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:

You do not, however, appear to have addressed the editor comments regarding the large amount of text overlap identified by iThenticate software. I am particularly concerned with the overlap between your manuscript and the paper by Asfaw et al (Asfaw et al., (2015). Prevalence of undernutrition and associated factors among children aged between six to fifty nine months in Bule Hora district, South Ethiopia. BMC Public Health, 15(41)). There are significant similarities in your discussion. Further, there is much overlap with other papers throughout your manuscript, again particularly concerning in the discussion. As advised in my comments on your previous submission, in order to be considered for publication you will be required to address the text overlap so as to avoid any potential academic integrity issues:

Discussion

The whole discussion and conclusion had been rewritten

Old version

The study was aimed to assess the magnitude and determinants of 6 – 24 months old children’s’ nutritional status in a rural area of Mali where agriculture is the main source of livelihoods. Overall, 23.9% of children were underweight, 28.3% were stunted, and 13.9% were wasted.
According to WHO criteria, the prevalence of underweight was “high”, the prevalence of stunting was "medium" and the prevalence of wasting indicated a "serious problem”. These results are similar to those obtained during the 2014 national DHS [9, 10].

The results showed that children from food insecure and very poor households were more likely to develop wasting and stunting than those from food secure and wealthier households. Models of food security and child nutrition assume that food insecurity results in a lower intake of energy-rich foods and nutrients resulting in changes to child health [31-33]. Studies conducted in deprived settings have shown that dietary diversification is rare and that many households consume the same foods for most meals [1, 5]. The positive relationship between food security and child nutrition therefore suggests that poor households are unable to achieve their daily dietary needs. Household food security is reached when all the members of the household have access to sustainable and safe food of sufficient quality and quantity to ensure their adequate intake and a healthy life [33]. In rural areas where the livelihood of entire household relies mainly on the harvest, household food security depends on access to land and other agricultural resources to guarantee sufficient domestic production. As a household manages the available resources over the course of a year, its ability to meet its food needs may vary depending on numerous factors including inadequate crop production by the household due to poor soil condition, lack of labor, loss or decrease in income to purchase inputs, and less access to improved technologies. Poor and deprived households have few opportunities to build up sufficient stocks of food, or to develop alternatives that would cushion them in times of hardship [34]. Therefore, increasing yields and production combined with developing storage techniques to ensure year-round food availability could help in alleviating the burden of child malnutrition.

We found that, reporting episodes of diarrhea occurrence within the two weeks preceding the survey was an independent risk factor for stunting. Results of this study are in agreement with studies conducted in other developing countries [3, 17, 35]. Infections play a major role in the etiology of undernutrition because they result in increased needs and high energy expenditure, lower appetite, nutrient losses due to vomiting, diarrhea, poor digestion, malabsorption and poor utilization of nutrients, and disruption of the metabolic equilibrium [4, 31]. The interplay between inadequate dietary intake and illness tends to create a vicious cycle: A malnourished child, whose resistance to illness is compromised, frequently falls ill and as a result,
malnourishment worsens. Children who enter this malnutrition-infection cycle can quickly fall into a potentially fatal spiral as one condition feeds off the other.

Compared to girls, the likelihood of both stunting and wasting was higher among boys. Similarly, many studies in other developing countries and elsewhere have reported that male children are more likely to become stunted than their female counterparts [17, 35, 36]. This could be because boys are more influenced by environmental stress than girls. Thus, boys are more likely to display impact of stunting; especially in environments where stresses are at play, like repeated infections and exposure to toxins and air pollutants [17, 19, 36].

Our results also pointed out the fact that children born to a mother who gave birth to five or more children had higher likelihood to be undernourished when compared to children born to a mother with fewer children, which corroborates earlier findings [37-39]. We hypothesized that families with a high number of children are under more economic constrain for food consumption and hence are more likely to suffer from poor nutritional status. In other words, inadequate allocation of household resources among many children may lead to the low nutritional status. Also, families with more children generally devote less time to care of each child [37].

Maternal characteristics did not exhibit enough variability in our study population. For example, 1.1% of mothers attended more than primary school, 73% were housewives and more than 80% were aged under 34 years. This could explain why these potential predictors were not associated with child malnutrition.

The limitations of this study include its cross-sectional design, rendering it difficult to examine any potential temporal relationships and causality. There is potential memory recall bias, concerning for example the child’s history of illness and breastfeeding behavior. Data were not collected on parasite infection, birth weight and daily caloric intake. These variables are potential confounders, and their absence can lead to an erroneous interpretation of our results. A parasitic infestation can have an impact on the child's nutrition and growth, altering the intestinal absorption of fats and nutrients [1, 38]. Also, information on the child’s birth weight, which is strongly associated with the child’s size, was not considered due to a high number of missing values. The exact daily caloric intake was not ascertained. Household wealth was assessed using proxy measures (household amenities and asset ownership) due to the inability to collect
CONCLUSION

The findings of this study show that food insecurity and household poverty were major determinants of child malnutrition. Food insecurity is a public health problem and should be considered and managed as a social determinant of health. Policymakers should develop and implement social protection policies in Mali, in order to contribute in the reduction of the high rates of child malnutrition in Sikasso and Mopti. In addition, it is imperative that specific efforts be made to combat malnutrition in children. The policies put in place should increase the availability and sustainability of household food supply. They must also take into account possible diseases, which can counteract improvements in food security. Future efforts should maximize the capacity of families living in very poor and food insecure areas to provide their children with a more diverse diet throughout their childhood. Our findings point to the need to promote age-appropriate feeding practices in order to prevent stunting and increase the chances of recovery in children with stunted growth.

New version

This study aimed to assess the magnitude and determinants of 6–24 months’ children nutritional status, in a rural area of Mali where agriculture is the main source of livelihoods. Overall, 23.9% of children were underweight, 28.3% were stunted, and 13.9% were wasted. According to WHO criteria, the prevalence of underweight was “high”, the prevalence of stunting was "medium" and the prevalence of wasting indicated a "serious problem". Our findings confirm those obtained during the 2014 national DHS [9, 10].

Children living in food insecure and very poor households had higher likelihood to develop wasting and stunting than those living in food secure and wealthier households. Models developed to study food security and infant nutrition hypothesize that food insecurity leads to a decrease in the consumption of foods and nutrients rich in energy, thus increasing the risk of
children to become ill. Some authors have conducted studies among populations living in underprivileged areas and have reported rare dietary diversification and consumption of the same types of foods during most meals in many households. The fact that higher food security is associated with better child nutrition implies that poor households are unable to achieve their daily dietary needs. A household has optimal food security if all its members have durable and safe food of sufficient quality and quantity to ensure adequate intake and a healthy living [33]. In rural areas in Africa, household food is mainly based on harvesting as a means of livelihood. For this reason, their food security depends on access to agricultural land and the quality of agricultural production systems to meet sufficient domestic needs. Resources available to a household have to be enough to cover all the needs for the whole calendar year. The capability of the household to meet all the nutritional needs of its members during this period is tributary to many parameters, including an incident requiring additional income, soil fertility and lack of manpower. For these reasons, resource-limited households have few chances to constitute enough stocks of food, or to develop alternatives that would be used in times of hardness [34]. Therefore, increasing yields and production combined with developing storage techniques to ensure year-round food availability could help in alleviating the burden of child malnutrition.

We found that, reporting episodes of diarrhea occurrence within the two weeks preceding the survey was an independent risk factor for stunting. The results of this study were in agreement with those studies conducted in other developing countries [3, 17, 35]. Infections are major risks factors for undernutrition. They are responsible for increased nutritional needs and higher energy expenditure, lower appetite, nutrient losses due to vomiting and diarrhea. All this creates in addition to undernutrition a disruption of the metabolic balance [4, 31]. The interaction between inadequate dietary intake and gastro-enteritis tends to create a vicious cycle: A malnourished child will have lower disease resistance; for this reason, he will fall sick more often and, as a result, his malnutrition will worsen. Children entering this cycle of malnutrition-infection are less likely to be able to survive as one state feeds on the other.

The probability of both stunting and wasting was higher among boys compared to girls. These results confirm the findings of other authors in Uganda and Ghana [17, 35, 36]. A possible explanation is that boys are more susceptible to environmental stress than girls. Therefore, they
have higher likelihood to display consequences of stunting; this is particularly true in stressful conditions [17, 19, 36].

Our results, which are confirmed by earlier studies [37-39], also highlighted the fact that children born to mothers who gave birth to five or more children had higher likelihood to be undernourished than children born to mothers with fewer children. It seems obvious that families with large number of children are more vulnerable to economic constraints resulting from the need to fulfill the nutritional needs of the household. These families are therefore more likely to suffer from poor nutritional status. Inadequate allocation of household resources among many children can lead to the low nutritional status. In addition, families with more children generally spend less time caring for each child [37].

Maternal characteristics did not exhibit enough variability in our study population. For example, 1.1% of mothers attended more than primary school, 73% were housewives and more than 80% were aged under 34 years. This could explain why these potential predictors were not associated with child malnutrition.

The limitations of this study include its cross-sectional design, which makes it difficult to examine potential temporal relationships and causality. A memory recall bias cannot be ruled out, for example with regard to the child’s history of illness and breastfeeding behavior. Data were not collected on parasite infection, birth weight and daily caloric intake. These variables are potential confounders, and their absence can lead to an erroneous interpretation of our results. A parasitic infestation can have an impact on the child's nutrition and growth, altering the intestinal absorption of fats and nutrients [1, 38]. Moreover, information on the child’s birth weight, which is strongly associated with the child’s size, was not taken into account due to the high number of missing values. The exact daily caloric intake was not ascertained. Household wealth was assessed using indirect measures (household amenities and asset ownership) due to the inability to collect accurate information on household income and expenditure, which are better measures of household wealth.
CONCLUSION

The results of this study showed that food insecurity and household poverty are major determinants of child malnutrition. Food insecurity is a public health problem and should be considered and managed as a social determinant of health. Policymakers should develop and implement social protection policies in Mali, in order to contribute in the reduction of the high rates of child malnutrition in Sikasso and Mopti. In addition, it is imperative that specific efforts be made to combat malnutrition in children. The policies put in place should increase the availability and sustainability of household food supply. They must also take into account possible diseases, which can counteract improvements in food security. Future efforts should maximize the capacity of families living in very poor and food insecure areas to provide their children with a more diverse diet throughout their childhood. Our findings point to the need to promote age-appropriate feeding practices in order to prevent stunting and increase the chances of recovery in children with stunted growth.