

RESPONSES TO THE REVIEWERS' COMMENTS

We appreciated the reviewers' comments on the initial manuscript. We have revised the manuscript based on the useful comments. Please refer to the following point-by-point-based responses to the respected comments, along with revised manuscript. Please note that the changes in the revised manuscript have been highlighted in red.

REVIEWER #1

[Comment 1-1] This is a well written manuscript that addresses and revisits an existing issue - the association between malnutrition and school performance.

→ **[Response 1-1]** We appreciate the reviewer's deep understandings and recognition of the importance of the paper. We are pleased to address the comments and suggestions made by Reviewer #1 (please see bullets below).

[Comment 1-2] The statistical methods may be further elucidated.

→ **[Response 1-2]** To make the statistical methods clearer, the sub-section "Data analysis" has been restructured and adjusted (para 4-5, page 8 and para 1-2, page 9).

[Comment 1-3] Why causality and just not association may well be clarified too. →

[Response 1-3] To more clearly describe need for assessing not only associations but also causalities between children's nutritional status and their academic performances, two sentences have been added to the section "Introduction" (last 5 lines, para 3, page 5).

REVIEWER #2

[Comment 2-1] This study aims to dig deeper into the relation of malnutrition with academic performance. The setting for the study is a sample of schools from Madagascar, a country where stunting and under nutrition is still highly prevalent. Whereas this relation has been extensively addressed in the literature, no previous studies exist in Madagascar. A second major strength has to do with proposing a model that allows exploring possible causal paths, which is difficult to do when studies are cross-sectional. A third strength has to do with the inclusion of socioeconomic and sociodemographic variables, including maternal educational level. While the study is far from novel, in my view it is important to provide local evidence when, in addition to knowledge generation, the purpose is informing policy making and planning. I have a few minor suggestions.

→ **[Response 2-1]** We appreciate the reviewer's recognition of the strengths of the paper. We are pleased to address the comments and suggestions made by Reviewer #2 (please see bullets below).

[Comment 2-2] It would be great if the authors could sex-control their analysis. I

understand that sample size is not too large but sex differences have been reported in other studies exploring this relation.

➔ **[Response 2-2]** While agreeing to this comment, please be reminded that “Gender” (i.e. sex) was controlled in multivariate analyses, by entering gender/sex into the ordinal regression models as a possible confounder (middle part of Table 2, page 13).

[Comment 2-3] Also, I’d like the authors may discuss their results in light of other studies addressing the same topic and more importantly in light of the evidence that overnutrition could be as harmful as undernutrition when the aim is achieving all the cognitive potential.

➔ **[Response 2-3]** Thanks for this comment. We newly inserted a paragraph in the section “Discussion”. i.e. *“Earlier studies in Ethiopia, Sri Lanka and Uganda reported that being stunted was negatively associated with mathematical proficiency of primary school children.²⁶⁻²⁸ The results of our study support this trend. Yet, our study found that being stunted was significantly associated exclusively with poorer mathematical proficiency, while two earlier studies detected the similar associations with both mathematical and national language proficiencies^{27,28} or exclusively with national language proficiency.²⁹ Thus, the type of subjects whose proficiencies are associated with being stunted differs between the school children settings and contexts (e.g. countries, grades, and age). An earlier study in Chile reported that being overweight was not associated with poorer mathematical and national language proficiencies.³⁰ Our study did not find the association between being overweight and academic performance either, despite its plausibility.”* (para 3, page 15)

[Comment 2-4] Third, I’d like the authors may reckon as a potential limitation the lack of a variable measuring children’s IQ.

➔ **[Response 2-4]** Thanks for this suggestion. Having fully supported this suggestion, we added two sentences *“Third, this study did not employ children’s intelligence quotient (IQ) scores as the variable for bivariate and multivariate analyses. Thus, their congenital intellectual abilities to be approximated largely by IQ have not been considered and addressed.”* (para 1, page 17).

END