Reviewer's report

Title: Using height-for-age difference (HAD) instead of height-for-age z-scores (HAZ) for the meaningful measurement of population-level catch-up in linear growth in children less than 5 years of age

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Reviewer: Johanna Helena Nel

Reviewer's report:

1. Is the question posed by the authors well defined?
2. Are the methods appropriate and well described?

The main objective of this paper was to assess whether there is evidence of population-level catch-up growth in children. The authors reason that the mean height-for-age difference is a more appropriate measurement than using findings with the HAZ measurement.

On page 7 line 133 onwards they reason that if HAD is negative but remains constant with age (they imply that there is no catch-up growth), the z-score will increase with age, because the SD increases, indicating catch-up growth. But this actually implies catch-up growth, because, relative to the population, this (a constant HAD) is actually an improvement. An increased standard deviation implies an increase in HAD.

Page 8 line 161 the authors mention that the z-score criterion is different from the absolute difference criterion. According to the z-score criterion, #HAD > (negative number) for catch-up growth; whereas the absolute difference criterion states that #HAD > 0, for catch-up growth. The z-score criterion cannot be different from the absolute difference criterion – it is less restrictive, and includes the absolute difference criterion.

Page 10 line 198 a reference of where the WHO 2006 growth standards median heights can be obtained from is missing. Also, motivate why 5SD’s were used to drop records, as opposed to 4SD’s in line 207.

The purpose of this article can be merely to describe the relation between HAD and z-scores. I refer to “Issues in the assessment of nutritional status using anthropometry”, Gorstein, Sullivan, Yip, de Onis, Trowbridge, Fajans and Clugston, in Bulletin of the WHO, 1994, 72(2): 273-283. They reason that “the percent-of-median is simpler to calculate than a z score or percentile. Unfortunately, because the calculation of the percent-of-median ignores the distribution of the reference population around the median, the interpretation of the fixed percent-of-median value varies across age and height groups.” They continue to reason that “the z-score and percent—of-median curve would be approximately the same only if the coefficient of variation were to remain constant throughout childhood. But it changes, especially during the first two years.
In summary, if the HAD value of a person remains constant over time (age), it actually indicates an improvement for that person relevant to the population, because for the rest of the population the differences or HAD values increased because the standard deviation increased.

One cannot view the HAD only when considering catch-up growth, because it is not relative to the population.

3. Are the data sound? Yes, secondary data used.

4. Do the figures appear to be genuine, i.e. without evidence of manipulation? Yes

5. Does the manuscript adhere to the relevant standards for reporting and data deposition? Yes

6. Are the discussion and conclusions well balanced and adequately supported by the data? I do not agree with the conclusion that the HAD is a better measurement for describing catch-up growth than using the z-score comparisons.


8. Do the authors clearly acknowledge any work upon which they are building, both published and unpublished? YES

9. Do the title and abstract accurately convey what has been found? YES

10. Is the writing acceptable? YES

In conclusion, although the article is well written, I do not agree with the conclusions.

I will therefore feel that it cannot be published as is.

**Level of interest:** An article of limited interest

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests