Author’s response to reviews

Title: Predictors of poor nutritional status among children aged 6-24 months in agricultural regions of Mali: a cross-sectional study

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Author’s response to reviews:

To the Editors and Reviewers of Manuscript NUTN-D-17-00035R1,

BMC Nutrition

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Dear Editors and Reviewers,

Please find enclosed the revised version of our manuscript entitled "Predictors of poor nutritional status among children aged 6-24 months in agricultural regions of Mali: a cross-sectional study", NUTN-D-17-00035R1.

Also, please find below our point-by-point responses (in bold red).
We hope that our modifications adequately address the Reviewer’s comments and that our paper is now suitable for publication in the BMC Nutrition.

We thank you for your consideration.

Yours sincerely,

Dr Makamto Sobgui

Reviewer reports 1:

It has come to our attention that throughout the manuscript there is significant text overlap with other publications, most notably in these following sections:

i. Abstract

(We noticed this is your own Abstract that you Submitted at the 21st International Congress of Nutrition - https://www.karger.com/Article/Pdf/480486, could you please clarify whether you own the rights to this Abstract and are therefore able to use if for publication with us?)

Answer: The abstract has been rewritten

Old version

Background: Inadequate nutrition during the first two years of life has tremendous consequences on the health and growth of children. Understanding the magnitude and determinants of nutritional status can help to avert this problem. This study aimed to assess the prevalence and potential causes of undernutrition in children aged 6 - 24 months in poor rural regions of Mali.

Methods: A community based cross-sectional study was conducted in villages in Sikasso and Mopti regions from January to March 2016. A structured questionnaire was used to collect data
and characteristics of 959 boys, 856 girls, and their mothers, living in 1764 households. Anthropometric measurements such as weight, height, and mid upper arm circumference (MUAC) were performed using standardized methods. Bivariate and multivariable logistic regression analyses were conducted to identify factors associated with nutritional status of the children.

Results: The prevalence of underweight, stunting and wasting was 23.9%, 28.4% and 13.9% respectively. MUAC also indicated that 16.5% of children were undernourished. Stunting was significantly associated with the presence of diarrhea in the past two weeks (p<0.001), higher child age (p<0.001), male sex (p<0.001), households with lowest household amenity score (p<0.002) or fewest dietary diversity score (p<0.001). Likewise, wasting was associated with preterm birth (p<0.03), lower child age (0.001), high number of siblings (p<0.03) and living in a household with higher months of inadequate food provisioning (p<0.03). These factors should be considered for any intervention aiming to reduce undernutrition among children in this age group living in Sikasso and Mopti in Mali.

Conclusion: Future efforts should be directed at examining how families in very poor and food-insecure areas can be empowered to feed their children a more diverse diet. These interventions must increase the availability and sustainability of household food provisioning as well as take into account potential illnesses.

New Version

Background: The right nutrition during the first two years of life can positively impact a child’s ability to develop, grow, and learn. Malnutrition remains a public health problem in Mali and little is known about the factors affecting the nutritional status of children. This study aims to assess the magnitude and the predictors of undernutrition in children aged 6–24 months in the poor rural regions of Mali.

Methods: A community-based cross-sectional study was conducted in the villages in the Sikasso and Mopti regions in Mali from January to March 2016, comprising of 959 boys and 856 girls aged 6–24 months. A structured interviewer administered a questionnaire that was used to collect
data from the mothers living in 1764 households. Anthropometric measurements were performed using standardized methods in order to identify the factors associated with children suffering from undernutrition (stunting and wasting). Bivariate and multivariate logistic regression analyses were conducted.

Results: The results of our study indicated that 23.9% and 28.4% children were underweight and stunted; the prevalence of wasting was 13.9% using the W/H measurement and 16.5% with the MUAC. Overall, the presence of diarrhea in the past two weeks (p < 0.001), higher child age (p < 0.001), male sex (p < 0.001), households with the lowest household amenity score (p < 0.002), and households with a low dietary diversity score (p < 0.001) were significantly associated with chronic malnutrition. The factors significantly associated with acute malnutrition were male sex (p < 0.01), preterm birth (p < 0.03), lower child age (0.001), a high number of siblings (p < 0.03), and living in a household with more months of inadequate food provisioning (p < 0.03).

Conclusion: Child undernutrition is a critical public health problem in the agricultural regions of Mali. Future efforts should be directed at addressing the food insecurity and at improving the yearlong household availability and accessibility of nutritious food, as well as taking diseases prevention into account.

ii. Methods – Dependent variable, Independent variables

While we understand that you may wish to express some of the same ideas contained in these publications, please be aware that we cannot condone the use of text from previously published work. Please be informed that we cannot proceed with handling your manuscript before this issue is resolved, and the sections of text in question have been reformulated.

Answer: These sections have been reformulated
Dependent variable

The nutritional status of children aged 6 – 24 months, expressed as the prevalence of underweight, stunting, and wasting, was assessed using anthropometric variables such as length, Mid Upper arm Circumference (MUAC) and weight. Weight was measured twice with minimum clothing and no shoes using the Uniscale (Seca®, Hamburg, Germany) in kilograms, to the nearest 0.1 kg. Measurement of length was done twice with a stadiometer (Schorr®, UNICEF) in centimeters to the nearest 1 mm. MUAC was measured thrice using non-stretchable tape on the left mid upper arm to the nearest 1 mm.

WHO Anthro version 3.2.2 software was used to convert the anthropometric measures; weight, height and age values into Z-scores of the indices: WAZ, Height-for-Age (HAZ) and Weight-for-Height (WHZ) taking sex into consideration, using WHO 2006 standards [20]. A low height-for-age, below -2SD of the reference population, indicates stunting, while below -3SD indicates severe stunting. A low weight-for-height, below -2SD of the reference population, indicates wasting, while below −3SD indicates severe wasting. A child with a weight-for-age z-score below -2SD of the reference population is underweight while a child below or -3SD is severely underweight [20, 21]. During data processing, exclusion criteria were applied to the child anthropometric data based on WHO recommendations to remove data that are most likely to be erroneous (HAZ and WAZ were excluded if the child value was < -6.00 or > +6.00. WHZ was excluded if the value was < -4.00 or > + 6.00). MUAC below 12.5 cm indicates acute undernutrition, and below 11.5 cm severe acute undernutrition [22].

Independent variables

Three main types of questionnaires (for households, for mothers, and for children) were designed to record data on indicators of household socioeconomic and socio-demographic status, household food security, and care practices for children and their mothers.

The Household Food Insecurity Access Scale (HFIAS) was used to determine household food insecurity including all nine generic questions that require a recall about the worry of food availability and accessibility in the previous four weeks [23, 24]. The responses determined the
Household Food Insecurity Access Prevalence (HFIAP) status indicator as a proxy of household food insecurity prevalence [23]. Each household was then classified as either food secure, or mildly, moderately or severely food insecure, based on Food and Nutrition Technical Assistance (FANTA)'s recommended cut-offs. Information on durable assets (cupboard, hurricane lamp, radio, bicycle, boat, telephone, refrigerator, motorcycle and car, etc.) and the materials of the dwelling structure was used to construct a relative index of household wealth (asset) status using principal components analysis [25]. For each amenity available in the household, a score based on the Health/Nutrition/Population/Poverty Thematic Group of the World Bank for Mali was given and their sum was the household amenities score [26]. From the total household score, quartiles were computed and defined four wealth classes, from poorest (first quartile) to richest (fourth quartile). The household dietary diversity score (HDDS), which collects information on the number of different food groups consumed over a given reference period among 12 different food groups (cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts, milk and milk products, oil/fat, sugar/honey, spices/condiments/beverages) was used to assess household nutritional diversity [27, 28]. The number of months during which the household was unable to meet its food needs during the last 12 months was collected using a structured questionnaire developed by FANTA [29]. Other household indicators included household possession of a latrine (available or not available), the presence of a fence around the household, educational level of the household’s head, livestock, and disposal of garbage.

Mothers’ characteristics included maternal age in years, educational level, current occupation, number of children, and vegetable intake. Educational status was measured according to the education levels in Mali: no formal education, having a primary level education, secondary level and above.

Children’s characteristics included gender, term of delivery (< 37 weeks or ≥ 37 weeks) and age in months; immunization against BCG and Penta 3 + Polio; deworming status in the past 6 months (yes or no); and history of illness episodes. To assess childhood illness, the mothers were asked whether their children had been affected by diarrhea, fever or cough in the past two weeks. Diarrhea was defined as having three or more loose or watery stools in a 24-hour period in the two weeks prior to the survey [30]. Assessment of feeding covered breastfeeding (yes or no) and
dietary diversity of the children. The quality of complementary feeding was assessed using the individual dietary diversity score adapted for children, with 8 items instead of 12 as was the case for the household[28].

New version

1.1.1. Outcome Variable

The nutritional status of children aged 6–24 months, expressed as the prevalence of underweight, stunting, and wasting, was assessed using anthropometric variables such as height, Mid Upper Arm Circumference (MUAC), and weight. The weight was recorded on children wearing minimal clothing and bare feet using a standard calibrated weighing Uniscale (Seca®, Hamburg, Germany) in kilograms, to the nearest 0.1 kg. The height was taken using a stadiometer (Schorr®, UNICEF) in centimeters to the nearest 1 mm. The height and weight were taken twice and a difference of 0.1 cm in height and 100 grams in weight was accepted as normal. The MUAC was measured thrice using non-stretchable tape on the left mid-upper arm to the nearest 1 mm.

Based on the recorded weight, the nutritional status was graded as per the 2006 WHO child growth standards using WHO Anthro version 3.2.2 software [20]. The children were considered stunted, wasted, or underweight if the height-for-age Z-score, the weight-for-age Z-score, or the weight-for-age Z-score was less than −2 SDs (Standard Deviation) using the new WHO child growth standards, while those children with a score equal to or greater than −2 SD were considered normal [20,21]. During data processing, the exclusion criteria were applied to the anthropometric data of the children based on WHO recommendations to remove data that are most likely to be erroneous (HAZ and WAZ were excluded if the child value was <–6.00 or >6.00. The WHZ was excluded if the value was <-4.00 or >6.00). A MUAC below 12.5 cm indicated acute undernutrition and a value below 11.5 cm indicated severe acute undernutrition [22].

1.1.2. Explanatory Variables
Three main types of questionnaires (for households, for mothers, and for children) were designed to record the data on any indicators of household socioeconomic and socio-demographic status, household food security, and care practices for children and their mothers.

The Household Food Insecurity Access Scale (HFIAS) was used to determine the household food insecurity including all nine generic questions that require recollection about the worry of food availability and accessibility in the previous months [23,24]. The responses were summed to create a total score between 0 (the most food secure household) and 27 (the most food insecure household), which was determined using the Household Food Insecurity Access Prevalence (HFIAP) status indicator as a proxy of the household food insecurity prevalence [23]. Each household was then classified as either food secure, or mildly, moderately, or severely food insecure, based on the Food and Nutrition Technical Assistance (FANTA)'s recommended cut-offs. Information on durable assets (cupboard, hurricane lamp, radio, bicycle, boat, telephone, refrigerator, motorcycle, car, and so forth) and the materials of the dwelling structure were used to construct a relative index of the household wealth (asset) status using principal components analysis [25]. For each amenity available in the household, a score based on the Health/Nutrition/Population/Poverty Thematic Group of the World Bank for Mali was given and their sum was used as the household amenities score [26]. From the total household score, quartiles were computed and four wealth classes were defined, from the poorest (first quartile) to the richest (fourth quartile). The household dietary diversity scores (HDDS) were assessed using standard tools which collected information on the number of different food groups consumed over a given reference period among the 12 different food groups (cereals; roots and tubers; vegetables; fruits; meat, poultry, offal; eggs; fish and seafood; pulses/legumes/nuts; milk and milk products; oil/fat; sugar/honey; and spices/condiments/beverages) [27,28]. The number of months during which the household was unable to meet its food needs during the last 12 months was collected using a structured questionnaire developed by FANTA [29]. Other household indicators included household possession of a latrine (available or not available), the presence of a fence around the household, the educational level of the household’s head, livestock, and the disposal of garbage.

The characteristics of the mother included the maternal age in years, educational level, current occupation, number of children, and vegetable intake. The educational status was measured
according to the education levels in Mali: no formal education, having a primary level education, or secondary level and above.

The characteristics of the children included gender, the term of delivery (<37 weeks or ≥37 weeks) and age in months; immunization against BCG and Penta 3 + Polio; deworming status in the past 6 months (yes or no); and a history of illness episodes. To assess childhood illnesses, the mothers were asked whether their children had been affected by diarrhea, fever, or coughs in the past two weeks. Diarrhea was defined as having three or more loose or watery stools in a 24-hour period in the two weeks prior to the survey [30]. Assessment of feeding covered breastfeeding (yes or no) and dietary diversity of the children. The quality of complementary feeding was assessed using the individual dietary diversity score adapted for children, with 8 items instead of 12 as was the case for the household [28].

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Answer: Done
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Answer: Done

6. We noticed some of your participants (mothers) might be less than 16 years old. Please provide a clear statement, explicitly stating whether parental or legal guardian consent was acquired for participants under 16 years of age for the study. Add this to the ‘Ethics approval and Consent to participate’ section.

Answer:

Informed consent was acquired from a legal guardian for participants under 16 years of age at the time of the study. Participants with diarrhea, respiratory tract infections, and undernutrition were referred to health institutions and organizations working on nutrition.

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Currently, the contributions of authors Victor Afari-Sefa and Abdou Tenkouano do not automatically qualify them for authorship. Please provide clarification on their contributions, or remove their names from the list of authors and place them in the “Acknowledgements” section instead. Please note that any changes in the list of authors requires the completion of the “Change in authorship” form.

Answer: Victor Afari-Sefa and Abdou Tenkouano were involved in the study conception and design, played key roles in funding acquisition and project administration from 2014–2016, as well as reviewing and editing the manuscript.

10. In the ‘Authors’ Contributions’ section please use initials to reflect authors names on the ‘Title Page’. Currently the initials used for author Leopold Kamedjie Fezeu do not reflect how his name is presented on the ‘Title Page’.

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Reviewer report 2:

(1) Line 57-58: Please cite the updated Lancet 2013 article. In this article, ~ 30% of mortality can be related to stunting or underweight.

Answer: This section has been modified according to the reviewer comments

(2) Line 74 - 76: Specify that these are Z-scores

Answer: This section has been modified according to the reviewer comments (line 70-72): In addition, among the children under five years old, 39% were stunted (Z-scores < −2 SD height-for-age); 13% were wasted, or underweight for their height (Z-scores < −2 SD weight-for-height); and 26% were underweight (Z-scores < −2 SD weight-for-age).

(3) Line 81: Citation 17 missing from initial list?

Response: This section has been modified according to the reviewer comments and citation 17 included

(4) Line 124-125: sentence "only households with children... is repetitive. Can be deleted.

Response: The repeated sentence has been deleted

(5) Line 204: please provide citation

Response: Line 203: The citation has been provided (Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for measurement of household food access: Indicator Guide. Weblin: http://www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf. 2006)

(6) Line 256: provide 95% CI for age
Response: This section has been modified according to the reviewer comments and 95% CI for age has been added

(7) Line 257-258: Drop sentence "one third of the children were aged 6 to 11 months..."

Response: The sentence has been dropped

(8) Line 280+: I think that it would be easier to read if OR were removed from the text, since they are already presented in table (p values could remain perhaps)

Response: New version is Line 270+: This section has been modified according to the reviewer comments and OR dropped while p Values remain