Reality of Higher Malnutrition among Indian Children

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India has claims to many firsts, some on the wrong side; one being the highest proportion of malnourished children in the world, higher than several of the poorer Sub-Saharan African (SSA) countries. Panagariya (2013) hypothesises that it is the flawed measurement methodology which is responsible for the reported high prevalence of malnutrition in Indian children (p 98). He further avers that Indian children may never attain the goals as per the World Health Organisation's (WHO) standards as their genetic potential to grow is limited. We argue here that his conclusions are unwarranted as they are based on inappropriate comparisons and a lack of appreciation of the determinants of child growth.

A Case for 'Lowering the Bar'?

Panagariya contends that malnutrition in an *individual* child is best assessed on the basis of a comprehensive clinical examination that includes anthropometry, and a systemic examination/evaluation of nutrient and mineral deficiencies. We agree. However, for evaluation of nutritional status of children in a *population*, one has to rely on an objective measure – anthropometry.

It is important to differentiate between growth standards and growth references. Growth standards are prescriptive and define how a population of children should grow given optimal nutrition and health, whereas growth references are descriptive and are based on data from selected communities worldwide that are thought to be growing in the best possible state of nutrition and health describing the growth of children at a particular place and time (Centers for Disease Control and Prevention 2010; Khadilkar and Khadilkar 2011). They represent how children are growing rather than how they should be growing. The WHO's 2006 growth charts for children under five years are example of growth standards. They delineate how children of the world under the age of five years should grow if most of the controllable variables are kept optimal. The WHO multi-country study shows that a common standard could be used across different countries (WHO Multicentre Growth Reference Study Group 2006) and has demonstrated that children in countries like India could grow as well as their American and Norwegian counterparts under similar conditions. These standards have been widely scrutinised and are currently in use in nearly 125 countries as norms to assess how well a country is complying with children's right to achieve their full genetic growth potential (de Onis et al 2012).

The implication of Panagariya's argument is that each country should have its own chart, with some having multiple charts. This in any case is happening as reference charts. For instance, both the data generated by Agarwal and Agarwal (1994) and the Indian growth charts by Khadilkar and others (2007) for affluent children are examples of growth references. If, as Panagariya states, the malnutrition figures for Indian children go down by using a lower "Indian" standard, the same will also apply to African children. Will it then prove his hypothesis that Indian children have better nutritional status than poorer Sub-Saharan Africa children?

Moreover, were Panagariya's argument to be extended, India with its 4,635 anthropologically well-defined populations, among which 532 are tribes, including 72 primitive tribes (36 hunter-gatherers) (Tamang et al 2012), would need to have as many charts. Given the diversity in the country, if a specific chart for each subgroup is to be developed, it may be difficult to find adequate numbers of "elite" children in many of the subgroups, e g, tribal populations, to develop reference charts.

Even if these genetic make-up specific charts are developed, how will these be implemented at a national scale?

More importantly how would they be interpreted?

Is the Indian Genetic Make-up Distinct?

The central question is whether the Indian genetic make-up is so distinct that it warrants separate charts. There have been multiple studies on the genomic diversity in India of which the Indian Genome Variation Consortium (IGVC) initiative has been the most comprehensive one (Indian Genome Variation Consortium 2008). Recently, the genetic origins of Indian population have also been reviewed (Tamang et al 2012). These papers highlight that the Indian population is a genetically diverse population with significant overlaps with other populations of the world, chiefly European and African. Very few groups are genetically distinct. It is postulated that the Indian populations are the descendants of the very first modern humans, who ventured out of Africa about 65,000 years ago and that the recent gene flow from east and west Eurasia is also evident (ibid). The IGVC initiative highlighted the presence of five major groups within the country based on genomic analysis. These groups share genomic diversity with different populations like the Europeans, Africans, Mongoloids, etc. The available genomics data does not suggest a unique genetic make-up of Indians and thus supports the use of a universal standard for comparing the burden of childhood undernutrition across countries.

Within India there is evidence that the height of different birth cohorts of children has increased with time. This points to the yet-to-be realised potential for growth of Indian children. For instance, from 1971 onwards, the mean heights of affluent boys in Delhi and Varanasi increased by 2.1 cm and 1.5 cm per decade respectively, indicating that there is a definite potential for Indian children to improve their heights (Agarwal et al 1992). With this slow decadal increment even among elite children, as Panagariya has suggested, indeed it may take many decades to catch-up with the developed world! The Dutch took nearly 150 years to increase their mean heights by 6 inches and now their heights appear to have plateaued off (Schönbeck et al 2013). In fact, the rate of increase in height in children observed by Agarwal and others (1992) is similar to that observed in the Dutch cohorts.

Hypothetical Cumulative Height Distribution: A Critique

Panagariya correctly concludes that it is difficult for malnourished children to catch up completely even if they are provided a balanced diet because undernourished children need more than the recommended diet for normal children to catch up. Once a child is undernourished due to a chronic dietary inadequacy, catch-up is likely to be difficult; hence the need to target various periods in a child's life to improve child nutrition (Bhutta et al 2008).

Panagariya uses a hypothetical cumulative distribution of five-year-old boys in India (Figure 10 in Panagariya 2013) to conclude that even in "best circumstances", Indian children will not be able to achieve growth as in the WHO growth charts. This argument is misleading. The fact that anthropometric measures of Indian children contributed to the development of the WHO charts strongly disproves Panagariya's contention. The author has not provided any basis for the cut-off figures of 30% and 15% for distributions 2 and 3.

For a preventive strategy to reduce child malnutrition in the country, the efforts have to begin with a potential mother, continue during pregnancy and follow up with appropriate feeding of the infant and young child (Bhutta et al 2008). Targeting under-nourished children, as distribution 2 implies, to reduce the overall malnutrition figures is an inadequate strategy. Even though the treatment is essential for the individual under-nourished children, prevention is the key for improvement of the overall nutritional status in the country.

The nutrition report of National Family Health Survey-3 (NFHS) uses similar analysis (Arnold et al 2009) but points to its inadequacy.

> If the analysis had included additional variables that would permit elite children to be better defined, it is likely that the cumulative distribution would have moved even closer to the cumulative normal distribution (p 10).

Is the definition of elite used by Tarozzi (2008) or NFHS-3 appropriate for identifying the group of children who would have no nutritional or environmental constraints to grow? Has the growth of the "elite" group of children reached its peak? Is this definition anywhere close to the living conditions of Dutch children (the author has used the Dutch example widely in his arguments) or is there no scope for further improvement in the living conditions of these "elite" Indian children? Certainly not! Furthermore, this definition of "elite" children does not take into account the objective quantification of dietary intakes of children. In such a scenario, accepting Panagariya's suggestion that the growth pattern of "elite" children (as in NFHS-3) is the best that we can achieve is inappropriate.

The infant and young child-feeding (IYCF) practices in our country are far from optimal, worse than the poorer Sub-Saharan African countries (WHO/UNICEF 2010). Currently, a large segment of our population is living with meagre incomes and a hostile environment with a high burden of infectious diseases particularly pneumonia and waterborne enteric infections. India has a higher proportion of poor people than many of the poorer Sub-Saharan African countries have (World Bank 2013). Examples from the poorer countries in the Indian subcontinent with similar genetic make-up show us that the nutritional status is not necessarily linked to economic indicators (Table 1).

Table 1: Comparison of Key Indicators in Child Health: India with Other Countries in the Indian Subcontinent

Country	Per Capita GDP (US $) (2010)	IMR* (2010)	U-5MR** (2010)	Prevalence of Stunting in under-5 Children (%)*	Prevalence of Underweight under-5 Children (%)*
Pakistan	1,017	60	74	44	32
Bangladesh	675	39	49	41	36
Nepal	535	41	50	41	29
India	1,397	49	63	48	43

*: Per 1000 live births; ** Years of survey variable (http://www.childinfo.org/malnutrition_nutritional_status.php).
Source: World Bank, UN agencies.

Is Childhood and Adult Stunting Inconsequential?

Panagariya argues that if the available stunting and underweight trends are extrapolated back in time, nearly all children born in the 1950s would have been malnourished and, therefore, would be

deficient in learning and cognitive achievements, an inference untenable given the achievements of the Indians in this cohort who had opportunities to learn in their childhood and youth. His statement reflects an elitist bias, because in the immediate post-Independence period (1950-51), the proportion of the Indians who had opportunities to learn in their childhood and youth was a mere 18% (Ministry of Finance 2001).

Stunting and underweight problems have great implications not just for short-term survival of children but also have long-term consequences both for the health and productivity of adults (Victora et al 2008; Dewey and Begum 2011). Based on a comprehensive review on the long-term consequences of stunting, Dewey and Begum (2011) conclude:

> There is growing evidence of the connections between slow growth in height early in life and impaired health and educational and economic performance later in life. Recent research findings, including follow-up of an intervention trial in Guatemala, indicate that stunting can have long-term effects on cognitive development, school achievement, economic productivity in adulthood and maternal reproductive outcomes (p 5).

The consequences of maternal and child under-nutrition on adult health and human capital have been systematically reviewed by Victora and others (2008). They note that indices of maternal and child under-nutrition (maternal height, birth weight, intrauterine growth restriction, and weight, height, and body mass index – BMI – at two years) as per the new WHO growth standards, were directly related to adult outcomes (height, schooling, income or assets, offspring birth weight, BMI, glucose concentrations, and blood pressure). Under-nutrition was strongly associated with shorter adult height, less schooling, reduced economic productivity and – for women – lower offspring birth weight and concluded that height-for-age at two years was the best predictor of human capital. Young and Martorell (2013) highlighting the public health challenge of early growth failure in India note that "[s]uch growth failure has dire consequences in the short term (increased mortality) and long term (loss of human capital and increased risk of chronic disease)" (p 496). The authors conclude, "[w]aiting to improve nutrition after the initiation of complementary feeding at six months is a missed opportunity and may permanently alter…[children's] life trajectory and potential. Maternal nutrition interventions before, during and after pregnancy may be an overlooked solution to improve early child health" (p 499).

Studies by Satyanarayana and others (1978) demonstrated the negative impact of low adult body weight and BMI on work capacity and productivity. As far as the achievements of Indians and Africans are concerned, Panagariya provides no evidence that Indians perform better than Sub-Saharan Africans. Given our large population, even a small percentage of well-performing individuals would be more than many of the other countries. The achievements of the African nations in sports and that of Indians are well known! How does one account for these differences?

Disservice to Cause of Health

By suggesting that Indian children have a low genetic potential to grow and, therefore, stunting in Indian children is not amenable to interventions, Panagariya is doing a great disservice to the cause of child health and nutrition in the country. Children do not have a voice to fight for their interests. It is the duty of a civilised society to do so. By presenting unadjusted analysis (ignoring the impact of HIV infection and malaria in Sub-Saharan African countries due to which even the richer countries have worse health indicators than India) and using selective data to prove a hypothesis that all individuals in our fast-growing economy are equally being benefited, the author has undermined the right of children and mothers to adequate nutrition and a proper environment to grow to their full potential.

Contrary to what Panagariya says about the positive improvements in the nutrition levels of all social groups, a mere 3 percentage point decrease in the severe underweight proportion and a 5 percentage point decrease in stunting and no change in severe wasting over a decade and a half among tribal children (NNMB 2009), can, by no stretch of imagination, be considered a significant change. Other indicators of malnutrition, as suggested by Panagariya, also show similar trends In NFHS-3, 70% of children 6-59 months age group were found to have anaemia (Hb< 11 g/dL); 43% had moderate or severe anaemia (Arnold et al 2009). Anaemia among children under 3 years was found to be widespread in NFHS-2, and the prevalence actually increased from 74% in NFHS-2 to 79% in NFHS-3 (Arnold et al 2009). There does not seem to be a decline in the prevalence of anaemia with improvement in the economic health of the country. The same is true for other micronutrient deficiencies (Toteja and Singh 2004). In fact, social disparities in childhood under-nutrition in India either widened or stayed the same during a time of major economic growth (Subramanyam et al 2010). We are a deeply unequal society borne out by several yardsticks. If it is Panagariya's case that these differences between social groups are genetically determined, it would amount to doing away with the reality of inequality and its consequent hunger in the country in one fell swoop.

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REFERENCES

Agarwal, D K and K N Agarwal (1994): "Physical Growth in Indian Affluent Children (Birth-6 Years)", *Indian Pediatrics*, 31:377-413.

Agarwal, D K, K N Agarwal, S K Upadhyay, R Mittal, R Prakash and S Rai (1992): "Physical and Sexual Growth Pattern of Affluent Indian Children from 5 to 18 Years of Age", *Indian Pediatrics*, 29(10):1203-82.

Arnold, F, S Parasuraman, P Arokiasamy and M Kothari (2009): "Nutrition in India", National Family Health Survey (NFHS-3) India 2005-06, International Institute for Population Sciences, Mumbai.

Bhutta, Z A, T Ahmed, R E Black et al (2008): "What Works? Interventions for Maternal and Child Undernutrition and Survival", *The Lancet*, 371; pp 417-40.

Centers for Disease Control and Prevention (2010): "Use of World Health Organization and CDC Growth Charts for Children Aged 0-59 Months in the United States", *MMWR* 59(No RR-9).

de Onis, M, A Onyango, E Borghi, A Siyam, M Blössner and C Lutter; WHO Multicentre Growth Reference Study Group (2012): "Worldwide Implementation of the WHO Child Growth Standards", *Public Health and Nutrition*, 15(9): 1603-10.

Dewey, Kathryn G and Khadija Begum (2011): "Long-term Consequences of Stunting in Early Life", *Maternal and Child Nutrition*, 7 (Suppl 3): 5-18.

Indian Genome Variation Consortium (2008): "Genetic Landscape of the People of India: A Canvas for Disease Gene Exploration", *Journal of Genetics*, 87(1): 3-20.

Khadilkar, V and A Khadilkar (2011): "Growth Charts: A Diagnostic Tool", *Indian Journal of Endocrinology and Metabolism*, 15 (Suppl 3): S166-S171.

Khadilkar, V V, A V Khadilkar, P Choudhury, K N Agarwal, D Ugra and N K Shah (2007): "IAP Growth Monitoring Guidelines for Children from Birth to 18 Years", *Indian Pediatrics*, 44: 187-97.

Ministry of Finance, Government of India (2001): "Economic Survey 2000-01, Selected Indicators: 1950-51 to 1999-2000", viewed on 11 June 2013, http://indiabudget.nic.in/es2000-01/appo.1.pdf

NNMB (2009): "Diet and Nutritional Status of Tribal Population and Prevalence of Hypertension among Adults, Technical Report Series No 25", National Institute of Nutrition, Hyderabad.

Panagariya, Arvind (2013): "Does India Really Suffer from Worse Child Malnutrition Than Sub-Saharan Africa?", *Economic & Political Weekly,* 48 (18), pp 98-111.

Satyanarayana, K, A N Nadamuni, B S Narasinga Rao (1978): "Nutrition, Physical Work Capacity and Work Output", *Indian Journal of Medical Research*, 68 Suppl: 88-93.

Schönbeck, Y, H Talma, P van Dommelen, B Bakker, S E Buitendijk, R A Hira Sing, and S van Buuren (2013): "The World's Tallest Nation Has Stopped Growing Taller: The Height of Dutch Children from 1955 to 2009", *Pediatric Research*, 73(3): 371-77.

Subramanyam, M A, I Kawachi, L F Berkmanand and S V Subramanian (2010): "Socioeconomic Inequalities in Childhood Undernutrition in India: Analyzing Trends between 1992 and 2005", *PLoS ONE*, 5(6): e11392.

Tamang, R, L Singh and K Thangaraj (2012): "Complex Genetic Origin of Indian Populations and Its Implications", *Journal of Biosciences*, 37(5): 911-19.

Tarozzi, Alessandro (2008): "Growth Reference Charts and the Status of Indian Children", *Economics and Human Biology*, 6 (3): 455-68.

Toteja, G S and Padam Singh (2004): "Micronutrient Profile of Indian Population", Indian Council of Medical Research.

UNICEF. ChildInfo: "Monitoring the Situation of Children and Women. Low Birth Weight", viewed on 31 May 2013, http://www.childinfo.org/low_birthweight_table.php

Victora, C G, L Adair, C Fall et al; Maternal and Child Undernutrition Study Group (2008): "Maternal and Child Undernutrition: Consequences for Adult Health and Human Capital", *The Lancet*, 371(9609): 340-57.

WHO Multicentre Growth Reference Study Group (2006): "WHO Child Growth Standards Based on Length/Height, Weight and Age", *Acta Paediatrica*, 450 (Suppl): 76-85.

WHO/UNICEF (2010): "Indicators for Assessing Infant and Young Child Feeding Practices Part 3: Country Profiles".

World Bank (2013): "Poverty Headcount Ratio at $2 a Day (PPP) (% of population)", viewed on 31 May 2013, http://data.worldbank.org/indicator/SI.POV.2DAY

Young, M F and R Martorell (2013): "The Public Health Challenge of Early Growth Failure in India", *European Journal of Clinical Nutrition*, 67(5): 496-500.