Measuring stunting and tracking trends in prevalence: Conceptual and methodological considerations with a focus on South Africa

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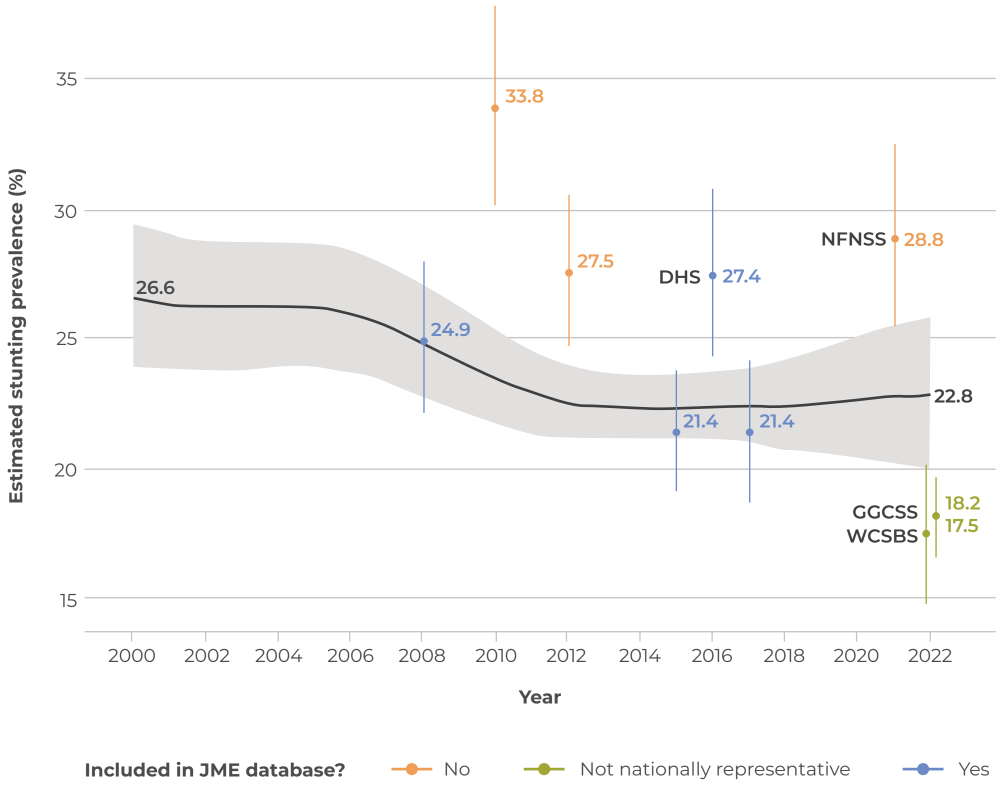
Child growth faltering – being too short for one's age, commonly measured by stunting – is a useful marker of a poor growth environment in early life, which impairs children's development and is associated with long-term consequences for cognitive development, schooling outcomes, health, and adult earnings[1]. However, measuring child growth faltering is a difficult task, both conceptually and methodologically. As seen in Figure 1, nationally representative surveys in South Africa have produced a wide range of estimates of stunting prevalence among children under 5, making it difficult to track trends in stunting over time.

This brief summarises key findings from a paper reviewing conceptual and methodological issues with measuring stunting and factors that may contribute to variation in stunting estimates and limit the comparability of stunting estimates across surveys. It concludes with some key recommendations to improve stunting measurement to allow better monitoring of progress towards reducing stunting.

What stunting does and does not measure

Children are classified as stunted if their height is more than two standard deviations below the WHO Child Growth Standards median height for their age and sex (i.e. they have a height-for-age z-score below -2). **The rate of stunting in a population is a useful indicator of the extent of growth faltering in the population.** However, **stunting is an imperfect indicator of linear growth faltering at the individual level,** as height-for-age z-scores (HAZ) do not take into account children's individual growth potential[2]. The prevalence of stunting likely underestimates the true extent of growth faltering. Many children not classified as stunted still experience growth faltering, failing to reach their growth potential . What's more, while a lower HAZ is associated with worse outcomes, the cut-off used to classify children as stunted has no biological or clinical basis; the risks associated with stunting increase continuously as height-for-age decreases[3].

Figure 1: Estimated stunting prevalence among children under 5 in South Africa between 2000 and 2022: UNICEF-WHO-World Bank Joint Child Malnutrition Estimates and South African survey estimates



Source: JME estimates from UNICEF-WHO-World Bank JME database, May 2023 (UNICEF-WHO-World Bank Joint Child Malnutrition Estimates (JME) Working Group, 2023). Estimates for NIDS Waves 2 and 3 (not included in JME database) are based on authors' own calculations.
Note: The black line represents the UNICEF-WHO-World Bank JME estimated stunting prevalence, with confidence intervals in grey. The coloured data points are point estimates with confidence intervals from national surveys as follows: 2008 = NIDS Wave 1, 2010 = NIDS Wave 2, 2012 = NIDS Wave 3, 2015 = NIDS Wave 4, 2016 = DHS, 2017 = NIDS Wave 5, 2021 = National Food and Nutrition Security Survey (NFNSS). Estimates from the Grow Great Community Stunting Survey (GGCSS) and Western Cape Stunting Baseline Survey (WCSBS) are included for comparison, but are not nationally representative. The surveys in blue were included in the database used to produce the Joint Child Malnutrition Estimates (JME); the surveys in orange (NIDS waves 2 and 3 and the NFNSS) were not. The JME estimates suggest a decline in stunting in South Africa since 2000, with the decline concentrated between around 2006 and 2012. However, the sparsity and variability of the surveys on which the estimates are based means that the confidence intervals are wide.

Rates of growth faltering differ by age

Stunting takes time to develop, and stunting prevalence differs markedly with age. Across low- and middle-income-countries (LMICs) mean HAZ tends to be lower than the growth standard at birth, but declines sharply between 6 and 18 months of age, reaching its lowest point around 24 months before improving. In the SA Demographic and Health Survey (DHS) 2016, the overall under-5 prevalence of stunting was estimated to be 26 percent, but the peak prevalence at 22 months was as high as 36 percent[5] .

Catch up growth may be driven by how height-for-age z-scores (HAZ) are constructed.

Part of the apparent catch up in HAZ may be driven by the construction of HAZ[6]. HAZ is the absolute height deficit (the centimetre difference between the child's height and the growth standards median) divided by the standard deviation of height for the child's age and sex. But the standard deviation of height widens with age as height increases. This means that HAZ may improve with age even when the absolute height deficit has not – even when the height deficit has worsened slightly.

Even when children seem to catch up from stunting, having been stunted earlier in childhood likely has lasting effects. Several studies have shown that children who 'catch up' from stunting still do worse in terms of cognitive function and schooling outcomes than children who were never stunted[7]. This implies that estimates of stunting in children under 5 likely underestimate the proportion of children affected by stunting at some point in their lives and suffering from lasting associated consequences.

Issues limiting comparability of stunting estimates across surveys

Three main issues compromise the comparability of stunting estimates across surveys:

1. Differing age distributions of child samples

Because the risk of stunting differs so dramatically by age, samples with different age distributions may produce different stunting estimates. Even surveys targeting the same age range may have different sample age distributions due to sampling variation or due to the peculiarities of the data collection process.

2. Missing height data

In some surveys, large proportions of children have missing height data, which could bias stunting estimates. If children who are less likely to be stunted (e.g. children from high socioeconomic status backgrounds) are more likely to have missing height data, stunting prevalence would be overestimated.

3. Measurement error

Measurement error leads to more children having extreme values of height-for-age. This means that a greater percentage of children will fall below a HAZ of -2 and be classified as stunted. **Surveys that measure height less accurately may overestimate stunting compared to surveys with less measurement error. Measurement error is particularly problematic among younger children.** Younger children are more difficult to measure accurately[8].

Key implications

We need to be very cautious when comparing estimates of stunting prevalence across surveys. Because of the wide variation in estimates, it is difficult to say with any certainty what has happened to stunting rates in South Africa in recent years. Box 1 outlines some key recommendations to improve the measurement of stunting and better allow us to track progress towards reducing stunting.

In spite of the difficulties in tracking trends in stunting, it is clear that far too many South African children are still failing to reach their growth potential. Measurement error likely inflates stunting estimates, but all available estimates of stunting prevalence are many times higher than what one would expect in a population facing healthy conditions for growth. Available estimates suggest that around 1 in every 4 or 5 South African children is stunted; in a healthy population this would be around 1 in 40. Furthermore, many more South African children are likely falling short of their growth potential than only those classified as stunted.

Key considerations to improve the measurement of stunting

- We need nationally representative surveys using comparable methodology and sampling strategies, repeated regularly and ideally with larger sample sizes, to accurately monitor trends in stunting.
- We need more coordinated data collection efforts. South Africa should consider establishing a national nutrition surveillance system to generate data that would be more suited to tracking trends in stunting, as well as other nutritional indicators such as obesity.
- Attention should be given to appropriate training of fieldworkers to improve data quality, and to improved monitoring of data quality during fieldwork.
- Surveys should ideally report the number and percentage of children whose heights or ages were not recorded and the distribution of these children across key variables to allow for an assessment of the risk of bias.
- Surveys should ideally include a set of survey weights adjusting for non-response in anthropometric modules.
- Comparisons of stunting rates and height-for-age over time require using the same growth reference.
- Surveys should clearly record whether height or length was measured so that necessary adjustments can be made.
- Surveys should capture both gestational and chronological age.
- Taking more than one height measurement may result in more accurate data.
- Consistent approaches to handling biologically implausible values would support improved comparability of stunting rates across studies. The cut-off recommended by the WHO and UNICEF is a height-for-age z-score less than -6 or greater than 6. Data releases should ideally include children with z-scores above or below the cut-off to allow comparisons across surveys using different cut-offs. Improved data validation controls during survey data collection could enable verification of biologically implausible z-scores.
- In the analysis and reporting of data, it is worth examining and reporting mean and median height-for-age z-scores and their distributions in addition to stunting rates.
- Future research could explore the possibility and practicality of stratifying child anthropometric surveys by age, or creating age-specific weights to render surveys with differing age distributions more comparable.

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