Does India Really Suffer from Worse Child Malnutrition Than Sub-Saharan Africa?

A common continuing criticism of the economic reforms in India has been that despite accelerated growth and all-around poverty reduction, the country continues to suffer from worse child malnutrition than nearly all Sub-Saharan African countries with lower per capita incomes. This paper argues that this narrative, nearly universally accepted around the world, is false. It is the artefact of a faulty methodology that the World Health Organisation has pushed and the United Nations has supported. If appropriate corrections are applied, in all likelihood, India will be found to be ahead of Sub-Saharan Africa in child malnutrition, just as in other vital health indicators.

1 Introduction

A widely-held view among nearly all development experts familiar with India is that despite accelerated growth in the last three decades, the country continues to suffer from worse child malnutrition than virtually every Sub-Saharan African country with lower per capita income. According to this view, India is also guilty of having made little or no progress in bringing malnutrition levels down. A prominent example is The Economist magazine, which stated in an article in its 23 September 2010 edition, “Nearly half of India’s small children are malnourished: one of the highest rates of underweight children in the world, higher than most countries in sub-Saharan Africa. More than one-third of the world’s 150m malnourished under-fives live in India.”

In addition to this high level of child malnutrition, the article repeated the common claim that India had made very little progress in combating child malnutrition. It noted, “Almost as shocking as the prevalence of malnutrition in India is the country’s failure to reduce it much, despite rapid growth. Since 1991 gross domestic product (GDP) has more than doubled, while malnutrition has decreased by only a few percentage points.”

In January 2011, even India’s otherwise measured Prime Minister Manmohan Singh went on to lament, “The problem of malnutrition is a matter of national shame”, while releasing the much publicised Hunger and Malnutrition (HUNGMA) Report.1

Reforms critics had originally argued that reforms had not helped the poor or that they had left the socially disadvantaged groups behind. Evidence has now decisively established, however, that reforms have been accompanied by a decline in poverty across all social groups, including the scheduled castes and scheduled tribes (Mukim and Panagariya 2012), that this reduction accelerated between 2004-05 and 2009-10 with the acceleration in growth, and that the gap in poverty ratios between the socially disadvantaged and other groups has finally begun to come down (Thorat and Dubey 2012; Panagariya and Mukim 2013). Therefore, the critics have now shifted to arguing that the reforms have done precious little for India’s malnourished children, with the country lagging behind even much poorer Sub-Saharan Africa.

This paper rejects this claim, arguing that it stems from child malnutrition estimates based on a flawed measurement methodology. The central problem with the current methodology is the use of common height and weight standards around the world to determine malnourishment, regardless of differences that may arise from genetic, environmental, cultural,
and geographical factors. Though medical literature recognises the importance of these factors, the World Health Organisation (WHO) totally ignores them when recommending globally uniform height and weight cut-off points against which children are compared to determine whether they suffer from stunting (low height for age) or underweight (low weight for age) problems.

It is important to point out at the outset that it is not my intention to downplay the seriousness of the child malnutrition problem in India. Just like vital health statistics such as life expectancy, infant and child mortality rates, and maternal mortality ratio, which need continued improvement, child malnutrition must be brought down and eliminated. The contention of the paper, instead, is that the current globally uniform height- and weight-based measures of child malnutrition, which place India behind nearly every Sub-Saharan African country, are premised on invalid assumptions and therefore need correction. The paper proposes to establish a strong presumption that once health experts and economists come together to devise a better methodology of measurement, we will find that as in the case of indicators such as life expectancy, infant and child mortality rates, and maternal mortality ratio, India does not suffer worse child malnutrition than Sub-Saharan Africa.

Some may argue that the debate on precisely measuring child malnutrition is counterproductive since as long as a large proportion of children are malnourished, the effort required to combat it is the same regardless of precise numbers. There are at least three objections to this argument. First, proper measurement and determination of progress have serious implications for the allocation of scarce revenue resources among competing social objectives, especially in a poor country with limited revenues. Should more be spent on combating child malnutrition or on improving elementary education? Or on providing guaranteed employment or on alleviating adult hunger? Should India spread the limited resources available for combating child malnutrition over half its children or just a quarter of them? These are real choices a poor country must make in setting its budget priorities.

Second, if a child is already receiving a balanced diet but is misclassified as malnourished because an erroneous standard is applied to evaluate her nutrition status, we may prescribe an increase in her diet when such an adjustment is uncalled for. At the other extreme, what if we misclassify a malnourished child as well-nourished? In the former case, we run the risk of turning a healthy child obese and in the latter that of ignoring malnutrition.

Finally, truth in numbers is an essential element in serious intellectual discourse. Else, we would be tempted to falsify all other indicators such as those relating to poverty alleviation, growth, life expectancy, infant mortality rate, and maternal mortality ratio on the premise that this is an effective way of attracting public attention. The ends rarely justify the means.

2 Why the Focus on Height and Weight

Malnutrition is a multidimensional phenomenon. In broad terms, it may be divided into protein energy malnutrition and micronutrient deficiency. The former manifests itself most prominently in poor gains in height, weight, and circumferences of head and mid-upper arm. Other physical symptoms such as skin peeling, abdominal distension, liver enlargement, and sparse hair as well as behavioural characteristics such as anxiety, irritation, and attention deficit may also accompany protein deficiency. Micronutrient deficiency results from inadequate levels of iron, folate, iodine, and various vitamins, including A, B6, D, and K, in the body. These deficiencies lead to anaemia, goitre, bone deformities, and night blindness.

Given these many dimensions involved in identifying malnutrition, only a thorough medical check-up can properly determine whether a child is malnourished or not. But few globally comparable large-scale surveys rely on extensive medical check-ups to measure malnutrition in children. Moreover, after the United Nations (UN) introduced the Millennium Development Goals (MDGs), which prominently included rapid progress in combating child malnutrition as a key goal, the pressure to come up with estimates of the proportion of children suffering from malnutrition grew. As a result, height and weight, which are easy to measure and require no specialised medical skills, quickly became the focus of attention. This was further aided by the WHO, which provided the common standards of height and weight by age and gender to determine whether a child was stunted or underweight.

Today, virtually all headline figures on child malnutrition, including the ones that led Manmohan Singh to declare the phenomenon a national shame, are based on height and weight. In view of the multidimensional nature of child malnutrition, this singular focus on low height and weight should itself be a source of concern. But this is not the direction of the critique in this paper.

Instead, the focus of the paper is narrower. Accepting poor height and weight gains as the principal manifestations of malnutrition, I ask whether we are correctly identifying stunted and underweight children. The underlying question is about the validity of applying uniform height and weight norms around the world as the basis for determining whether a given child is well-nourished or malnourished. This focus does not deny in any way the importance of a full medical examination to determine whether or not a child is malnourished. But it addresses the deficiencies of the measures that are the source of virtually all discussion on child malnutrition in the public policy space.

3 Planting the Seeds of Doubt

I begin by offering three comparisons that challenge the narrative that India has more stunted and underweight children than Sub-Saharan Africa. These comparisons should at least give the reader a reason to pause and entertain the possibility that something is wrong with the news headlines depicting India as one of the worst performers in child nutrition.

3.1 India versus Chad

Let us begin by comparing a set of commonly-used health indicators for the child and the mother in India to those in Chad and the Central African Republic, two of the poorest countries in
the world. As Table 1 shows, Chad has just 48 years of life expectancy against India’s 65 years; an infant mortality rate (IMR) of 124 against India’s 50; an under-five mortality rate of 29% relative to India’s 66; and a maternal mortality ratio (MMR) of 2,209 compared to India’s 230. Yet, Chad has disproportionately fewer stunted and underweight children than India. The comparison with the Central African Republic is equally stark.

3.2 Kerala versus Senegal and Mauritania

Next, I compare the Indian state of Kerala with two other countries from Sub-Saharan Africa, Senegal and Mauritania. Of the 28 states in India, I choose Kerala to bring out the absurdity of the current child malnutrition indicators as sharply as possible. The conventional vital health statistics in Kerala are the highest among all Indian states and rival those observed in China. Among the largest 17 Indian states, it ranks fourth in terms of per capita income. In terms of per capita income, Senegal and Mauritania are among the better-off countries in Sub-Saharan Africa but both lag behind India and Kerala with the gap being especially large with respect to the latter.4

According to Table 2, Senegal, which has 4.25 times the infant mortality rate of Kerala, almost six times Kerala’s under-five mortality, and 4.3 times Kerala’s maternal mortality ratio, has lower rates of stunting and underweight children. Children in Senegal, better nourished as per malnutrition estimates, die at rates many times those in Kerala. A comparison with Mauritania yields the same picture. A higher incidence of child malnutrition in Kerala than Senegal and Mauritania is even more puzzling given its significantly higher female literacy rate. The state has had a long history of educating its women and its female literacy rate at 92% in 2011 is among the highest in the developing world. In addition, women have traditionally enjoyed high social status in Kerala with many communities following the matrilineal tradition. In contrast, at 29%, Senegal has one of the lowest female literacy rates in the world. Mauritania does better at 51%, but it also lags far behind Kerala.

3.3 India versus the 33 Poorer Sub-Saharan African Countries

The above comparisons are not isolated examples. A comparison of India with nearly every one of the 33 Sub-Saharan African countries with lower per capita incomes in 2009 in current dollars shows the same pattern. I demonstrate this with the help of Figures 1-3 and Figures 4-7 (p 101) with each figure comparing India to the 33 countries in Sub-Saharan Africa along one health indicator. I arrange the countries from left to right in order of increasing per capita incomes.
The maternal mortality ratio per 1,00,000 live births in India at 230 is lower than those in every one of the 33 Sub-Saharan African countries.

But this pattern collapses when it comes to child malnutrition. The proportion of children under five years of age classified as stunted (low height for age) at 47.9% is higher in India than all but six of the poorer Sub-Saharan African countries (Burundi, Malawi, Ethiopia, Niger, Madagascar, and Rwanda have stunting rates of 63.1%, 53.2%, 50.7%, 54.8%, 49.2% and 51.7%, respectively).

The proportion of children under five years of age classified as underweight (low weight for age) at 43.5% is higher in India than every one of the 33 poorer Sub-Saharan African countries.

4 Can Superior Health Infrastructure Be the Explanation?

When confronted with this evidence, some proponents of the current malnutrition indicators respond that the lower rates of infant and child mortality in India relative to Sub-Saharan Africa despite higher malnutrition rates reflect its superior medical infrastructure. In addition to contributing to low mortality rates, the latter contributes to increased malnutrition by helping save many malnourished infants and children.

Though a logical possibility, the authors of this explanation provide no concrete empirical evidence in its support. Whatever evidence we can gather points in the opposite direction—countries that have better medical infrastructure also nourish...
their children better. Developed countries enjoy low infant and child mortality rates and maternal mortality ratios as well as low rates of malnutrition. Likewise, declining rates of malnutrition typically accompany declining infant and child mortality rates and maternal mortality ratios.

India’s own experience points to improving malnutrition side-by-side with declining infant and child mortality rates and maternal mortality ratio. Figure 8 (p 101) shows the average proportions of children classified as underweight and stunted in rural areas in nine Indian states during four time periods – 1975-79, 1988-90, 1996-97, and 2003-06. The proportion of children stunted as well as those underweight declines between every successive pair of periods. If improved ability to save the infants and children as reflected in declining infant and child mortality rates are expected to result in worsening child nutrition performance, we should observe rising rates of malnutrition in India. But we see precisely the opposite trend in Figure 8.

Figure 9: Child Malnutrition and Under-Five Mortality

Three important indicators of child malnutrition are conventionally reported – the proportion of children stunted, those underweight, and those wasted. As already indicated, stunting and underweight refer to low height and low weight for age, respectively. Wasting refers to low weight for a given height, regardless of age. Since wasting has received little attention in the public policy discourse, I will not focus on it in the rest of this paper.6 Indeed, for clarity of exposition, I will present much of the discussion with respect to the determination of stunting.

The height of an individual can vary for both genetic and nutritional reasons. Without detailed medical examination, one cannot conclude whether an individual is short because of malnourishment or because of genetic factors. This makes identifying stunting by referring to just height, an imperfect exercise. Nevertheless, this is the current practice.

The current approach is to define a height norm for children of a given age and gender. All children of the same age and gender in a given population who are below this norm are classified as stunted. The critical remaining step then is to identify the height norm. In the strictest sense, the norms currently used are premised on the following key assumption – all differences in height between populations of children of a given age and sex occur due to differences in nutrition.

This assumption implies that populations of children from entirely different races, ethnicities, cultures, time periods, and geographical locations would look identical in terms of height distribution provided they are given the same nutrition. That is to say no differences in the proportion of children below or above any pre-specified height would exist between two populations provided they are given identical nutrition.

Suppose we can identify the population of children of a given age and sex that is the healthiest possible. Although the heights of children within this population will differ due to genetic differences, taken as a whole, the population represents the best attainable distribution. Then, given the above assumption, any deviations in the distribution of height in a population of children of the same age and sex from this population would be attributable to malnutrition. This is the essence of the approach underlying the measures of malnutrition currently in use worldwide.

The first step in making the approach operational is to identify the healthiest populations of boys and girls of different ages. Once this is accomplished, a certain percentage of children at the bottom of the distribution of this population by height are defined as stunted. Based on statistical considerations, the conventional cut-off point for this purpose is set at 2.3%.7 The height of the child at the 2.3 percentile in the healthiest population serves as the norm against which all children are measured to determine their stunting status.

What is required then is the identification of the healthiest population of children of a given age and gender, or what is often called the “reference population”. The us first adopted such a reference population in 1977. The National Center for Health Statistics (NCHS) of the Centers for Disease Control (CDC) developed the height and weight distributions of children by age
and sex using longitudinal data collected in Yellow Springs, Ohio between 1929 and 1975 by the Fels Research Institute (Roche 1992). The NCHS 1977 distributions remained in use to measure malnutrition among children in the US until 2000. Beginning in the late 1970s, the WHO encouraged other countries to adopt this same reference population to measure malnutrition.

In the 1990s, the CDC concluded that the Fels reference population data came from a sample that was quite limited in genetic, geographic, cultural, and socio-economic variability (Kuczmaszki et al 2002: 2-3). It therefore replaced the NCHS 1977 charts by CDC 2000 charts that were based on a nationally representative sample in which infants came from a broader spectrum of racial/ethnic groups, socio-economic backgrounds, and modes of infant feeding.

The discussions surrounding this change led the WHO to develop its own height and weight standards on the basis of a more diverse reference population. It collected data on 8,440 healthy breastfed infants and young children from Brazil, Ghana, India, Norway, Oman, and the US and adopted new standards in 2006. Almost all developing countries, including India, now use these WHO 2006 standards to measure malnutrition. The estimate that approximately half of Indian children are malnourished is based on an application of these standards.

6 The Key Elements of the Critique

Central to the present critique is a challenge to the assumption that the provision of a fully balanced diet will eliminate the height and weight differences between the population of Indian children and the healthiest existing population of children anywhere, which is currently represented by the WHO reference population. Potentially, the failure can occur at two levels.

First, we have what has been called the “gradual catch-up” hypothesis whereby it takes several generations of balanced diet for a population of children to achieve its full potential height and weight.\(^8\) Put differently, even if a fully balanced diet replaces the status quo diet of an entire cohort of malnourished children, it can achieve only so much improvement in height and weight outcomes.\(^9\) Weak and malnourished mothers give birth to children with height and weight disadvantages that a balanced diet cannot fully eliminate. Premature births and lack of proper care during pregnancy give rise to similar problems. Therefore, what we may call the “catch-up” deficit takes several generations to eliminate.

Second, there is the possibility that a specific population of children is genetically shorter than the children in the reference population. This means that even after the population has fully eliminated the “catch-up” deficit after several generations of a balanced diet, it will still fall short of reproducing the reference population. An example, discussed at length later in the paper, is that Japanese adults have grown much taller on average over the generations. They have, nevertheless, remained 12 to 13 centimetres shorter than their Dutch counterparts. Poor nutrition and the “catch-up” deficit cannot explain this height difference between Japanese and Dutch adults unless one argues that the Japanese are still in the “catch-up” process.

Figure 10 illustrates the above points with the help of four strictly hypothetical population distributions of five-year-old boys. On the horizontal axis, we measure height in inches. On the vertical axis, we measure cumulative population below the height shown on the horizontal axis. The curve labelled “Distribution 4” represents the tallest population anywhere in the world and serves as the reference population. Since 2.3% of this population is below the height labelled s, the height at point s serves as the norm.

“Distribution 1” gives the observed height distribution of a hypothetical population of five-year-old boys in a given year. As shown, 50% of these boys have heights below point s and are therefore classified as malnourished. “Distribution 2” shows the height distribution that the population can achieve if every boy in it is given a fully balanced diet. It shows that even after every boy is given a balanced diet, we would classify 30% of them as stunted. Finally, “Distribution 3” shows the “maximum-height” distribution that the future generations of this population can achieve after eliminating entirely the “catch-up” deficit through a sustained balanced diet. If the genetic potential of this population is below that of the reference population, “Distribution 3” will lie above “Distribution 4”, and if not, it will coincide with or lie below the latter. As shown, “Distribution 3” is strictly above the reference population distribution with 15% of the boys still classified as malnourished.

There is broad agreement that cumulative height “Distribution 2” in India lies above “Distribution 4”. That is to say, even if the entire current population of children were given a balanced diet, it still would not achieve the height distribution of the reference population. But almost all analysts explicitly or implicitly see nothing wrong with the current approach under which “Distribution 2” would lead us to classify 30% of India’s children as malnourished.\(^9\) At least from the viewpoint of policy formulation, we need to make a distinction between the 20% in this example who can cross the threshold after being given a balanced diet and the remaining 30% who are classified as...
malnourished despite receiving such a diet. Without such a distinction, we would run the risk of biasing policy towards obesity for this 30% of the population.

The dominant view around the world is that “Distribution 3” coincides with “Distribution 4”. That is to say, a balanced diet over several generations will lead to height distribution of every population of children becoming coincident with the distribution of the tallest population in the world. In this view there are no genetic differences between populations as far as height and weight are concerned.

I will document below substantial evidence from medical and other literature pointing to genetic differences across populations. But as a preliminary point, it may be noted that when recommending the switch from NCDS 1977 standards to CDC 2000 standards, even the CDC cited limited genetic, geographic, cultural, and socio-economic variability in the former sample as a key reason for its recommendation (Kuczynski et al 2002: 2-3). The argument rationalising the shift, thus, in essence acknowledged the relevance of genetic factors. Against this background, we must also ask whether the WHO 2006 sample, collected from countries as diverse as Brazil, Ghana, India, Norway, Oman, and the US, adequately represents the population of India or any other country in terms of their genetic, geographical, cultural, and socio-economic backgrounds.

7 Evidence from Indian Data

The two standards that the WHO has recommended over the decades – NCDS 1977 and WHO 2006 – lead to substantially different levels of measured malnutrition. Using the sample of children under 3 years of age in the second round of the National Family Health Survey (NFHS-2), Tarozzi (2008) estimates that the NCDS 1977 standard leads to classifying 42% of these children as stunted. But when the WHO 2006 standard is applied to the same sample, the estimate rises to 48%. One can imagine that over time populations in the same countries from which the WHO has drawn its sample will become healthier, yielding an even higher standard, which would turn yet more children in the NFHS-2 sample from well-nourished to malnourished.

Indeed, the problem turns out to be far deeper than what these remarks suggest. NFHS-2 data divide the families in the sample into three wealth categories – high, medium and low – on the basis of a standard of living index (SLI) constructed from ownership of a large number of assets and other wealth indicators. With the help of this index, Tarozzi isolates families in the high wealth category. This brings down the number of children in the sample from tens of thousands to approximately 5,100. Measuring against WHO 2006 growth charts, Tarozzi (2008: Table 4, last row) finds that both among boys and girls in this group, approximately one-third remain stunted and one-quarter underweight.

Tarozzi (2008: 463) explores the issue further by “using only information from families where malnutrition should be unlikely”. Out of the 5,100 children in high SLI families, he selects those “from urban areas, where both parents have at least a high school diploma, live in a house with a flush toilet with a separate room used as kitchen and whose family owns a car, colour television, telephone, and refrigerator”. This narrowing down shrinks the sample to a mere 212 elite or privileged children in India. Continuing to apply WHO 2006 growth charts, even in this group, 20% children remain stunted and 9.4% remain underweight.

A follow-up report by the Government of India (2009) analyses the data from NFHS-3 using an even stricter definition of elite children. It defines them as children “whose mothers and fathers have secondary or higher education, who live in households with electricity, a refrigerator, a TV, and an automobile or truck, who did not have diarrhoea or a cough or fever in the two weeks preceding the survey, who were exclusively breastfed if they were less than five months old, and who received complementary foods if they were at least five months old” (GOI 2009: 10). Applying WHO 2006 standards, the report estimates the proportion of stunted children among these elite children to be approximately 15%.

Prima facie, these findings imply that even if the populations of children underlying the NFHS-2 and NFHS-3 were provided a balanced diet and other amenities that lead to good height and weight outcomes, 15% to 20% of them will remain stunted by the WHO 2006 standards. It can be further argued that even these percentages underestimate the extent of stunting despite a healthy diet due to two possible selection problems. First, given that wealth persists over generations, the elite children identified in Tarozzi (2008) and GOI (2009) are probably farther along the “catch-up” curve than the rest of the population. Therefore, even if the non-elite children were given the same diet and other amenities, they would exhibit a higher incidence of stunting and underweight than their elite counterparts. Second, it is also possible that genetically taller children are represented in disproportionately large numbers in the populations of elite children analysed by Tarozzi (2008) and GOI (2009). This may result, for example, from genetically taller individuals achieving success in disproportionately larger numbers during the earlier part of India’s development process and holding on to their lead.

These findings and arguments show that the absence of a balanced diet alone cannot fully explain the estimates of stunted and underweight children in India. The “gradual catch-up” hypothesis or genetic differences or both are at work as well. Deaton and Dreze (2009), who carefully review the findings of Tarozzi (2008), reach the same conclusion. They discuss the possibility of genetic differences but favour the “gradual catch-up” hypothesis as the explanation for the high proportions of stunted and underweight children even among the elite. They state, “The genetic potential hypothesis, although certainly not disproved, is becoming less accepted in the scientific literature, if only because there is a long history of differences in population heights that were presumed to be genetic, and that vanished in the face of improved nutrition.”

I will argue that while the “gradual catch-up” hypothesis is definitely at work in India, it is insufficient to explain the differences in the incidence of child malnutrition between India and Sub-Saharan Africa. Genetic differences remain a
necessary part of the full explanation of these differences. I reinforce this conclusion by providing evidence of genetic differences across populations around the world.

8 Height Differences Have Not Vanished: Adults

I noted above that the justification Deaton and Dreze (2009) provide for the rejection of genetic differences across populations is that “there is a long history of differences in population heights that were presumed to be genetic, and that vanished in the face of improved nutrition” (emphasis added). In providing this justification, the authors do not specify if they have in mind here the differences in adult or child heights or heights at all ages. But since they refer to the contributions by Cole (2003) and Nube (2008) in this context and these authors consider both adult and child nutrition, it is appropriate to consider both populations.

Begin with the evidence on whether improved nutrition over several generations causes the differences in adult heights to vanish. In his lively essay entitled “The Height Gap” in the New Yorker, Burkhard Bilger (2004) traces the fascinating history of the literature on the subject. Going by his account, evidence supporting the hypothesis of improved nutrition leading to the elimination of height difference remains the Holy Grail of researchers in this field. Bilger reports that US soldiers were two inches taller than the average German during the first world war.

But sometime around 1955 the situation began to reverse [with Germans surpassing the Americans in height]. The Germans and other Europeans went on to grow an extra two centimetres a decade, and some Asian populations several times more, yet Americans haven’t grown taller in 50 years. By now, even the Japanese – once the shortest industrialised people on earth – have nearly caught up with us [Americans], and Northern Europeans are three inches taller and rising (2004: 7; emphasis added).

John Komlos, a professor of economics at the University of Michigan and a pioneer in the field, has thoroughly analysed the data for signs of catch-up by US adults but found none. In the words of Bilger,

But recently he [Komlos] has scoured his data for people who’ve bucked the national trend. He has subdivided the country’s heights by race, sex, income, and education. He has looked at whites alone, at blacks alone, at people with advanced degrees and those in the highest income bracket. Somewhere in the United States, he thinks, there must be a group that’s both so privileged and so socially insulated that it’s growing taller. He has yet to find one (2004: 10).

Adult height differences magnify as we expand the comparison to a larger group of high-income countries. Table 3 reports comparable heights of men and women in several of these countries with the countries arranged in declining order of height of men. Male height in the Netherlands is shown to be 12.5 cm greater than in Japan. Even the gap between male heights in the Netherlands and Portugal is 9.5 cm. Similar differences exist in female heights. In broad terms, both men and women in northern Europe are the tallest and those in Asia the shortest. An interesting observation is that South Korea has overtaken both Japan and Singapore even though its per capita income is still far below that of the latter.

This evidence aside, even the references cited by Deaton and Dreze (2009) – Cole (2003) and Nube (2008) – do not support the proposition that the differences between heights of different populations vanish with improved nutrition. Cole (2003: 162) documents the steady increases in height over generations in countries such as the US, the Netherlands, and Japan but makes no claims that these differences eventually vanish. Indeed, he explicitly notes, “Height in the USA, the most affluent nation, currently lags behind that in Northern Europe”. He goes on to state, “These differences are substantial”.

Nube (2008) does not analyse the height dimension of nutrition and instead focuses on body mass index (BMI). He specifically focuses on south Asians living in various parts of the world and reaches the conclusion that genetic factors are partially responsible for the low BMI among them. It is instructive to quote a key paragraph from his paper in its entirety.

Results from countries that are home to sizeable population segments from different ethnic backgrounds, including people of Asian and African descent, reveal consistently higher prevalence rates of low BMI among people of South Asian descent. These differences cannot be explained on the basis of indicators which relate to access to food, social status of women or overall standard of living. Apart from the presented results on South Africa, Fiji and the USA, similar results are also reported for England, although these results do not present the socioeconomic status of the various ethnic population segments is not presented. On the basis of these outcomes it is hypothesised that there exists among adults of South Asian descent an ethnically determined predisposition for low adult BMI. This ethnic predisposition can be based on both genetic and cultural factors (2008: 512; emphasis added).

Interestingly, in an earlier paper, Deaton (2007) himself analyses height data from 43 developing countries and finds that no variables, including those relating to nutrition as measured by calorie intake, explain the differences across countries. He finds the high stature of Africans the hardest to explain, admitting, “Perhaps the major puzzle is why Africans are so tall” (ibid: 132-35). Variables such as per capita income in childhood, incidence of infant and child mortality rates, per capita calorie availability, and mother’s education, conventionally considered to correlate with height, all fail to explain the exceptionally tall stature of African men and women.

Unable to resolve the puzzle, Deaton goes so far as to state, “Given that Africans are deprived in almost all dimensions, yet are taller than less-deprived people elsewhere (although not more than Europeans or Americans), it is difficult not to speculate about the importance of possible genetic differences in population heights. Africans are tall despite all of the factors that are supposed to explain height (2007:132-36). But he stops short of accepting the genetic factor as an explanation, arguing that it does not explain the differences.
between other populations. In effect, he leaves unexplained the tall stature of Africans despite greater deprivation relative to other countries.

9 Height Differences between Child Populations

It is puzzling that despite having discussed at length the inexplicably tall stature of African adults relative to those from other poor countries in Deaton (2007), Deaton and Dreze (2009) makes no attempt to draw out its implications for the puzzle of lower incidence of stunting among children in nearly all Sub-Saharan African countries than in India. One imagines that the two puzzles are intimately linked. But nowhere in the paper do the authors mention this possibility.

A possible explanation of this oversight may be the belief that differences in heights for reasons other than nutrition do not appear in childhood. But evidence fails to support this proposition as well. Height and weight differences can be found even between populations of newborns who are otherwise perfectly equally healthy.

9.1 Height and Weight Differences between Equally Healthy Populations of Newborns

In a paper entitled “Birth Outcomes of Asian-Indian-Americans”, Alexander, Wingate, Mor and Boulet (2007) compare infants born in the US to resident Asian-Indian-American (AIA) mothers to those born to resident non-Hispanic white and non-Hispanic African-American (AA) mothers. The sample includes more than 1,000,000 AIA children, more than three million white children, and more than one million AA children. The authors are also able to control for the relevant maternal characteristics. They summarise their key findings as follows.

Compared to AA’s or Whites, AIA’s have the lowest percentage of births to teen or unmarried mothers and mothers with high parity for age or with low educational attainment. After taking these factors into account, AIA had the highest risk of low birth weight (LBW) and small-for-gestational age (SGA) and term SGA births but a risk of infant death only slightly higher than Whites and far less than AA’s. Conclusions: The birth outcomes of AIA do not follow the paradigm that more impoverished minority populations should have greater proportions of low birth weight and preterm births and accordingly greater infant mortality rates.

The authors speculate that the small body size and low birth weight of AIA children may be due to either “certain genetic factors related to the shortness or smaller size of the mother caused by undernourishment occurring during childhood” or “a different body habitus among this ethnic group and maybe due to genetic factors, not suboptimal growth”. Whatever the reason, the authors’ findings are that the AIA children are fully caught up with white and AA children of similar socio-economic and demographic backgrounds in terms of infant mortality but continue to exhibit higher incidence of low birth weight and small size for gestational age.

Even so, it is tempting to invoke the “gradual catch-up” hypothesis and argue that over several generations, Indian mothers will catch up with the American mothers in height and weight, thus bridging the size and weight gap between the two sets of children that is currently observed. But there are at least two problems with this argument. First, as I have already documented, as a matter of general proposition, adult differences in heights persist across races and ethnicities. Second, the pattern found for AIA children by Alexander et al (2007) has also been observed for Japanese-American children.

In particular, Mor, Alexander, Kogan, Kieffer and Ichih (1995) compare the birth outcomes of US-resident white and Japanese-American mothers using 1979-90 linked live birth and infant death records from the state of Hawaii. The majority of these Japanese-American mothers were born in Hawaii and the majority of the white mothers were born in the mainland US. Summarising their findings, the authors state,

After controlling for maternal socio-demographic and prenatal care factors with logistic regression, Japanese-American infants had significantly higher risks of low birth weight, preterm and very preterm birth and of being small-for-gestational age.

It is difficult to attribute these differences to a “catch-up” deficit among the Japanese-American mothers, especially since the infant mortality rates for the Japanese children, like those for the American children, were reported by the authors to be below the us Year 2000 Health Objective.

9.2 Older Children and Persistent Height Differences

Systematic studies of older children of migrant populations settled in the developed countries provide additional evidence of persistent differences across populations despite improved nutrition over some generations. Fredriks et al (2004) collected cross-sectional growth and demographic data on 2,880 children of Moroccan origin and 14,500 children of Dutch origin living in the Netherlands in the age range 0 to 20 years in 1997. Their findings are consistent with our previous discussion. “Moroccan young adults were on average 9 cm shorter than their Dutch contemporaries. …Height differences in comparison with Dutch children increase from 2 years onwards.” These authors find the differences so compelling that they recommend drawing up separate growth charts for Moroccan and Dutch children.

Indeed, today, it is possible to find separate growth charts for children of Moroccan and Dutch origin living in the Netherlands, making it possible to compare the two populations. Table 4 reports mean heights in centimetres in 2010 for these two populations. Differences are minimal at the first year but positive and rising from the second years onwards. By the third year, the difference is a full centimetre and grows to 1.8 cm for boys and 2.7 cm for girls in the fifth year. By the fifth

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>Boys</th>
<th>Girls</th>
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<tbody>
<tr>
<td></td>
<td>Moroccan</td>
<td>Dutch</td>
</tr>
<tr>
<td>1</td>
<td>76.1</td>
<td>76.7</td>
</tr>
<tr>
<td>2</td>
<td>87.7</td>
<td>88.4</td>
</tr>
<tr>
<td>3</td>
<td>96.8</td>
<td>97.8</td>
</tr>
<tr>
<td>4</td>
<td>104.5</td>
<td>105.5</td>
</tr>
<tr>
<td>5</td>
<td>111.4</td>
<td>112.3</td>
</tr>
<tr>
<td>6</td>
<td>117.8</td>
<td>118.3</td>
</tr>
</tbody>
</table>

Source: www.tno.nl
year, the gaps are thus almost a third of the gaps obtained at full adulthood – 6 cm for boys and 7.9 cm for girls.

Fredriks et al (2004) are not alone in finding persistent differences between populations of children of migrants in developed countries and those of local families. Smith et al (2003), who compare the heights and weights of 6-12 year old Maya-American children using samples collected at two different points in time with the National Health and Nutrition Examination Survey (NHANES) reference standards for US children, also find the height gap narrowing over time but not vanishing.

As many as half a million Guatemalan Maya, mostly from rural areas, have migrated to the US since the civil war in Guatemala in 1978. The bulk of this migration took place in the 1980s. Smith et al compare the heights of Maya children living in the US in 1992 and 2000 with their Guatemalan counterparts as well as the NHANES standard for American children. They find that 6-year-old Maya children living in the US in 1992 were on average 6 cm taller than their 1998 Guatemalan counterparts. They had gained another 3 cm after eight years in 2000. Nevertheless, they remained 5 cm shorter than the NHANES standard for American children in 2000.

A defender of uniform worldwide norms for measuring nutrition may argue that the reason Moroccan children in the Netherlands and Maya children in the US lag behind their host country counterparts in height is that they still have not had enough time to eliminate the “catch-up” deficit. It is possible that the remaining gap will be eliminated in another few generations.

But this argument has two limitations. First, given that adult height differences across developed country populations have persisted, as has the incidence of low birth height and low birth weight between Japanese and American children born in Hawaii, how can we be sure that the height and weight differences between children will vanish in due course? Indeed, the weight of evidence remains in favour of the differences narrowing but not vanishing. Second, as previously stated, from a policy standpoint, what sense does it make to attribute differences in height and weight that can only be bridged over future generations to malnutrition?

9.3 Children of Indian Migrants in the UK

At least some analysts who believe that height differences across populations of children can be eliminated by good nutrition have relied on a comparison of children born to Indian (and Pakistani and Bangladeshi) parents settled in the UK with those born to white parents in the study by Tarozzi (2008). This necessitates a close examination of his following finding.

Overall, these results [shown in his Table 6] provide some prima facie evidence in support of the hypothesis that the growth performance of children of Indian ethnicity who live in the UK is comparable to that of the reference population used to construct either the WHO-2006 or the CDC-2000 references (2008: 464; emphasis in the original).

A casual reader already unsympathetic to the possibility of genetic differences is likely to conclude from this statement that the key assumption underlying the WHO-sanctioned methodology to measure malnutrition is valid. Yet, she will be wrong for a number of reasons, some of which Tarozzi is himself careful to note.

For starters, observe the qualification “prima facie” in the statement. Tarozzi is tentative and by no means conclusive in his tone. And there are good reasons for this caution. The sample with which he works is extremely inadequate to draw strong inferences about the absence of genetic differences. Thus, for example, the sample of children under 2 years of age born to Indian parents in the data set available to him is so small that he does not even attempt a comparison between them and children of the same age born to white parents. For children 2 to 3 years old, his sample has just 19 Indian children and for those between 2 and 5 years, it has 72 children. Such small samples are quite inadequate to measure even the average levels of stunted and underweight children with any degree of precision, let alone the entire distribution of the underlying population.

Moreover, even these small samples do not yield zero differences between stunting levels among children born to Indian parents and those to local white parents. The proportion of Indian children, 2 to 3 years old, who are placed in the stunted category by the WHO 2006 definition is 5.3% compared with nil among white children. Surely, the difference between 5.3% and 0% is not zero. Moreover, if we were to make the height norm against which stunting is evaluated even more demanding than the WHO 2006 norm, the proportion of Indian children who are stunted would rise, whereas it may still remain zero among white children.

There are more qualifications to the conclusion by Tarozzi. Even if it were true that the height gap between Indian children born in the UK and their white counterparts is nil, it does not prove that at some point in time Indian children born and brought up in India will also close the gap. There are at least two reasons for this conclusion. First, there may be a selection problem such that Indian parents who migrated to the UK are disproportionately drawn from a part of the population that is taller for genetic reasons. Those who chose to migrate may have on average enjoyed some genetic advantage over the population left behind. Tarozzi himself is aware of this possibility and is careful to highlight it. Immediately following the conclusion quoted above, he states,

Of course, these findings are not sufficient to disprove the claim that genetic factors play a role in explaining the relative disadvantage in growth pattern of children, such as those sampled within the UK, who are born and raised in India. To argue that ethnic Indians who live in the UK share the same genetic characteristics in terms of growth potential as their counterparts still living in India, one should argue that migration to the UK is uncorrelated with growth potential. However, there are reasons to suspect that correlation may exist, as migrants are often taller (2008: 464).

Second, even assuming that migrant parents are representative of the Indian population, the possibility that the gap will persist in the case of children born and raised within India cannot be ruled out. What if the UK geography, culture, and environment are more conducive to height and weight development of children than the Indian geography, culture, and environment? Therefore, what is needed is evidence that some sub-populations of children born and raised within India have
managed to entirely eliminate the gap with respect to the WHO 2006 reference population. That evidence has remained elusive so far, as we have seen from the analysis of the sample of elite children from NFHS-2 by Tarozzi (2008) and NFHS-3 by the Government of India (2009).

9.4 The South Delhi Study

Before I conclude this section, it is important to briefly discuss a study by Bhandari et al (2003) analysing a sample of children strictly between 1 and 2 years of age collected from households in South Delhi, an elite neighbourhood of New Delhi. Applying the CDC 1977 standard, this study reports the incidence of stunting at 3.2%. Some observers view this finding as a vindication of the hypothesis that there are no genetic differences between populations.

But there are four problems with such an inference. First, there is a strong possibility of selection bias. The elite inhabit South Delhi and we cannot rule out the possibility that they are drawn disproportionately from the genetically taller part of the country’s population. As previously mentioned, early success in the development process may have come disproportionately to those from the genetically taller part of the population.

Second, the sample was collected as a test run for the WHO, which was trying to ascertain whether a sample from South Delhi would qualify for inclusion in its larger sample that was to eventually form the WHO 2006 reference population. This meant that a tendency for excessive sanitisation of the sample might have unconsciously crept in, leading to the exclusion of shorter or underweight children even as the researchers were consciously applying objective criteria for inclusion. The authors report having eliminated a solid 13.7% of the observations “because of prematurity, chronic illness affecting growth, or both”. The elimination of such a large proportion of the observations invites speculation whether prematurity and chronic illness were not defined too liberally to substantially eliminate children with low height and weight.

Third, the study only included children strictly between 1 and 2 years of age. Differences resulting from factors other than nutrition at the age below 2 are small and hard to capture. Even for a sample drawn from a wealthy section of the population, it is likely that larger differences would emerge only if it included children of ages 3, 4 and 5.

Finally, even the 3.2% stunting incidence is measured against the CDC 1977 standard and not the WHO 2006 standard. Applying the latter standard would yield a larger estimate of stunted children.

10 Weight and BMI Differences across Populations

Recall that the common worldwide standard for the identification of malnourished children as recommended by the WHO 2006 guidelines is based on the assumption that there are no weight differences across populations other than those resulting from differences in nutrition. I have come across little systematic evidence validating this assumption.

A study by Smith et al (2003) of children 6-12 years old reports that even the Maya children living in Guatemala in 1998, who significantly lagged behind their American counterparts in height, exhibited average BMI equal to or exceeding the average BMI of the latter beginning at 7 years of age. Applying the CDC 5% threshold, underweight children among these children in Guatemala were just 6%, notwithstanding that the proportion of stunted children in the same sample was a gigantic 71.6%. When a sample of Maya children living in the US in 2000 is considered, their average BMI exceeds that of their American counterparts from 10% for 6-year olds to 25% for 12-year olds. In a similar vein, Fredriks et al (2004) report that the BMI for Moroccan children living in the Netherlands exceeds that of Dutch children. Based on these studies and that by Nube (2008), the scientific basis for applying a uniform BMI or weight standard to determine malnutrition would seem to be on even shakier grounds than a uniform height standard.

11 Gradual Catch-up Hypothesis and Three Puzzles

Three puzzles further strengthen the case that the “catch-up” deficit alone is insufficient to explain the observed facts and that genetic differences are at play.

First, an application of the WHO 2006 standards leads to the conclusion that proportionately more children in India are malnourished than their counterparts in Sub-Saharan Africa. It is implausible that the poor diet of Indian children on average accounts for the difference. It is even more implausible that children in Kerala receive poorer diets than those in Senegal and Mauritania.

If we further assume that no genetic differences are at work, the only logical explanation for the observed difference in the incidence of child malnutrition between India and Sub-Saharan Africa is that Sub-Saharan African children are farther along the catch-up path. But if maternal mortality reflects the general health of the mother, this conclusion is contrary to the observation that maternal mortality in India is uniformly lower than in the poorer countries of Sub-Saharan Africa. The proposition that mothers in Mauritania are healthier than those in Kerala despite a maternal mortality ratio that is 5.75 times that of the latter is not persuasive.

Even so, some would persist in arguing that the lower maternal mortality ratio in Kerala reflects its superior medical infrastructure, which allows it to save the lives of mothers even though they are poorly fed relative to their counterparts in Mauritania. But given the historically high rate of female literacy, superior achievements in health along virtually all dimensions other than child nutrition, the generally high status of women in the state, a much higher per capita income, and much lower incidence of poverty, it is not plausible that Kerala mothers suffer from a greater “catch-up” deficit than their counterparts in Mauritania.

Finally, even the direct empirical evidence goes against the hypothesis that mothers in Sub-Saharan Africa are better nourished than their Indian counterparts. Deaton (2007) studies the puzzle of African adults being much taller than South Asian adults despite much higher child mortality rates in Africa. He hypothesises that the answer to the puzzle might lie in a lower disease burden in Asia leading to lower child mortality.
there and higher nutrition levels in Africa leading to superior height achievements in Africa. To quote him,

Africa is well endowed with land relative to its population, so nutrition might be relatively plentiful, despite low national income. The contrast between Africa and South Asia would then be between, on the one hand, high disease burden but good nutrition and, on the other, low disease burden but poor nutrition. If nutrition is the main determinant of height and disease burden the main determinant of child mortality, we would have a possible explanation of the height and mortality pattern between Africa and Asia (2007: 132-36).

Deaton goes on to examine the available data on nutrition but finds no support for the hypothesis. Once again, it is best to quote him directly.

There are many African countries whose women are tall, even though there was very low calorie availability in the year of their birth. The worst example is Chad, where the FAO [Food and Agricultural Organisation] estimates a per-capita calorie availability of 1,640 around 1980, one of the lowest numbers ever recorded.

No matter how we look at it, the difference in incidences of stunted and underweight children between India and Sub-Saharan Africa cannot be explained without admitting the role of genetic differences.

Turning to the second puzzle, the reason we care about stunting and underweight problems among children is the belief that it affects various forms of learning and cognitive achievements in adulthood.14 Assuming this to be the case, suppose we take the available stunting and underweight trends in India and do a rough and ready extrapolation back in time. It will not be unreasonable to conclude that such an extrapolation would place nearly all Indian children born in the 1950s or before in the stunted and underweight category. This would imply widespread deficiency in learning and cognitive achievements among today’s Indian adults born in the 1950s or before. But such an inference is hard to draw if we go by the achievements of Indians in this cohort who had opportunities to learn in their childhood and youth.

Finally, Indian children today show a far greater incidence of malnutrition than nearly all Sub-Saharan African countries with similar or lower per capita incomes. Given that India has made far greater progress than Sub-Saharan African countries in child-related vital health indicators such as infant mortality, under-five mortality, and maternal mortality in recent decades, it may be hypothesised that its progress during the same decades in improving child nutrition would be at least as good as the latter.15 This means that India lagged even farther behind Sub-Saharan Africa two to four decades ago than now. Given the presumed relationship of malnutrition in childhood to adult learning and cognitive achievements, we should then expect Indian adults 20 years or older today to be performing significantly worse in terms of learning and cognitive achievements than their Sub-Saharan African counterparts. But there is no evidence that this is the case.

12 India Does Show a Declining Trend in Malnutrition

While estimates of the nutrition level based on the WHO 2006 standard and its predecessor NHIS 1977 standard are, thus, of little value for cross-section comparisons of different populations at a point in time, they can still be deployed to assess the trend in malnutrition levels of a given population. The main point that emerges from estimates for India over time is that contrary to the impression given in public discourse, either implicitly or explicitly (see, for example, the quote from The Economist magazine at the beginning), steady progress has been made in combating child malnutrition throughout the period for which we have such estimates. The claims of lack of progress or deterioration in nutritional levels constitute a myth in its own right.

There are two sources of nutrition data in India – surveys of rural populations in nine states by the National Nutritional Monitoring Bureau (NNMB) established by the Indian Council of Medical Research, Hyderabad, in 1972, and the National Family Health Survey (NFHS), a collaborative project with the Indian Institute of Population Studies (IIPS) in Mumbai as the nodal agency. The NNMB covers the rural areas in nine states and offers comparable indicators of nutrition for the periods 1975-79, 1988-90, 1996-97 and 2003-06, while the NFHS covers both rural and urban areas in all states and has had three rounds in 1992-93 (NFHS-1), 1998-99 (NFHS-2), and 2005-06 (NFHS-3).16

Figure 8, mentioned previously, shows comparable estimates of the proportions of stunted and underweight children above 1 year and below 5 years of age under the NCHS 1977 standard used by the NNMB. The estimates are based on pooled observations from all nine states surveyed by the NNMB. Both the proportion of stunted children and the proportion of underweight children show a steady decline over time.

The NFHS data show a similar trend. This latter source covers both rural and urban areas and extends to all the major states in India. In Table 5, I report nutrition measures among children under 3 years of age in 1998-99 (NFHS-2) and 2005-06 (NFHS-3) in urban and rural areas and the country as a whole.17 The table provides the proportions of children who are stunted, underweight, and wasted as per the WHO 2006 reference population.

Three observations follow from the table. First, rural nutrition levels measured in terms of both height and weight are consistently worse than urban ones. This is consistent with the expectation that a higher incidence of poverty would translate into a higher incidence of malnutrition. Second, improvements can be seen in the proportions of stunted and underweight children in both rural and urban areas, though the improvement in the proportion of underweight children in rural areas has been minimal in NFHS data and less than that observed in NNMB data. Finally, the proportions of stunted and underweight children in rural areas in 1996-97 and 2003-06 in the NNMB data are higher than the corresponding proportions in the NFHS-2 and NFHS-3 estimates, respectively. The possible reasons include differences in populations in terms of age and state coverage, and the use of different norms.

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<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>Height-for-age (stunted)</td>
<td>41</td>
<td>54</td>
</tr>
<tr>
<td>Weight-for-age (underweight)</td>
<td>34</td>
<td>45</td>
</tr>
<tr>
<td>Number of children</td>
<td>5,241</td>
<td>18,475</td>
</tr>
</tbody>
</table>

Source: Based on International Institute for Population Sciences (IIPS) (2007), Table 8.3.
13 Average Height in India Has Been Rising

As a final point, I briefly mention the progress in the average heights of Indian children. Once again, progress is being made on this front. Predictably, we encounter differences between NNMB and NFHS estimates on this count as well. According to the former, the average increase in height at age 3 was a little below 2 cm per decade between 1975-79 and 2004-05. According to the latter, the increase was 2.5 cm per decade between 1992-93 and 2005-06. The corresponding increase in China between 1992 and 2002 was 3 cm for children between 2 and 5 years in rural areas and slightly more in urban areas.18

14 Concluding Remarks

In this paper, I question the higher measured levels of child malnutrition in India than in virtually all countries in Sub-Saharan Africa that are poorer than it. I also present evidence contrary to claims that India has made little or no progress in combating child malnutrition despite accelerated growth since the 1980s. I have argued that the estimates showing higher levels of malnutrition in India than in Sub-Saharan Africa are rooted in the methodology recommended by the WHO, which applies a uniform worldwide height and weight standard regardless of race, culture, geography, or environment to identify stunted and underweight children.19

Conceptually, the incidence of measured malnutrition in a population relative to an exogenously specified “reference population” is attributable to three broad sources. (i) Lack of a balanced diet;20 (2) The “catch-up” deficit, which measures the gap between the observed height (or weight) distribution of a population and the one obtaining after the population has realised its full genetic potential; and (3) The difference in the height (or weight) distribution of a population after it has realised its full genetic potential and that of the reference population.

Figure 10 explains how these sources enter into a measured incidence of stunting using a hypothetical example. In it, the measured incidence of stunting is 50%. If a balanced diet is given, thus eliminating the first of the three factors above, the incidence drops to 30%. Once the “catch-up” deficit is also fully eliminated, the incidence drops to 15%. The remaining difference in the incidence of malnutrition between this population and the reference population, 12.7 percentage points, is genetic and cannot be eliminated.

There is agreement that an important part of measured malnutrition represents the “catch-up” deficit, which can be eliminated only through a sustained balanced diet over several generations. Regarding the genetic factor, the dominant view is that it does not exist. In this view, all child populations are capable of achieving the same height distribution as the population of the tallest children in the world. In terms of Figure 10, “Distribution 3” coincides with “Distribution 4”. The present paper rejects this dominant view on two broad grounds.

First, my review of the evidence shows that while a sustained balanced diet over several generations does narrow down height differences across populations, it does not eliminate the latter in the case of either adult or child populations. Japanese adults have remained 12 to 13 cm shorter than their Dutch counterparts despite more than 50 years of good diet. Japanese newborns remain subject to greater incidence of low birth weight and small-for-gestational age than their American counterparts. Asian-Indian-American newborns of Indian mothers in the US exhibit an identical pattern. Even Maya children living in Guatemala, who significantly lag behind their American counterparts in height, exhibit average BMI equal to or exceeding the average BMI of the latter beginning at 7 years of age. Morroccan children born in the Netherlands begin to fall behind their Dutch counterparts in height as early as 2 years of age but exhibit higher BMI than the latter.

Second, without genetic differences, there is no empirically plausible explanation for the significantly higher levels of stunting and underweight among Indian children than their Sub-Saharan African counterparts. The contrast is brought out most starkly by a comparison of Kerala and Mauritania. Historically, Kerala has had very high rates of female literacy. It also has had impressive vital statistics such as low infant and child mortality rates, and maternal mortality ratio. It has the highest per capita expenditure and the lowest rate of poverty among the largest 17 Indian states. Despite this, it exhibits worse child malnutrition incidence, especially in terms of the proportion of underweight children, than Mauritania.

Evidence also does not support the view that a lower incidence of child malnutrition in Sub-Saharan Africa reflects its smaller “catch-up” deficit. African mothers exhibit far higher maternal mortality than Indian mothers. The argument that higher maternal mortality ratios in Sub-Saharan Africa can be reconciled with its higher nutrition levels once we recognise its poor medical infrastructure turns out to be empirically invalid. Direct evidence on adult nutrition, discussed in Deaton (2009), does not support the view that African adults have been historically better nourished than Indian adults. We are left with genetic differences between the Indian and Sub-Saharan African populations as the only plausible explanation of the observed differences in malnutrition rates.

The common impression that India has not made much progress in child nutrition despite economic progress also turns out to be false. Whether we go by indicators of stunting or underweight, progress in child malnutrition, consistent with that in other vital statistics such as life expectancy, infant and child mortality rates, and maternal mortality ratio, has been made. The proportions of stunted and underweight children have been steadily declining and the average height and weight steadily rising since the late 1970s when data on these measures began to be collected.

What does this analysis imply for the measurement of malnutrition? To be sure, common height and weight standards, which the WHO and UN have pushed to make it easy for the latter to track malnutrition levels to give substance to its quest for child nutrition-related MDGs, do not make sense. Instead, countries must either rely on proper measures of protein and other micronutrients in the body or, in case this is not feasible,
develop country- or even region-specific norms that allow them to identify malnutrition resulting from the lack of a balanced diet.

Finally, I note in passing that another myth similar to the one considered here has plagued policy discussion on adult hunger in India. There are widespread claims that more than one-fifth of the Indian population, or approximately 240 million Indians, suffer from chronic hunger. This is also a much-exaggerated claim, as discussed in my recent book with Jagdish Bhagwati (Bhagwati and Panagariya 2012).

NOTES
1 The word bangsma in Hindi means “disorder.” The quote here is from Santosh Singh, who has written widely on the subject and can be found at http://www.livemint.com/2012/01/102900/Malnutrition-8216national.html (accessed on 27 August 2012).
2 For instance, when commenting on the paper at a conference at Columbia University, Jishnu Das made this argument.
3 If we switch to this alternative approach, however, we must adhere to it in measuring malnutrition in other countries as well, or not indulge in international comparisons.
4 Per capita GDP in 2009 in current dollars was $1,192 in India, $1,023 in Senegal, and $919 in Mauritania. Going by per capita gross state domestic product (GSDP), Kerala was the fourth richest among the largest 15 Indian states in 2009. Per capita GSDP was more than one and a half times the per capita income nationwide.
5 For instance, a senior health ministry official offered this hypothesis during the discussion following a presentation of the findings of the paper by the author at the parliamentary forum for children, chaired by Member of Parliament Naveen Jindal.
6 A problem with the wasting indicator is that it can potentially classify a child who is both stunted and underweight as healthy. Likewise, progress in bringing stunting down without a corresponding progress in alleviating the underweight problem would imply increased wasting.
7 The cut-off point is defined as two standard deviations below the median of the healthy population. Assuming the latter follows the normal distribution, this definition translates into 2.5% of the population at the bottom being classified below as malnourished.
8 For example, see Deaton and Dreze (2009).
9 I interpret “balanced diet” broadly here and subsequently to include factors other than diet that policy can influence. These may include, for example, epidemiological factors relevant to child growth such as breastfeeding and a healthy social environment.
10 For example, see Deaton and Dreze (2009).
11 The authors do not cite the relevant literature here, which makes it difficult to assess this stance. If it is based on the differences being just narrowed rather than eliminated, the basis is incomplete. At least the literature on adult heights only shows the narrowing of gaps with better nutrition over several generations but not the elimination of gaps. I shall return to this issue below.
12 The charts can be found at http://www.tno.nl/content.cfm?context=them&content=prop_case&laag=89&aalag=902&alag=70&item_id=2141&taal=2 (accessed on 1 September 2012).
13 This last possibility arises because the information reported by Tarozzi only tells us that all children born to white parents are above the WHO 2000 norm, but not how much above the norm. This leaves the possibility that raising the norm further might still leave the proportion of white children classified as stunted at zero.
14 I am concerned here not as compelling as many policy analysts, politicians and non-governmental organisations (NGOs) implicitly or explicitly claim. The study of the subject is at its best in its infancy due to the paucity of longitudinal data connecting differences in adult achievements to nutrition differences in childhood (for example, see Maluccio, Hoddinott, Behrman, Martorell, Quesmubing and Stein 2005). But the general belief in the hypothesis that stunting and underweight affect adult achievements remains strong. Without it, the disproportionate focus on poor nutrition levels of children in India and Africa is difficult to explain.
15 While there are reliable estimates on progress in child nutrition in India (Figure 8 and related discussion) from the late 1970s, we lack similar estimates for Africa to allow a direct comparison of the progress.
16 The nine NNMB states are Andhra Pradesh, Kerala, Tamil Nadu, Karnataka, Maharashtra, Madhya Pradesh, Gujarat, Odisha, and West Bengal.
17 Comparable data for under-five children in NFHS-2 and NFHS-3 are not available.
18 See Deaton and Dreze (2008: 51-52) for more details.
19 Two decades ago, Basu (1993) used data from a field survey to quantify nutritional measures using the WHO sex-standardized norms. She found girls to be doing far worse than boys. Not persuaded by the conclusion, she decided to then use the Harvard sex-specific standards and found that the results turned on their head—girls fared better than boys. The application of uniform standards is not without hazard.
20 As noted in a previous footnote, I interpret a balanced diet broadly here to include factors other than diet that policy can influence. These may include, for example, epidemiological factors relevant to child growth such as breastfeeding and a healthy social and natural environment.

REFERENCES

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