Author’s response to reviews

Title: Trends and Inequalities in Stunting in Nepal: A Secondary Data Analysis of Four Nepal Demographic Health Surveys from 2001 to 2016

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Version: 2 Date: 23 Jan 2019

Author’s response to reviews:

Dear Editor,

BMC Nutrition,

On behalf of the co-authors, we would like to thank you for encouraging us to resubmit our manuscript. Please see our point-by-point response to the comments raised. We have modified the manuscript according to suggestions and believe the manuscript has significantly improved. We hope it will now be suitable for publication in BMC Nutrition.

Editor Comments:

The paper has been improved but there are still a number of important issues to be addressed before it can be accepted. If you are able to address all these issues I hope to be able to give a prompt decision. The numbers refer to lines of the manuscript:

Editor: 13

Please consider whether your objectives would be better characterized as to present longitudinal data on stunting prevalence according to socio-demographic and geographical circumstances and to determine the impact of those circumstances on the risk of stunting (or similar). Remove the idea of ‘presenting inequalities’ because that introduces the risk of confirmation bias

Authors: Thank you for the feedback. Following the feedback, the objective in the abstract has been revised accordingly in the line 13-15 as follows.
The objective of this study was to present data on stunting prevalence according to socio-demographic and geographical circumstances and to determine the impact of those circumstances on the risk of stunting.

Editor: 18

This sentence needs to be reworded – percentage/prevalence of stunting was determined by counting, the univariate/regression analyses were used to determine risk factors for stunting.

Authors: This sentence has been reworded in the line 20-22 as follows:

The prevalence of stunting was determined by descriptive analysis and logistic regression analysis was used to determine risk factors for stunting.

Editor: 22

Could you start by presenting the overall decrease in stunting and then look at the changes in the different populations? As presented you are according primacy to the rural vs urban disparity and yet that appeared to be entirely explained by wealth in the multivariate analysis.

Authors: The result section has been slightly edited as per the editor's comment line 25-42. A headline summary sentence mentioning stunting has declined in overall as well as in all groups and subgroups analysed has also been added in line 25.

Editor: 23

Sentence beginning ‘The prevalence of stunting...’ is redundant because you give the exact figures later (it also appears to be incorrect based on those figures…)

Authors: The sentence has been removed in the manuscript in the line 31.

Editor: Conclusion

See my comments on your main discussion – I would prefer that you said ‘substantial inequalities have been preserved’ rather than implying you have statistically demonstrated a divergence.

Authors: A slight change in the sentence has been made in the line 44-46 as below:

At national level, stunting is decreasing in Nepal; however, the prevalence of stunting is different between groups and subgroups analysed. The substantial inequalities in stunting have been preserved.
Your first sentence is still not very clear – a reader might wonder if you are referring to linear growth of children or macroeconomic growth – for example. Could you try to formulate something like ‘Linear growth of children during early life correlates with long term health and productivity and, as it is partly a reflection of the environment in which they are growing up, may be considered as an indicator of a country’s overall development’.

Authors: It has been revised as suggested in the line 54 as below:

Linear growth of children during early life correlates with long term health and productivity and, as it is partly a reflection of the environment in which they are growing up, may be considered as an indicator of a country’s overall development.

Editor: Please can you move the sentence defining stunting higher up to the first time you talk about stunting – perhaps parenthesise it

Authors: Thank you for reminding to parenthesizing. Accepted and done.

Editor: I appreciate you have responded to the comment about recent data suggesting catch-up growth in adolescence, but it’s now a bit over-done and detracts from the flow of your argument. If you want to talk about reversibility of stunting please move this to later on in the introduction. I think you should remove it.

Authors: The sentence has been removed.

Editor: Black and co-authors’ work made a major contribution to that UNICEF report. Please can you consider formulating it like that ‘the established conceptual framework for considering causes of stunting and other forms of malnutrition considers proximal causes (e.g. insufficient nutrient intake, frequent infections and other diseases), and more distal underlying causes e.g. socio-economic etc. etc.

Authors: The sentence has been formulated in line 72-76 as below:
The established conceptual framework for considering causes of stunting and other forms of malnutrition considers proximal causes such as insufficient nutrient intake, frequent infections and other diseases, and more distal basic causes such as socio-economic, political, cultural and socio-demographic factors [2], which this study focuses on.

Editor: 58

Remove the reference to sub-Saharan Africa and instead provide the number and percentage for South Asia

Authors: Done. The sentence has been revised in line 77-80 as below:

Worldwide, 154.8 (22.9%) million children under five years were reported stunted in 2016 [6]. There are 86.5 (23.9%) million stunted children under five years living in Asia, of which 61.9 million (35.8%) belongs to South Asia [6].

Editor: 64

The sentence doesn’t make sense. Are you trying to say that there is more food security in the mountainous region?

Authors: The sentence meant that mild form of food insecurity was higher in terai belt whereas moderate and severe forms of food insecurity were higher in the mountainous region. However, a slight edition has been made in the sentence considering severe impact of food insecurity in the mountainous region in line 86 as below:

This is highest in the mountainous region of the country (13.8%), compared to the hill (10.0%) and terai (9.2%) regions.

Editor: 69

I’m not sure it’s well established that there is an actual ‘dose-response’ relationship between food insecurity and stunting rate – you have already mentioned food insecurity as an important proximate cause of stunting so please consider whether this reference actually adds anything to your argument

Authors: The phrase ‘dose response relationship' has been reworded as positive correlation in line 91 as below:

Food insecurity positively correlates with stunting, as the threat of stunting increases with level of food insecurity.
This is all pretty confusing – it’s tricky that Nepal is subcategorized in two different ways, I think if you really think this is important background to your study would need to add a table with these data – but I don’t think that these differences are terribly germane to what you are trying to show? You talk about this a bit in the discussion and it fits better there. I would remove it all from the introduction

Authors: The whole sentence has been removed following your feedback and has been added a bit in the discussion section as per your suggestion.

Please avoid the technical term ‘disaggregation’ when you could use e.g. ‘different between various socio-demographic and economic subgroups’

Authors: This sentence has been revised in line 100 as below:

While the average percentage of stunted children has reduced, the prevalence is different between various socio-demographics and economic subgroups.

Remove the sentence beginning ‘There is a…’ as it doesn’t add anything and is redundant based on what you say later

Authors: The sentence has been removed.

Remove the comma

Authors: The comma has been removed.

Remove ‘with a focus on lower economic subgroups’

Authors: This has been removed.
Methods

I would encourage the authors to shorten the first paragraph of the methods – if these are well described in freely available reports of the surveys, the authors should consider whether e.g. there is a need to include all the information about oversampling etc.

Authors: Thank you for the feedback again. We agree the details of the method for all the NDHS surveys have been published in freely available reports. The method section has been shortened mentioning the detail of sampling is provided in the freely available NDHS reports.

Editor: 115

Was the variable wealth or ‘wealth index’, which you go on to describe.

Authors: Its wealth quintile. The description of wealth has been edited in the line 140-143 as below sentence:

The wealth quintile is developed using the statistical procedure known as principal component analysis, that categorized the above five categories based on household’s ownership of selected assets, such as televisions and bicycles; materials used for housing construction; and types of water access and sanitation

Editor: 134-39

I would remove this paragraph as these methods are described elsewhere (and are not statistical analysis, anyway)

Authors: These sentences are removed.

Results:

On stunting trends: You present the data in Table 1 (I have some comments, see below). You summarize in the body of the text, but I think that you should provide the main headline summary that stunting has generally declined in all groups and subgroups analysed (rural/urban, divided by education status, divided by wealth index, divided on the basis or administrative or ecological region). When you plot these data as graphs it is striking that there is little convergence or divergence between the lines – when you started with a inequality (wealth/educational/geographical) in the first survey, it is there to a markedly similar degree in the most recent surveys. Because you are interested in talking about inequality I would encourage you do draw such graphs and include them in a single composite image (with e.g. panels a), b), c) etc.) because this brings out well the failure of a reduction in inequality. However, a caveat to this is that it is unclear from your Table 1 exactly how many people are in each group. If there was a policy intervention to improve maternal education rates to target
stunting so there was a dramatic increase in the number of children born to mothers with qualifications (who have a lower stunting rate according to your data) – then that would be a positive effect

Authors: The headline summary sentence has been added indicating the decline of stunting among groups and subgroups analyzed. As per feedback, to indicate failure in reduction in inequality, graphs/figures are prepared and they are numbered in the order they are first indicated in the result section of the manuscript. Separate graphs/figures for each of the variable was drawn for clarity rather than making a single composite image.

We also agree that there is dramatic increase in mother's education level. Regarding policy intervention to improve maternal education rates, there were numerous interventions implemented to increase the literacy rates of females and women such as National Campaign for education, Education for All, Welcome to School, which are well described in discussion starting from line 244.

Editor: Table 1:

What are these n? If they don’t relate to real numbers could they be removed? How did they relate to the numbers in your initial Table 1? It is also intrinsically confusing that are different numbers in each of the wealth quintile groups – these aren’t really quintiles then? Could that be explained somewhere in the text?

Authors: "n" are numbers/frequency and are real numbers of stunted children in Table 1. The "n" in initial table 1 referred to frequency of total children (both not stunted and stunted) under five years, whereas initial table 2 (which is present table 1) is for frequency of "stunted children" under five years only. Alongside, the percentages (%) in table 1 are "Percentage of stunting among certain subgroups" and are calculated dividing the number of stunted children in particular subgroups by total children in that particular subgroups. For instance, the percentage/prevalence for stunting children of rural areas was calculated dividing stunted children of rural areas by total children of rural areas. The same procedure NDHS applies for calculation of percentage was followed in this study too and numbers and percentages produced in this study in table 1 match with the NDHS reports for all the survey years. The initial table 1 was removed as per the suggestion of reviewer 1 and editor.

The numbers in each of the wealth quintile are different here because only child dataset was analyzed in this study, which is a subset of the overall household survey. This caused differences in the numbers in each of the wealth quintile groups.

Editor: Figure 1:

I can’t reproduce this from the data you have supplied, is it built on other data not supplied? Please check and clarify. Including the confidence intervals would be helpful if possible
Authors: Figure 1 has been revised along with confidence intervals in the table 1. All the data in the manuscript were again verified with the one in the table for confirmation. Confidence interval for was calculated in excel using the formula of confidence interval for population proportion (CI= p± z*√[p{1-p}/n])

Editor: On association between stunting and other exposures: Please include crude OR in this table as well as adjusted OR.

Authors: The crude OR has been added in table 2. Instead of having a separate table for crude OR, crude OR has been added to table 2 along with adjusted OR for convenient comparison of both the OR.

Editor: 193

I presume that living in a rural area was associated with an increased odds of stunting in the crude but not the adjusted analysis? Please make clear that there is no statistically significant difference in the adjusted analysis.

Authors: Now the crude OR has been added in the analysis and we agree with your feedback. The following sentence has been added in the line 215 as below:

Children living in the rural areas were associated with increased odds of stunting than their urban counterparts in the crude analysis; however, no association was seen in the adjusted analysis for all the survey years.

Editor: 198

Better to be consistent and say ‘odds’ rather than ‘likelihood’

Authors: Likelihood has been replaced with odds throughout the manuscript.

Editor: 203

Don’t say ‘significantly increased’ unless you mean a statistically significant difference between the two proportions (which you haven’t demonstrated)

Authors: This has been revised throughout the manuscript.

Editor: Discussion
‘Reduction can be explained by ..... increase in access to health care, improvement in sanitation, and implementation of integrated interventions.’ – you have provided no data in support of this in this paper (which should be the main focus of the discussion) - suggest changing to ‘might’

Authors: Thank you for the suggestion. The changes have been made from line 244, describing the intervention that brought about positive changes in maternal education rates. However, please do let us know for any changes on this.

Editor: 264-271

Your analyses that shown that children living in rural areas are more likely to be stunted than those in urban areas, but this is explained by (presumably – can’t see the crude OR) differences in wealth and education between the rural and urban areas – and when you correct for those the rural/urban effect goes away. That needs to be brought out – your AOR shows that urban environment is not in and of itself protective.

Authors: The feedback has been incorporated as below in line 291:

Previous studies have found urban children taller than rural [27]. Of particular relevance is a study from Paciorek, Stevens et al. (2013) that analysed 141 low and middle income countries between 1985 and 2011 showing urban children are taller and heavier than their rural counterparts from the majority of countries analysed [27]. This contradicts the result of the present study. In the unadjusted analysis, the children living in the rural areas were associated with increased odds of stunting compared to their urban counterparts; however, in the adjusted analysis, no association was noted for all the survey years.

Editor: 271

Suggest new paragraph from ‘An…’

Authors: Accepted.

Editor: 281-2

The sentence starting ‘This study…’ is redundant

Authors: The sentence has been removed.

Editor: 282-286

It is important to deal with this issue – but you must include data from 2001 and 2016
Incase of mothers without education, the prevalence of stunting decreased from 62 to 46 percent from 2001 to 2016. This reduction may be associated with the reduction in the overall proportion of mothers without education from 72 to 34 percent as noted in NDHS 2001 and 2016 respectively.

In the latest census the prevalence of stunting in Central is a mere 1% less than in Far-Western. I think this section therefore needs to be moderated somewhat.

Authors: This section has been moderated taking into account your feedback considering the highest prevalence in mid-western development region in line 317-333 as below:

A large proportion of stunted children belong to the mid-western region. The mid-western development region of Nepal is the least developed region. For instance, the mid-western development region is the poorest region with the greatest difference between revenue and expenditures (−7,903.82 Nepalese Rupee) in comparison to nation's richest region i.e. central development region that generates 79.5 percent of the government revenue [33]. Similarly, the central region’s per capita income was $1,597, which was more than the national average of $1,310 and the mid-western region had the lowest per capita income of $988 [14].

I don’t understand – terai experienced substantial reductions 2006-11 did it not?

Authors: This section has been moderated.

‘low reduction in stunting’ – there were reductions in terai of a similar magnitude to the other regions between each census except for the last one. Therefore again, this section requires the language be moderated

Authors: This section has been moderated as below in line 314.

The decline in prevalence of stunting among children has been similar for the three ecological regions till 2011. After 2011, it was noticed that the prevalence of stunting in terai region declined by less than one percent from 2011 to 2016. The low reduction in stunting in terai
region from 2011 to 2016 might be due to large size of population in terai region deprived of basic education and health related facilities [35]. Alongside, this region holds ethnic populations who are socially, culturally and economically excluded from mainstream development and thus have challenges to enjoy health, education and access to resources [35].

Editor: 305-8

Unless you want to describe more about ‘multidimensional poverty’ I would remove this sentence – the point is well made in the preceding sentences

Authors: This section has been removed.

Editor: 315

I don’t think that the rate of decline in stunting in the poorest group has got worse over time.

Authors: The phrase "where it has worsened with time" has been deleted.

Editor: 322

I would argue that reduction in stunting inequality would actually be most efficiently achieved by targeted provision of resources to the most impoverished and not ‘equal distribution… across economic subgroups’

Authors: This sentence has been removed.

Editor: 329

New paragraph at ‘The limitation’

Authors: Accepted and done.

Editor: 351

Rather than saying ‘reduction is not uniform’ I think it’s more accurate to say ‘substantial inequalities have been preserved’ because you have not attempted any formal statistical test to show difference in rate of change of stunting prevalence in any group or other

Authors: The phrase "substantial inequalities have been preserved" has been added.
Your own analyses have show that rural/urban is not a key determinant so I would remove this sentence.

Authors: This sentence has been removed.

‘Gap between the mountainous region…’ this sentence is incorrect.

Authors: This sentence has been removed.