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

Version: 3 Date: 11 June 2015

Reviewer: John S Fuqua

Reviewer's report:

Leroy, et al. submit a manuscript describing the comparison of population catch up growth when calculated using height for age Z-scores (HAZ) vs. height for age discrepancy (HAD) from the median. They particularly focus on several resource-limited countries in which adequate height data already exist. They first discuss the calculation of the two measures, emphasizing that because height SD increases with increasing age, the HAZ may improve over time even though the absolute height discrepancy may not. This is important, because recent publications appear to demonstrate an improvement of height limitations over time using the HAZ approach, whereas older papers using HAD assessments have not demonstrated such improvements. Analyzing the data using both approaches illustrates the pitfalls of the HAZ approach, confirming that additional height loss can occur over time even when the HAZ is getting better. The authors present a reasoned argument in favor of the HAD approach. However, the paper seems overly long and repetitious. Additionally, there are some clarifications that are needed to improve the article.

Major compulsory revisions:

1. Abstract: In the Background section, define the settings in which catch up growth is examined, such as assessments of growth as a measure of nutritional deprivation in resource-limited countries.

2. Methods: The Study Scope, Theoretical Background, and Mathematical Background sections are overly long and repetitive and should be shortened. I have highlighted some of the repetitive areas below. Although the equations listed make sense, they don’t really add anything. The concept being illustrated is not complicated, and the authors do a nice job laying them out verbally in the text.
   a. Lines 103-103 are repeated from lines 76-80.
   b. Lines 128-130 are repeated from lines 122-125.
   c. Lines 144-150 are repeated from lines 132-136.
   d. Lines 292-296 are unnecessarily repetitive.
   e. Lines 316-319 are repeated from lines 303-307.

3. Datasets: Give more detail about the Demographic and Health Surveys. Table 1 lists the survey years for different countries, but only lists one year for each.
Are the DHS data cross-sectional? If so, changes over time cannot be adequately assessed.

Minor essential revisions:
1. Line 40: change “pregnancy” to “conception.”
2. Line 86: I believe two words are inverted. Should read “…compare with findings using mean…”

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I declare that I have no competing interests.