Author's response to reviews

Title: Factors affecting utilization of skilled maternal care in Northwest Ethiopia: A multilevel analysis

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Author's response to reviews: see over
To: Editorial in Chief

BMC International Health & Human Rights

From: Abebaw Gebeyehu

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Subject: Submitting a revised version of the manuscript

MS ID: 6082083568409208
Factors affecting utilization of skilled maternal care in Northwest Ethiopia: A multilevel analysis.

We want to acknowledge the reviewers for their detail review of our manuscript. Their comments and suggestions have been incorporated to further improve the manuscript. Based on the comments and recommendations, English language edition is made by consulting an experienced language editor.

Please find the point by point response to the other reviewers’ comments. We have also uploaded the revised manuscript with track changes.

With best regards,

Abebaw Gebeyehu

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Point-by-point responses

We want to acknowledge the reviewers for their detail review of our manuscript. Based on their important and constructive feedbacks, the following point-by-point responses have been prepared.

Reviewer 1 (Eyob Zere):  (1874692831912801)

<table>
<thead>
<tr>
<th>Comments</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minor essential revisions</strong></td>
<td>Comments accepted and revisions are made</td>
</tr>
<tr>
<td>- Editing required</td>
<td>• Reference citations were done using endnote and the sequences are checked once again.</td>
</tr>
<tr>
<td>- Sequencing of references: from 9 it goes to 12 &amp; 13 and then jumps to 29, please address</td>
<td>• By consulting and experienced language editor, all mentioned and additional grammatical errors were checked and corrected.</td>
</tr>
<tr>
<td>- References required for some factual information (e.g. Page 3, Para. 1 – “…WHO standard of having skilled attendance for all births”)</td>
<td>• Acronyms are presented now according to the comment.</td>
</tr>
<tr>
<td>- Acronyms should be written in full the first time and indicated in parentheses (e.g. ANC on Page 3, para 1)</td>
<td>• Statement on page 5 is revised</td>
</tr>
<tr>
<td>- Page 5, Last Para, first sentence – it is better to limit to “studies in Ethiopia” as we cannot conclusively say that multi-level models have not been used elsewhere – there is enough literature</td>
<td></td>
</tr>
<tr>
<td>- Use a spell checker (e.g. Page 6, Para 1 - killo meter to mean kilometer)</td>
<td></td>
</tr>
<tr>
<td>- Page 6, Para 1, line 2 – insert “in”</td>
<td></td>
</tr>
<tr>
<td>- Page 6, Paragraph 2, Line 1: replace “have” with “had”</td>
<td></td>
</tr>
<tr>
<td>- Page 10, last para, Line 1: “has” should be “as”</td>
<td></td>
</tr>
<tr>
<td>Page 15, Para 2, last two sentences – although the paragraph is set out to highlight the limitations, the two last ones discuss the strength. These have to be excluded from the paragraph. Moreover, the strength of multilevel analysis has been described in the document elsewhere; hence no need to repeat.</td>
<td>Comment accepted and the sentences are deleted based on the recommendation.</td>
</tr>
</tbody>
</table>
**Reviewer 2: Miguel San Sebastian (1448881992911058)**

**Point by point response**

<table>
<thead>
<tr>
<th>Comments/questions</th>
<th>Response/Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major revisions</strong></td>
<td>Comments are well taken and clarifications are provided</td>
</tr>
<tr>
<td><strong>Methods</strong></td>
<td></td>
</tr>
<tr>
<td>• “The use of linked survey is also considered as the best approach to analyze causality in non-experimental studies”. I do not think this is correct. There are better ways to analyze causality.</td>
<td>• The statement is reflecting the advantage of linked survey (to have linked data). This has potential advantage to control confounders and allow us to see the effect of each factor on our outcome of interest. Hence, strength of association will become an important criterion of causality. Now the statement is revised.</td>
</tr>
<tr>
<td>• “All eligible women found in the selected cluster were studied”. Is this correct? Only 1730 women from 12,000 households were eligible?</td>
<td>• Yes. Our inclusion criterion was “having birth in the past one year preceding the survey”. During the house-to-house survey, all mothers fulfilling this criterion were eligible for our study. Accordingly, from all visited households we found 1730 women having birth within one year preceding the survey.</td>
</tr>
<tr>
<td>• Is there always only one health centre per kebele?</td>
<td>• No. One health center can be responsible for many kebeles (up to 5, 6 or even more). To link the facility and population data, we have considered the nearby health center utilized by that kebele population. We have taken care to avoid overlaps during the sampling procedure.</td>
</tr>
<tr>
<td>• “Epi Info stat calc software was used for the calculations by assuming 95% confidence level and 80% power with a 1:3 ratio of cases and controls”. It is very odd to apply a case control calculation to a cross sectional study. Avoid the terminology cases and controls in this study (exposed or non-exposed?)</td>
<td>• The sample calculation using power was to have adequate sample for our calculation of associations. • The terminology cases and controls are replaced by users and non users. The sample size for comparing two groups gave same result.</td>
</tr>
<tr>
<td><strong>Analysis</strong></td>
<td></td>
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<tr>
<td>• These sentences: “Some of the variables can be defined at their own level. In addition, we may move variables from one level to another level through aggregation or disaggregation” are unclear. Delete them?</td>
<td>• Comment accepted and statements are deleted according to the comments</td>
</tr>
</tbody>
</table>
This sentence is confusing (same applies to the abstract, study design and conclusion sections) “...characteristics of the kebeles and their health centers were treated as level-2”. In this study there are 2 levels: individual and kebele (at this level there are variables/factors related to the community and to the health centre) but the health centres do not act as level 2. So the authors cannot say that “… all potential factors operating at different levels (individual, community and health facility levels”

**Comment accepted and statements are revised to avoid confusions.**

The statements were used to show links of information at cluster level since we linked facility characteristics to the kebeles.

This sentence is not clear: “we estimated two models; intercept-only models: an empty model that contains no covariates, and a full model that included fixed and random effects”. Broadly speaking, in MLA there are random intercept and random slopes models. Each of these models will have fixed effects (OR in this case) and random effects (variance). See Merlo articles for references. The null model is the first step of any MLA and from there, different model are assessed (for instance, first with individual variables, then with contextual, then will all). So the fixed and random effects are not characteristics of a full model but of any model (except empty models). Here what the authors should write is what included the full model, i.e. all the individual and kebele variables at the same time.

**As correctly explained, except the null model, all models have fixed and random effects in MLA. After the null model, the step-by-step fitting of individual level variables then higher (contextual) level variables and cross-level interaction will be followed. In our case, all the three (ANC, delivery and PNC) have empty models. Additionally, we showed the random slopes model for ANC and random intercept model for delivery and PNC. Based on the recommendation, the statement is revised as “we estimated two models; intercept-only model: an empty model that contains no covariates, and a full model that included individual and kebele level variables”**

**Results**

- “This indicated that the unobserved characteristics of the upper level contributed a lot”. What means a lot?

**The word “a lot” was used to show significant contribution of variables not included (unobserved characteristics) during analysis. Now the sentence is removed.**
• The meaning of this sentence is not clear to me. “The between kebele variance of slopes indicated that the two variables, ANC in the previous pregnancies and preference of skilled providers, were also significantly varies across kebeles”. How was this calculated? What is the meaning? This sentence is a repetition of the previous one: “The between kebele variance of slopes are also very small (negligible).” Same applies to page 12, postnatal care.

• Give the value of negligible in Table 4.

Using the multilevel mixed-effects logistic regression (Xtmelogit), the analysis was done in the following way. After inserting the dependent variable and level equation (in this case, defined by kebele ID), we have three important paths to address our interest.

1. **Null (intercept only) model** (without covariates): For our calculation of intra-class correlation and to test presence of significant cluster variation.

2. **Random intercept model** (with covariates): For testing presence of significant association by controlling cluster variation (here independent variables should be added). However, we cannot check the presence of significant variation on the slopes when clusters vary (only the intercept varies randomly between groups).

3. **Random slopes model**: In addition to testing presence of significant association, the model allows to check presence of significant slope variation across the clusters. During analysis, we follow similar procedure as the random intercept model except one criterion. Under random-effects equation, we should activate the factor equation and then we can add our factor of interest.

For each variable, we have checked the presence of significant variation across the kebeles using the random slopes model. For the ANC, we found significant estimates of variance (see the confidence interval) in two variables; **ANC in the previous pregnancies and preference of skilled providers**.

During our repeated checking, we do not have significant slope variance on variables for delivery and PNC and therefore the random intercept model result is presented.

The meaning of the finding is that **Having ANC in the previous pregnancies and preference of skilled providers by women are more important predictors for those kebeles having higher ANC coverage than those with lower ANC coverage.**

**The statements were added to make it clear.**

• The values of negligible are added in the table.
### Discussion
- When the authors discuss payments, they mention transport. Do women have to pay as well antenatal or delivery services? Other costs?
- A section on limitations would be necessary.

### Conclusions:
"Improving community awareness and perception on skilled providers and their care by targeting women who preferred non-skilled providers and those who do not have awareness". How can you target these women?

### MINOR REVISIONS:
Intro:
Maternal mortality is (or has) also not changed from its previous level

Methods:
Over three months (January - March, 2012) in North Gondar Zone, located 735 kilometer away

Results:
“a substantial proportion of the between kebele variance has (was) explained by this model”

Discussion:
“Another strong facility level indictor for skilled maternal care utilization was”

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Yes, but it was in some of the facilities. Free maternal service policy is implementing in Ethiopia. However, some of the facilities especially those having retail pharmacy are still requesting clients to pay for drugs and supplies.

Separate section is provided for limitation

In our recommendation, we considered the communication networks in the rural communities. At this time, we have “health development army” (lowest level organization). In the system, there is one responsible woman for every five women in the rural community. These groups of mothers have discussions weekly related to health and other issues. Through communicating the leader of the groups, we can identify and target the disadvantaged women for our intervention.

By consulting an experienced language editor, all mentioned and additional grammatical errors and language usage were checked and corrected. (See track changes)