Author’s response to reviews

Title: Factors Influencing Unmet Need for Family Planning among Ghanaian Married/Union Women: A Multinomial Mixed Effects Logistic Regression Modelling Approach

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Reviewer #1: Reviewer: Micaela Comendeiro-Maaløe

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Title: Factors Influencing Unmet Need for Family Planning among Ghanaian Married/Union Women: A Multinomial Mixed Effects Logistic Regression Modelling Approach

This paper aims at identifying which factors could act as determinants influencing the existence of unmet need for family planning in Ghanaian married/union women at their reproductive age (15 to 49 years) by using the variables included in the Ghana Demographic and Health Survey (year 2014).

The paper deals with a relevant issue, since family planning services have shown to reduce unintended pregnancies, unsafe abortions, and consequently maternal and neonatal morbidity and mortality in many countries. Getting to know those multidimensional factors which influence unmet need for family planning could help decision makers authorities to reorient policies, maybe not only scaling up the uptake of family planning, but also transcending the borders of strictly focusing on sanitary measures.
In general terms, it is an interesting topic, even though there is already a lot of international literature addressing it. Therefore, I think that authors should use some space in the background section to point out which are the specificities of Ghanaian population, as well as giving some brief information about the Ghanaian health system context, that justify addressing the study. Otherwise it gets difficult to fully understand to common readers the contribution of this paper to the already existing evidence.

On the other hand, I think that the authors must give some insight about various aspects of their analyses. I pose my comments following the page numbering of the manuscript when needed:

1. Since family planning services are meant to counsel all kind of individuals, including single women without stable relationship whom even more deeply suffer the consequences of unintended pregnancies, readers would appreciate the authors briefly explaining why they only focus on married/union women. Any rationale you could provide? In that sense, the title should also specify "married women" to avoid confusion.

RESPONSE; we have modified the title to include married/union women. This concern seem to depend on the context and settings. We are reluctant in including and discussing in our study single women who are not married and are not in any union. We included only women who are married/ in union as we can reasonable assume that by their status they are exposed to regular sexual intercourse. A woman who says she is not in any relationship can’t be asked whether she prefers to limit or space. We have stated this in our inclusion and exclusion criteria.

2. Since the source of data comes from a survey, responses are a subjective source of information (survey biases), so it seems convenient to deal with responses in terms of what the respondents "refer to ... (meet, feel, and so on)" and not in terms of "having", which could seem a very strong language.

Response: We have edited the manuscript and removed the words “having” etc.

3. Background section, page 5, 1st paragraph, lines 12-14. Authors point out the considerably variability that in The 2014 Demographic and Health Survey is shown regarding women's knowledge of contraceptive methods across different population demographics. What does the expression "population demographics" precisely stands for in this case? Which survey variable or variables do the authors refer to? Have the authors considered to assess if this/these variable/s could act as clusters in the regression models?

RESPONSE; Population demographics that has been referred to in the literature review has to do with factors such as; population size, density, age structure, fecundity (birth rates), mortality (death rates), and sex ratio. This has been included in the manuscript. Individual variables were not considered as cluster variables in our analysis. Variables are only considered as clusters if a number of individuals or households are grouped into it and are likely to contain similar characteristics or which are homogeneous in nature thereby having an effect on the standard error estimates hence giving misleading or bias interpretation.
4. Methods section, Sampling Approach and Study Population subsection. This subsection is confusing and would need rephrasing. Although it is not necessary to deeply explain all the details of the multistage sampling process of the survey, and therefore is referenced "elsewhere", it is necessary to inform about which are the clusters, mostly if these will be subsequently used for designing the multilevel regression models. On the other hand, the reported sample size, extracted to run the analysis, refers to the total of "women" (aged 15-49), without specifying which of them are the married women, the ones the authors finally assess, as reader must guess looking at table 1 or wait until he/she gets to the Results section. May be, the inclusion of a flowchart describing the main composition of the sample could easier readers follow-up. Consider including in the aforementioned flowchart the inclusion and exclusion criteria, given that they are not specified in the following sub-section, which is curiously titled as such.

Response: We have edited and included more information on the sampling approach and study population subsection as requested by the Reviewers. The final number of observations included in the analysis for the married/union women have been included in this subsection. We think that the information provided is enough and therefore we do not need to use a flowchart to represent it.

5. Methods section, Study Outcome, Inclusion and Exclusion Criteria. As mentioned before, no inclusion nor exclusion criteria are shown in this paragraph and yet nothing is mentioned about which the variables of the survey are used in the analysis. I would suggest renaming the subsection, and include information about the variables that will act as regressors in the models, their characteristics and meaning, specifying the group they will be in (socio-economic, socio-cultural, psychosocial, …)

Response: We have re-named and clearly stated our inclusion and exclusion criteria. This subsection deals only with the outcome variable and not the potential predictors or regressors. Variables that act us regressors in the model are provided in the subsection referred to as “Model building and potential risk factors” and are accordingly grouped.

6. Methods section, Statistical Analysis. This sub-section seems unnecessarily long with some sentences containing obvious information, while in contrast there is still a lack of detailed information about which and what kind of variables are being used for the analysis and which of them is acting as cluster. For instance, suffice it to say that bivariate analysis was used to discard non-significant variables, since the precise degree of association would only be obtained from multivariable models, once optimized, as you propose afterwards in the sub-section of "Model Building", otherwise one could be underestimating the issue of omitting relevant variables.

Page 7, lines 27 to 33. Why only these four variables? Any rational the authors could provide?

Response: Concerns about a lot of information provided in the statistical analysis subsection has been noted but we are unable to edit this page further because most of the information provided in that page was as a request by one of the reviewers in the first round of review. Again, the kind of variables used for the analysis are listed in subsection “model building and potential risk
factors”. The variables that act as clusters are provided in paragraph three of this subsection. Variables were not just dropped at the simple bivariate analysis stage mainly based on their significance at our interpreted alpha level or type I error of 5%. As stated in paragraph one of the statistical analysis subsection, we used a cut-off point of 10% or less bearing in mind that some were likely to act as confounders and may necessarily not be significant at the 5% alpha level. The four variables were chosen without any specific criteria just for exploratory purposes and were also of interest to us. We chose only these because we could not do this for all variables considered.

7. To better understand how the building-up model strategy works and if it significantly improves its effects on the outcome (explained at the Methods section, Model Building with Potential Risk Factors subsection), consider redesigning table 1 from the Results section to also include estimated parameters information of the three models prior to Model 4 showing the variation in the remaining unexplained variance.

Response: To include results of Models 1 to 4 in table 1 as it stands is not possible. Including results of the previous three Models which will give us about three different tables covering six pages without interpreting any of the parameters estimates from either of the tables will only increase or just add up to the number of pages of the manuscript. Results presented in table 2, we believe are enough to inform readers why the first three models results were not included in the final manuscript.

At the same time, it is not clear in which stages of the analyses were clusters considered by using multilevel modelling. Was the multilevel approach also used in the building-up model strategy? Which criterion have the authors used to observe the cluster effect and consequently, finally discard the multilevel modelling?

Response: Multilevel modelling was used throughout our inferential analysis as stated in paragraph one and two of the statistical analysis subsection. Multilevel was used also in the model building approach and was not discarded at any stage of our analysis. This is because it proved to have a better fit.

8. Results section. Consider rephrasing expressions when explaining the results, to easier comprehension, avoiding obviousness and sticking to just one decimal.

Response: There are obvious reasons we have used three decimals instead of two or one decimal for the relative risk ratios, for example a confidence interval with a lower bound of 0.003 if limited to one will imply zero is inclusive to a reader which is not true. So we feel it’s better left at three decimals than reducing it. Also, the number of decimals to be included in the results are highly subjective and we prefer the three. This also helps us to provide approximate p-values like, a p-value less than 0.05, 0.01 and 0.001.

Results section, page 10, 1st line. First two sentences should be clearer explained. What does unobserved effects of clusters stand for? Which are those clusters if previously, in the first lines of page 8, it has been said that "In absence of any significant unobserved cluster effect, our model represents an ordinary multinomial logistic regression?"
Response: We have removed the word, unobserved in order not to confuse any reader. The cluster variable is the enumeration areas which has been spelt out in the statistical analysis subsection. If the cluster variable is taking out, then level-2 will no more exist only level one hence multilevel will no more be appropriate.

9. Consider re-editing labels of legends in figure 2 to directly show information more precisely, mainly about outcome variable. Also give more space between axis titles and their labels.

Response; Legends to graphs have been edited and spaces provided between axis titles.

10. Finally, consider including in the Conclusion section a brief explanation about which variable or type of variables (socio-demographic, socio-economic, socio-cultural and psychosocial) better predict the unmet need for family planning and if it differs in the unmet need for limiting from the unmet need for spacing

Response: Variables that are significant predictors of both unmet need for limiting and spacing and those that are not when we considered the overall non-factor analysis have been explained in the conclusion section. We are unable to emphatically state that variable A was a better predictor or variable B because the p-values for the predictors for all the significant variables for both limiting and spacing were approximately the same.

Reviewer #2: Evaluation Report

Introduction: Paragraph three of the introduction more of stating that the family planning issues including unmet need is clearly explained. This in turn raises a concern of why your study is necessary because the problem is already known by GDHS. So, in this regard rather than doing further study/research it will be better to work towards the identified problems.

Response; we have demonstrated and indicated that, the main the major difference between our approach and the other approaches highlighted in the literature on the modelling of both observed and unobserved variables. In the analysis we have looked at so far, most of the survey data – which one of the most reliable source of data in developing countries like Ghana, researchers use simple random modelling approach in analysing the data which is obviously wrong. This is because, there produce wrong standard errors which in turn give wrong confidence intervals resulting in wrong interpretations. Demographic and Health Surveys are multi-stage and therefore, the statistical modelling must consider and account for it – which has been appropriately carried out in our work.

Methodology: The inclusion and exclusion criteria is not reader friendly. How and why the data manipulation was done.

Response; we have modified and edited the inclusion and exclusion criteria for more clarity.