

From Poverty to prosperity: Understanding Stunting in different Economic Strata (REVISION 1)

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Figure 1: Image shows the children falling below the standard height for 9-year-olds and hence are classified as stunted. This is a problem around the globe and any solution would help reduce stunting across the globe

A child that is stunted has a low height for their age. Malnutrition, recurrent illnesses, and/or a lack of social stimulation are typically to blame for this. Stunted children are defined by the World Health Organisation as those whose height is at least two standard deviations below the WHO's Child Growth Standards Median and lower than average for their age. Stunting in simple words is known as 'low height for age'.

Many causes lead to child stunting, the factors are often interlinked. Some causes are:

- Poor nutrition and a lack of access to diverse foods
- Poor sanitation and no access to clean drinking water
- Lack of proper healthcare for children and their mothers
- Inadequate psychosocial stimulation and/or parent-infant bonding

These are not all the factors, conflict of income opportunities, Gender Inequality, food pricing and Climate change also has an impact on the stunting rate.

Determining the underlying causes of stunting in a certain area is crucial to treating stunting globally. To do this, we must first measure stunting in order to assess how the previously listed causes affect it.

But to classify children into stunting? Luckily, the WHO has defined standards [1].¹ We can use a method called Multi growth Reference Study (MGRS) was introduced by WHO in the year 2006¹.

If the child's height in the MGRS normalizes to less than -2 SD from the median, that child is deemed stunted. By definition, children in ideal environments should have a stunting prevalence of no more than 2.3%. For countries like India with over 38% child stunting, there is a long journey ahead to reduce stunting.



Figure 2: Stunted Children In India

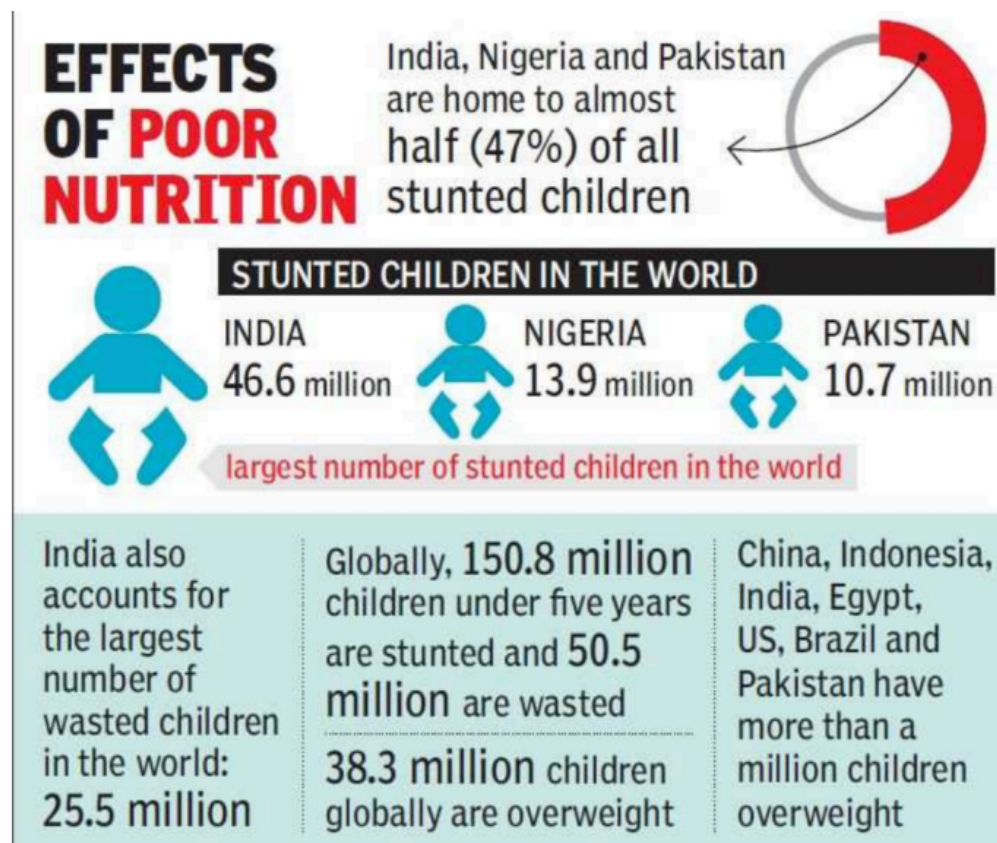


Figure 3: Chart showing that India, Nigeria, and Pakistan together have around half of the world's stunted children which is a matter of concern.

¹Critical analysis on the parameter defined by WHO is analyzed in the paper linked. It shows that 1 child's stunting is highly dependent on mother's height. Child stunting is high in India since the average height of mothers is less compared to many other countries.

Since stunting has both long- and short-term repercussions² as shown by the National Library of Medicine [2], it must be addressed immediately as soon as it is discovered. The short-term consequence is a fall in immunity, leading to repeated sickness. The long-term consequences effect include poor cognition and educational performance, low adult wages, lost productivity, and, when accompanied by excessive weight gain later in childhood, an increased risk of nutrition-related chronic diseases in adult life.

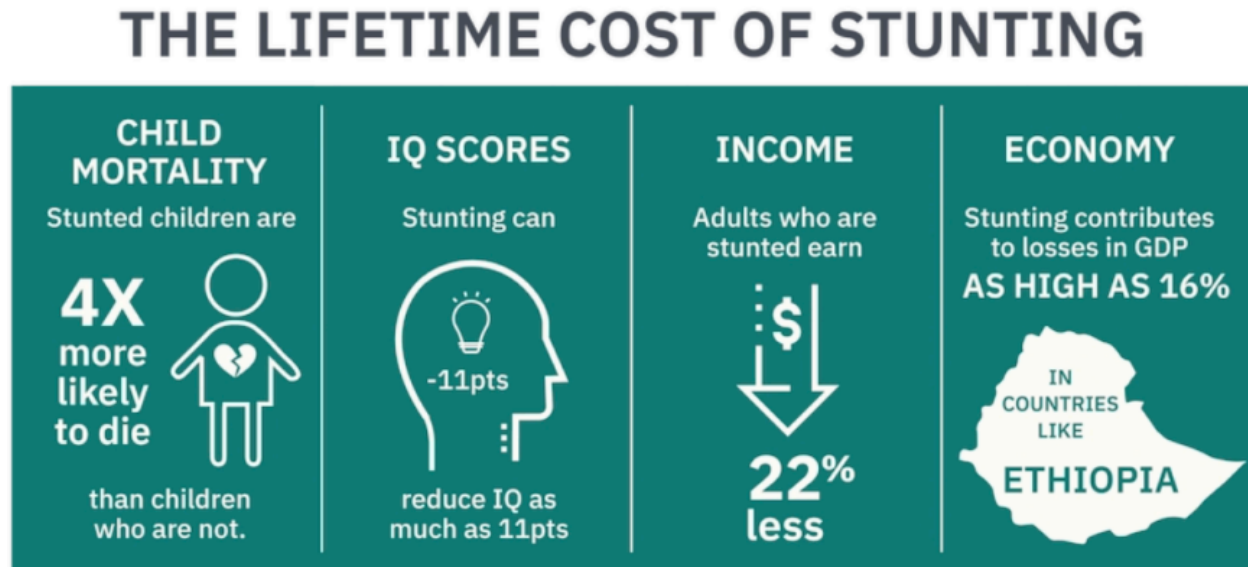


Figure 4: The diagram depicts the short-term and long-term effects of child stunting. It affects the person's well-being and also the economy of the nation as a whole.

The study has also found stunting to be irreversible [3]. The first 1000 days are crucial for assessing a child's progress, and if they are missed because of poor detecting skills or a lack of care, the consequences may last the remainder of the person's life. The person would not be able to compete educationally leading to a lack of income opportunities and would not be able to provide nutrition to their children making a never-ending cycle lasting for generations over generations.

It's critical to act quickly in the early phases of stunting to break the cycle and mitigate its short- and long-term effects.

To take action we need concrete analysis of which factors affect child stunting and how accurate/reliable these features are. According to these studies, we can develop different policies for different countries and different sections of people in the country.

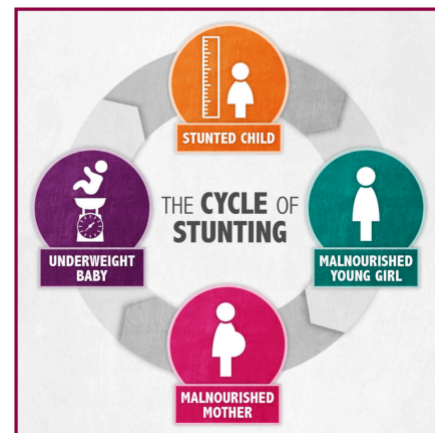


Figure 5: The unbreakable cycle of childhood stunting if no significant action is taken to lower stunting within a home

²Detailed study by National Library of Medicine shows the short-term and long-term effects of stunting on children.

Many studies show a strong correlation between child stunting and a country's growth in GDP. For instance, Ruel et al. (2003) [4] looks for a connection between the decline in stunting and economic growth. It concludes that a ten percent GDP rise will result in a six percent decrease in the frequency of stunting. This is in line with other research (Smith and Haddad 2015; O'Connell and Smith 2016) [3]; Mary et al. (2018b) also found that a 10% rise in GDP would result in a 7.3% decrease in stunting. Our research also aligns with these studies in the context of India.

However, these studies are not very specific. These studies are not very informative as they do not answer questions like which section of society will most benefit from a country's economic growth. Are people from different quintiles of economic distribution of a country able to see the reduction in stunting? Are these trends country-specific or they can be generalized to any country?

It is hard to create region-specific policies without answers to such important concerns. The nation's administration cannot decide if the issue is a lack of resources available to all socioeconomic and educational strata, a food shortage, or an economic crisis among the populace without doing a sufficient analysis.

For the government to implement laws that explicitly address this issue, we must determine whether these findings can be generalized to at least those who reside in the same nation. We must determine whether it is accurate to suggest that a country's GDP growth of 10% will result in a 7.3% decrease in stunting among all of its population or if this claim is overly optimistic.

We shall attempt to ascertain whether or not there is a direct correlation between financial status and stunting.

To do so, we must first quantify different economic sections of any country. We will divide it into 5 different parts and hence each is called an economic quintile.

Now we try to see the stunting rate amongst 3 different economic quintiles namely quintile 1, quintile 3 and quintile 5. The graph tries to depict the situation over the years for India.

We can observe that the 3 different quintiles are spaced sufficiently. So this means that if the government can uplift the economic status of the lower or middle economic quintiles, it would drastically reduce their stunting rate.

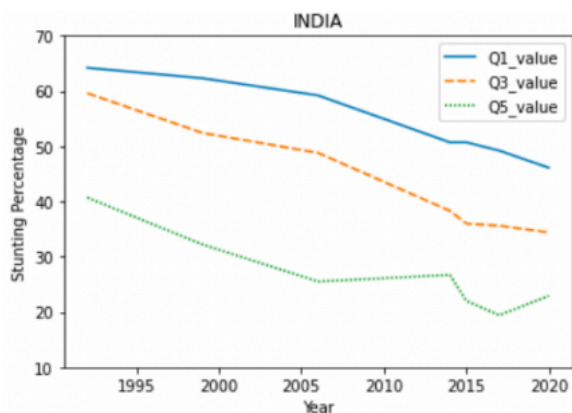


Figure 6: The Above graph depicts Indian economic quintiles VS stunting. We can observe sufficient spacing between different quintiles.

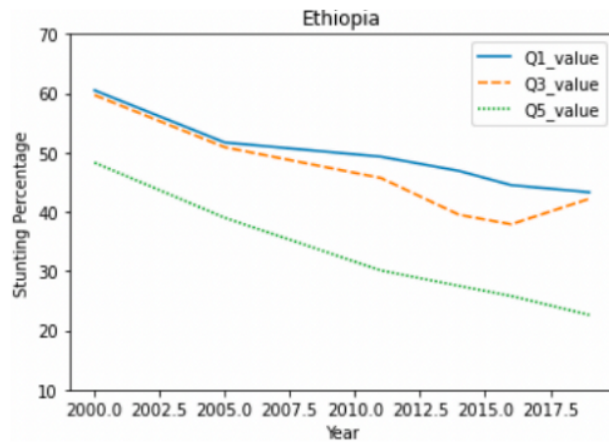


Figure 7: Shows Economic Quintiles of Ethiopia Vs stunting percentage. We Observe that the spacing is not as prominent as it was in the case of India.

However, we must ascertain whether this holds true for all nations. Let's use Ethiopia as an illustration. It's interesting to note from the graph that, in comparison to the third and fifth quintiles, the percentage reduction between the first and third economic quintiles is quite small.

This shows the unavailability of resources rather than an economic problem. The resources are only in reach of the rich and both the middle and lower class are struggling in terms of stunting percentage. The governments in these areas ought to put greater effort into ensuring that resources are accessible to all facets of society. In this case, our findings agree with the research by the National Library of Medicine. This is discussed more in detail at the end of our blog post.

There are other ways to explain the previously noted trends, but the main one we came up with was that there should be enough of a difference between the first and third quintiles compared to the third and fifth economic quintiles in wealthy nations like India. However, in comparison to the third and fifth quintiles, this gap would be negligible for underdeveloped nations. We need to prove this statement, so for that, we start by first trying to plot the same and observing if such trends are visible, next we can try to mathematically prove it as well.

High GDP countries, like India, Germany, Argentina, Brazil, Mexico, the Republic of Korea, Turkey, Thailand, Maldives, Egypt, and Low GDP countries, like Ethiopia, Republic of Congo, Zambia, Viet Nam, Uzbekistan, Zimbabwe, Uganda, Barbados, Eritrea, and the Republic of Moldova, would be the two groups that result from classifying the countries based on GDP³ [6].

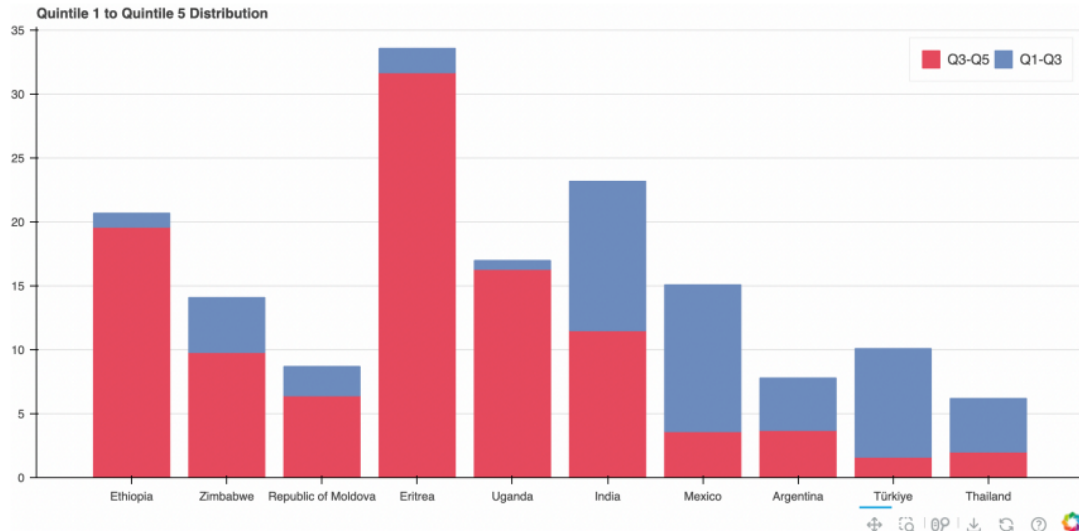


Figure 8: We can see that the gap between economic Quintile 1 and 3 is negligible for less developed countries like Ethiopia, Zimbabwe, the Republic of Moldova, Eritrea, and Uganda but for developed countries, it is very comparable. Which is in accordance with our studies.

³We can co-relate GDP to development. It is a sufficient but not completely accurate measurement as shown by the linked reference

We can observe from the area graph above that the previously mentioned pattern is in fact being followed. The two groups we created are adhering to the suspected patterns. However, as we are still unable to quantify our findings, this is insufficient evidence to support them. Thus, in order to produce more precise answers, we next attempt to mathematically translate the graphical observations.

We now will try to take a mathematical approach to try to solidify our claims based on speculations from graphs.

To do so, In the adjacent graph, we show how to translate or observation into equations. We can now observe the percentage that economic Quintiles 1 and 3 span between economic Quintiles 1 and 5 for a particular country and a particular country.

We replicate it for every year in the dataset for various nations, which we have categorised as having high and low GDPs.

Once the aforementioned value has been determined, we translate it into a percentage and take the average over all counties and years in the two categories of developed and underdeveloped, as depicted below.

$$\Sigma \Sigma \left(\frac{\text{Quartile 1} - \text{Quartile 3}}{\text{Quartile 1} - \text{Quartile 5}} \right) \times 100\%$$

The two summations are applied to add values between years and between nations. and at last translated into a percentage. Since it determined the percentage of the first and third economic quintiles relative to the overall first and fifth economic quintiles, let's refer to the above answers as Calculated %.

Now to get the total average percentage value for high GDP and low GDP countries, we shall take an average of it as shown below. This is similar to mean.

$$\frac{\Sigma \text{Calculated \%}}{\text{Total Values}}$$

Note :

There is a warning against averaging percentages [7]. We need to just see the existence of trend as hypothesised by us, so we can average these percentage. We will just see if the average percentage is significantly lower in Underdeveloped Countries or not. We won't be able to draw any numeric conclusions by comparing the two average percentages.

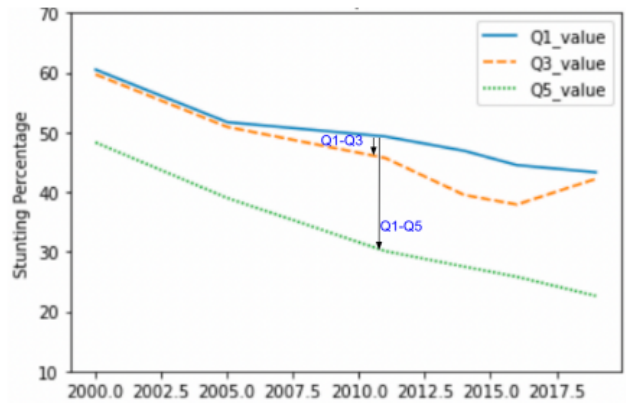


Figure 9: Shows a Graph depicting the how difference between first and third, and first and fifth economic quintiles is taken for a particular year in our calculation.

After the above calculations, we see that for high GDP countries, the spacing between 1st and 3rd economic quintile is about 59% and that in low GDP countries is only 21%.

Our research is also in accordance with the journal [8] which states that the GDP increase only helps rich children in developed countries and not children in Under developed countries. It implies that these results ought to be applied to determine the necessary adjustments to the present policy in accordance with child nutrition-related initiatives in Africa.

Instead of attempting to improve the economic status of the lowest class, these nations should work to extend the reach of resources throughout their whole economic strata, as this will not help to lower the rate of stunting among children.

The countries can learn from the success story of a South Asian country, Indonesia. Like India, Indonesia too had a high stunting rate of around 37% in 2007, which increased to 37.2 in 2013. But after that, there was a rapid fall to 30% in 2018 which fell to a shocking 21.6% in 2022. Such a decline has never been seen worldwide. How to explain such a sharp fall, the answer is simple, just like our conclusions from our study, Indonesia too implemented region-specific policies. It noticed the problems in their country and worked on child marriage laws [9], water and sanitation which were previously being ignored. After implementing the policies, the improvement became historic and set an example for other countries to follow.

If the first and third quintiles' economic circumstances are improved, nations like India stand a high possibility of seeing a significant decline in childhood stunting. Certain policies, including are in place. However, these are exclusively intended for kids in the first income quintile. Since our analysis indicates that there is no difficulty with the availability of food across different quintiles in India, more policies along these lines should be put into place in an effort to improve the financial standing of households in the third quintile as well. Improving economic standing will be very helpful in lowering the stunting rate.

So we can finally conclude :

“The World Health Organisation ought to release studies tailored to specific regions, as this will assist nations in altering their present policies and reducing stunting more effectively worldwide. ”

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