Reviewer’s report

Title: Severely malnourished children with a low weight-for-height have a higher mortality than those with a low mid-upper-arm-circumference: I. Empirical data demonstrates Simpson's paradox

Version: 1 Date: 03 Oct 2017

Reviewer: Martha Mwangome

Reviewer's report:

Major comments

1. Sample of pre-selected malnourished children on unknown criteria

The sample included in this analysis of from inpatient malnutrition treatment facilities (IPFs), Out-patient treatment programs (OTPs) and supplementary feeding centres (SFCs) include participants who are pre-selected from community-based screening into the treatment programme. As such the participants are all cases (malnourished) and such data is not adequate to make policy recommendations for various reasons

   a. These populations do not reflect a general population.

   b. When screening and treatment of the sample is predominantly based on one of these criteria (WFH/MUAC) this biases the sample. For example, children pre-selected by WFH should not be evaluated for MUAC and vise versa. This is particularly a concern for comparisons of the association of WHZ and MUAC with mortality as is the question in this study.

In my opinion, these data cannot therefore be used to answer the question at hand and cannot be used to refute an argument that has been built on general population/community based data.

2. Anthropometric classification is not of practical importance (line 213 to 221)
a. The definition of a MUAC only criteria as used in this study needs to be stated in the introduction section.

b. If the objective of the analysis is to evaluate currently proposed criteria, the 7 anthropometric classifications defined on page 11 and used as the basis of this analysis would need to be revised to make more practical sense. In policy and in current practice, the MUAC only criteria is defined giving no consideration to WFHZ (criteria one). In the same way, a WFHZ only criteria would not consider MUAC (criteria 2). As presented, the defined criteria are odd, not applicable in practice and results of which cannot be compared to studies that have defined MUAC/WFH only criteria differently.

In my opinion, authors should revise the defined anthropometric criteria used in this analysis to reflect current anthropometric criteria in policy and practice.

3. Kwashiorkor is not an unresolved criterion both in policy and practice. I would suggest that authors consider removing analysis on kwashiorkor completely from this analysis.

4. In the discussion section authors have dedicated 2 pages from line 405 to 451 to discuss merits and demerits of ROC curves. This section is a potential diversion from the main objective of this analysis…. to examine relative mortality rates of children who have SAM……. This section focuses on a different question on robustness of statistical methods used in trying to resolve this MUAC/WFH controversy. I would recommend raising this question in this manuscript but giving it a bit more attention and addressed it fully in a separate publication on statistical methods.

Minor comments
1. In several sections within the manuscript statements presented as facts are either not referenced or references are contrary to statement. I have isolated some examples below but would urge the authors to review all references carefully

Introduction

The sentence beginning on line 79 to 81; Children admitted by MUAC show good response to treatment…………, the second section of this sentence is generalized but not referenced.

The sentence beginning on line 108-110; "A major Assertion justifying the point of view is that children with a low WHZ are relatively healthy (44 - 49) and therefore are not in need of treatment". This statement is not supported by the reference that are provided. I have checked through the following references and could not find evidence to support this statement.


2. In the introduction paragraph beginning on line 88 to 100, results of an analysis are presented (REF 42). Authors report the mean overlap found in their analysis and base their subsequent argument on it. Would be useful for readers to get an idea of how these figures compare to what others have found (above, below, similar?)

3. Sentence starting on line 93 to 94; "There was no satisfactory explanations for this phenomenon". This sentence is speculative. Can the authors provide the reader with what the current explanations are for this phenomenon and then present their argument on how these are not satisfactory.

4. Lines 185 to 187, the author describes how height measurement was used to define age in participants whose age is unknown.
   a. Please provide a reference for validation of this method.
   b. Explain how stunting was accounted for in applying this method. Shorter children allocated a younger age may just be stunted and hence misclassified.

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