Author’s response to reviews

Title: Associations of childhood, maternal and household dietary patterns with childhood stunting in Ethiopia: Proposing an alternative and plausible dietary analysis method to dietary diversity scores

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Title: Associations of childhood, maternal and household dietary patterns with childhood stunting in Ethiopia—proposing an alternative and plausible dietary analysis method to dietary diversity scores

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Dear Editor,

We would like to thank you and the reviewers for the thoughtful and critical evaluation of our paper. Detailed responses are given below for each comment/question/concern.

Kind regards,

Yohannes Adama Melaku (corresponding author)
Reviewer #1:

General comments:

--- > The topic has relevance since dietary methodology is time consuming, costly and requires well trained fieldworkers for good quality data. Research on how to use this effectively contributes constructively to the field. The strengths of the study is the high number of children being assessed and the analyses of factors (household and maternal) other than the child's dietary diversity and patterns.

❖ Thank you for the positive comment.

--- > In the "sample size calculation and sampling technique" section, it is explained that "A total of 75 EAs (26 from Tigray and 49 from SNNP), from 56 districts (19 from Tigray and 37 from SNNP) were selected using probability proportional to size (PPS) sampling in relation to the population of the EAs", thus it may be useful to indicate in the "study area" section that SNNP is a larger geographical area or a more populated area and therefore more EAs (as indicated by the PPS sampling).

❖ We made the correction under Study area and participants.

Methods (line: 101-102)

“….The SNNP is a larger geographic area and has a greater population size compared to the Tigray region…..”

Further comments are mainly based on editorial/language changes as indicated below:

Editorial and language comments:

--- > Page 4, row 7: Change "children" to "child".

❖ Correction made.

--- > Page 5, row 42: Correct "process" to "progress".

❖ Correction made.

--- > Page 5, row 45: Indicate that EAs is the abbreviation from enumeration areas.
Correction made.

Page 6, row 12 and 14: Delete the unnecessary repeat of "using two stage cluster sampling" which has been explained in the first stage.

Correction made.

Page 7, row 4: Add after "Gregorian" the word "calendar" for clarity.

Correction made.

Page 7, row 30: 'minimum' should read 'maximum'.

Correction made.

Page 8, row 1: Clarify who's level of education was obtained - maternal / head of household.

Correction made.

Page 8, row 13: Add after "an indicator of nutritional status" the wording "and specifically stunting".

Correction made.

Page 8, row 14: Delete "and thinness was defined as body mass index <18.5 kg/m2". The thinness is not reported or discussed elsewhere and therefore renders this statement unnecessary.

Correction made.

Page 10, row 25: The words "Almost a third" should read "Almost two thirds".

Correction made.
--- Page 10, row 29: The sentence "The highest missing value was found related to household income" requires reconstruction for clarity.

- We made the correction as follows:

Results (line: 242-243)

“A fifth (777; 20.5%) of the study participants had missing values of household income (Table 2).”

--- Page 10, row 29: "Table 1" should read "Table 2".

- Correction made.

--- Page 11, row 44: The word "significant" should read "significance".

- We thought that the word “significant” is the correct one. Therefore, we didn’t change.

--- Page 14, row 20: The sentence: "Therefore, DDSs measure one dimension of dietary quality" is a repeat of the sentence in row 18. It can therefore be deleted.

- Correction made.

Reviewer #2:

--- This manuscript presents an innovative approach to better extracting the richness of dietary patterns from dietary diversity data. The extraction of the patterns follows accepted methods, and analysis of the association of patterns with child stunting is basic.

- Thank you for the positive comment.
Specific comments:

--- > While you reference the literature on dietary patterns associated with non-communicable diseases, others are addressing the same question in the context of lower and middle income countries, and that literature needs to be included. See, e.g., Humphries, Dearden et al., Economics of Human Biology, Aug 2017.

❖ Thank you. We added the above mentioned study and others in the background and discussion.

Background (line: 82-88)

“A study by Humphries et al reported that total food expenditures (using food groups for child DDSs) did not significantly predict HAZ in Ethiopia. In this study, household food group expenditure index, determined by factor analysis of disaggregated food expenditure, was found to be a significant predictor for HAZ [19]. This leads to a premise that a mere aggregate availability and accessibility of the included food groups are not the determining factors for HAZ, rather the specific types of food groups available and their consumption pattern. Another study in the same cohort strengthens this conclusion [20].”

Discussion (line: 309-311)

“In low- and middle-income countries, a study also indicated that the application of factor analysis, using disaggregated food expenditure data to explore food consumption patterns, is an important approach to identify patterns and food groups that predict children’s nutritional status [19].”

Discussion (line: 349-351)

“In Ethiopia, while household food group expenditure index (identified using factor analysis) significantly predicted HAZ (β=0.067; p=0.03), dietary diversity was only marginally associated with HAZ (β=0.037; p=0.05) [19].”

--- > Use of the term ‘traditional’ is highly problematic as someone who is not familiar with the traditional Ethiopian diet will not know what it consists of. Better to name the foods being consumed in the pattern (eggs, meats, legumes, cereals, oils, fats and sweets). In addition, at the
household level, fruits loaded higher in the 'traditional' pattern than they do in the dairy, fruits and vegetables pattern, making use of the label somewhat problematic. Given that you're using different food groups for each of the levels of consumption (HH, woman, kids <24 months, kids 24-59 months), it seems like it's reaching a bit to try to use parallel pattern groups.

- We changed the label “traditional” pattern to “egg, meat, poultry and legume” pattern.

- Although the labelling of dietary patterns is subjective, we tried to give names that can maximally reflect the food groups with higher factor loadings within the patterns. As mentioned in the above, for instance, factor loading of fruits was higher in “egg, meat, poultry and legume” pattern (0.39) compared to “dairy, vegetable and fruit” pattern (0.32). However, the relative contribution within a pattern (not across the patterns) vary accordingly. We have more food groups (six) with a higher factor loadings than fruit in household “egg, meat, poultry and legume” pattern than in the “dairy, vegetable and fruit” pattern (three). The colouring pattern of the figure (Figure 3) shows this difference clearly. The labelling was discussed thoroughly among the authors to come up with the most expressive names.

--->

While stunting is regularly used and reported in programmatic literature and evaluations, from a scientific perspective use of the continuous variable, HAZ, is preferred. The biological difference between a HAZ of -2.1 vs. -1.99 is insignificant, but stunting separates them into different categories. Use of the continuous variable better captures the biological reality. Please run your models with the continuous anthropometric variables.

- Based on the comment, we use HAZ as a continuous outcome variable (please refer Table 5 and related text) in the current version. We placed the previous table into the supplementary material (Supplementary Table 5) as we believe that it can also provide an additional information.

--->

In your results you need to interpret the meaning of the tertiles and patterns. It looks as if each child, woman and household had a separate score for each of the three patterns, how did the tertiles fall out?

- For each child, there were three separated factor scores and respective tertiles.

- This was clearly stated in the method section.
Methods (line: 199-206)

“….For each of the dietary patterns, factor scores were assigned for all study participants. Factor scores show the relative position of the study participants in each of the identified patterns, thus reflecting adherence to the patterns. Pattern-specific factor scores are calculated as the sum of the products of the factor loading coefficients and standardized daily consumption of food and nutrient groups related to the pattern. The factor scores were orthogonally (varimax) rotated to create less correlation among the patterns and to facilitate their interpretability. Participants were then assigned into tertiles (first [lowest adherence]; second; and third [highest adherence] tertiles) based on their factor scores……”

--->Were the same households in the third tertile for multiple patterns?

❖ Yes, there were. Unlike cluster analysis, factor analysis does not exclusively assign each participant into a specific group. Tertiles were determined for each of the dietary pattern scores (the assumption is that the factor scores are not correlated; and it is expected that a household can be in the same tertile of different dietary patterns. Of course, we don’t expect the same factor scores for each of the patterns for a given individual; however, we may find a person/household in the same tertile of different patterns because the tertiles of the factor scores of the dietary patterns are determined independent of each other (i.e. within a specific dietary pattern). Further explanations on factor analysis can be found in following articles:


--->Is there an interaction between the patterns?

❖ We have conducted an interaction (multiplicative terms) analysis among tertiles of dietary patterns, and with other covariates; we did not find any significant interactions.

Methods (line: 228-231)

“…We tested interactions between DDSs, dietary patterns, other covariates with HAZ and stunting using multiplicative terms. …. ”
Results (line: 295-297)

“…There were no significant interactions between the DDSs and dietary patterns, and the other covariates and HAZ (stunting). The interactions among dietary patterns for each of the levels (household, maternal and children) were also not significant (data not shown)…."

--->

Analysis needs to be taken further to include all three levels of tertiles, to look at how household, maternal and child tertiles are related, particularly since you have all patterns at each of the three levels.

- We conducted further analysis by joint classification of tertiles of dietary patterns and looked at their associations with HAZ (please refer Figure 3).

Results (line: 287-292)

“In the joint classification, children in the first tertile of maternal “egg, meat, poultry and legume” and the third tertile of child “dairy, vegetable and fruit” patterns had a 0.31 ($\beta=0.31$; 95% CI: 0.05, 0.57) increase in HAZ compared to the respective third and first tertiles of the patterns. A 0.29 ($\beta=0.29$; 95% CI: 0.07, 0.50) increase in HAZ was found for those children in the third tertiles of both the maternal and child “dairy, vegetable and fruit” dietary patterns, compared to the first tertiles of the patterns (Figure 3).”

--->

Table 5 is confusing, and needs to be clarified visually.

- In the current version, we replaced with a table showing associations between DDS and dietary patterns with HAZ (continuous). We placed the previous table into the supplementary material (Supplementary Table 5) thinking that it also provides an additional information. We also made corrections in the Supplementary Table to make it clear for readers.

Abstract:

--->

Please name the patterns you observe (dairy, vegetable, fruit; ‘traditional’) in the abstract.

- Correction made.
Background:

--- You say analysis of dietary data have remained challenging for various reasons. Please specify at least some of those reasons.

- We included the following statement:

Background (line: 62-65)

“Although there are well-established methods, collation and analysis of dietary data have remained challenging in low-income countries (LICs) for various reasons, including high costs, lack of centralized platforms for dietary data, little investment in research, low capacity and technical complexity [6]. …..”

Methods:

--- Give details on how you assessed and labeled household food security.

- We added details on how food insecurity status was assessed and labelled. We also provided a citation for methods of food insecurity assessment.

Methods (Line: 190-196)

“…..Nine Household Food Insecurity Access Scale (HFIAS) generic questions were used with a dichotomized response (0=no/1=yes) to assess food insecurity [9]. Each of the questions were asked with a recall period of four weeks (30 days). If a respondent answers “yes” to any of the above nine questions, frequency-of-occurrence questions were asked to determine whether the condition happened rarely (1=once or twice), sometimes (2=three to ten times) or often (3=more than ten times). The insecurity status was categorized into four groups (secured, mild, moderate, and severe) using the Food and Nutrition Technical Assistance (FANTA) algorithm [9].”

Results:

--- 'More than half … had a DDS less than or equal to the median.' That's the definition of median…not a result.

- Thank you. We made the correction.
Discussion:

--->'Dietary patterns represent the whole picture of eating habits'. Dietary patterns, in the absence of quantities, cannot tell the whole story. Rephrase what you're trying to say. They may represent more than a dietary diversity score, but they don't represent the whole picture.

⚠️ We made correction accordingly.

Discussion (line: 305-306)

“Dietary patterns show a better picture of eating habits compared to DDSs by reflecting mainly the behavioural aspect of food consumption that has a synergistic effect on health.....”

Typos -

--->prevalence ration

⚠️ Correction made.

--->food secured households

⚠️ Correction made

--->no significant between

⚠️ Correction made

--->dietary patterns z score

⚠️ Correction made