverty, avoiding use of ‘direct’ measurements of nutritional deficits, such as the growth curve of children and iron-deficiency anaemia. The Committee did not incorporate indicators for child chronic undernutrition, and anaemia, to shift attention to determinants of intergenerational transmission of poverty. It did not consider insufficiency in net dietary intake in early age as marker for impaired human capabilities, less schooling, likelihood of far lower wages, poorer health and being substantially poorer in later life.

Rising anaemia, food-based anaemia being one part, argued for inclusion of iron-rich meat as an additional food category in the new poverty line. But with common vegetarian dietary preferences that exclude meat, large numbers of women being confined to vegetarian and starch diets with low iron content, improved policy has merit. Yet, the new poverty line excludes iron-rich vegetables and fruits, as an additional food category. This neglects evidence that raised consumption represents a food-based pathway towards less anaemia, disease and child undernutrition. This exclusion is difficult to justify since 90 percent of children in the lowest wealth quintile in the rural areas do not consume iron rich food, coverage of universal iron supplementation to pregnant mothers and children is uncertain, food fortification is limited and anaemia prevalence continues to rise. Raised consumption of fruit and vegetables, together with fuller coverage of reproductive maternal and child health services, at community level is part of the solution to address rising anaemia.

Scaled-up proven nutritional interventions to avert stunting are likely to be some of the best investments for wealth creation and inclusive economic growth in India. With a life cycle approach, Hoddinott et al (2013) estimate an average very high returns on interventions for India. Umesh Kapil et al.

(2013) whilst supporting the goal to eradicate child malnutrition post -2015, observe that inclusion of interventions such as commercially marketed RUTFs in India needs review. Investment in infrastructure for sanitation and hygiene in underserved locations, in use of ‘direct’ indicators of net dietary deficits, in promotion of food system changes with horticultural crops, and in support for advocacy with local women groups is preferable to silo-oriented supply of micronutrients. Sequencing is essential. Revisiting targets proposed by V.K. Paul et al., Lancet (2011), addressing deficits in maternal and child dietary intake and reproductive care with institutional reform, has urgency in removing capability poverty.

Accountability cannot exist without data. Sharp inequities emerge across India’s 643 districts. The 2010-11 Hungama survey of 100 ‘focus’ districts in six states, sampling 103 500 children under 5y, 69000 mothers and 3000 Anganwadi Centres - the first survey at district level after the 2002-04 DLHS-2 – reports inter-district disparity, poor sanitation and negligible nutrition literacy. Child underweight has risen by more than 5 percentage points from 2002-04 to 2010-11 in 20 of 106 focus districts across six states. Location- specific determinants to persistent child undernutrition need diagnosis.

Will India, with admirable successes in rates of economic growth, science, technology and space exploration rise to the challenge in its self-interest? With its intellectual, economic and administrative resources, it has the capability to address the “development disaster” that occurs with high risk of stunted brain development for about half of its population of young children. 53 Will it address debilitating human capital poverty, and rising anaemia, that originates with deprivations in early age? An amended poverty line that incorporates ‘direct indicators’ of child chronic malnutrition - as marker of under provision of social protection, reproductive maternal and childcare and of maternal empowerment – would raise consciousness of the extraordinary human and social cost to India of persistent capability poverty, far higher than in other BRIC- countries. The Rangarajan Committee does not meet these challenges.

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## Figures

FIGURE 1 A LIFECYCLE APPROACH TO INVESTMENTS IN THE FIRST 1000 DAYS

