

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

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| <b>TITLE (PROVISIONAL)</b> | Determinants of Antenatal care use in nine sub-Saharan Africa countries: A statistical analysis of cross-sectional data from Demographic and Health Surveys |
| <b>AUTHORS</b>             | Andegiorgish, Amanuel; ELHOUMED, Mohamed; Qi, Qi; Zhu, Zhonghai; Zeng, L  |

### VERSION 1 – REVIEW

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| <b>REVIEWER</b>        | Hoxha, Ilir<br>Kolegjin Heimerer |
| <b>REVIEW RETURNED</b> | 04-May-2021                      |

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| <b>GENERAL COMMENTS</b> | <p>This is very interesting paper on very interesting topic of use of ANC visits in SSA. I think authors have done well in analysis they have performed and overall generated a very interesting manuscript depicting this topic. Overall, I think this manuscript needs to be presented better and fine tuned further.</p> <p><b>Abstract</b><br/>Generally, abstract could be written better.<br/>Objective is good, it conveys the intention of the study, but would phrase it better.<br/>Participants need more detail. Like which countries. What women, what year they have given birth. Has to be more specific.<br/>Methods. DHS what year/s?<br/>Results. I would improve the sequence of sentences. You start with descriptive then move to regressions and associations. Do not mix them. Go back and forth.<br/>Conclusion should be better written. For example, second sentence in conclusion is not that clear although I understand where authors want to go. I am not that sure how it reflects analysis.</p> <p><b>Strengths and limitations of the study</b><br/>You state: "To the best of our knowledge, no prior study has analyzed the determinants of antenatal care use in segregated and pooled data forms in a single study". Have you performed a review of literature to know this? A bit of surprise for me.</p> <p><b>Introduction</b><br/>Could be written better. I like the first paragraph leads well to research question but then it starts to get busy and not that clear. Please be systematic in use of DHS. You use sometimes Demographic Health Surveys, sometimes Demographic health surveys.</p> <p><b>Materials and methods</b><br/>Not sure if I see Figure 1 in methods section or results section. You</p> |
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|  | <p>can also not use that figure at all but just describe it in the text to save figure/table limit.</p> <p>Page 5. Line 53. Link should be provided in references.</p> <p>What year you have used DHS for each country. This is valuable information that should be present in the section you describe DHS use.</p> <p>I find figure 2 very useful in sample selection but authors should explain better figure 2 in the text section about participant. Also why use of such criteria. Based on what?</p> <p>You state “ANC provided by non-health professionals such as traditional birth attendants were excluded” (Page 6, Lines 18-20). Why is this not explained in exclusion criteria? Why you put it at outcome description which is nicely explained?</p> <p>Explanatory variables. How did you select the variables? Knowing DHS has many other information? Can the authors explain how did they select variables? What conceptual/theoretical/evidence framework they used to make decision on what variables to include or exclude?</p> <p>I don't think sentence “Data sets were segregated according to the nine countries in the SSA region. There is merit in segregating data, for it allows us to focus on aspects of ANC visits that may remain hidden in intra-national/national level indicators” belongs in the description of variables section.</p> <p>I think section Data sources/measurements should go after study design section or merge with it.</p> <p>Data analysis seems to have been done and described properly.</p> <p><b>Results</b></p> <p>I think the paper exceed limits for figures and tables. Some figures or tables may have to be excluded from manuscript (for example figure 3 as information is already described in the text) or maybe move to an online appendix.</p> <p>Presentation of results can be better organized and more systematic in reporting of statistical measures. Overall, I find tables (2-4) very well presented and clear while text could improve in organization and detail. For the later (stat measures), for example, sometimes there is only mention of effect of certain variables and sometimes statistician measures are reported for such effect.</p> <p>I see no use in Table 1. Can be just an overall column in table 2.</p> <p>Table 2. I think you need another row describing what column data are. Bellow the country. I think I understand the figures. But you need to make that visible to the reader.</p> <p>Table 3. Have you checked the data for this outcome “33.59(4.7,241.59)” on Ghana? Seems unusual.</p> <p><b>Discussion</b></p> <p>Doesn't follow a clear structure. It needs a major revision. I suggest you use following structure:</p> <ul style="list-style-type: none"> <li>- Summary of results</li> <li>- Strengths and limitations of your study</li> <li>- Context... your findings in context of other studies</li> <li>- How do you explain your results?</li> <li>- What are implications of your results for policy, clinical care, research?</li> </ul> <p><b>Conclusion and recommendations</b></p> <p>I find it hard to see how results and discussion coverts into current form of conclusions and recommendations. Suggest e major revision here also. What you recommend here has to link with data. I would not recommend overall/general recommendations.</p> |
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| <b>REVIEWER</b>         | Morhason-Bello, Imran<br>University of Ibadan College of Medicine, Department of Obstetrics and Gynaecology, Faculty of Clinical Sciences, College of Medicine/University College Hospital, University of Ibadan |
| <b>REVIEW RETURNED</b>  | 25-Oct-2021  |
| <b>GENERAL COMMENTS</b> | I am satisfied with the current revisions. The manuscript is acceptable.   |

### VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Dr. Ilir Hoxha, Kolegjin Heimerer, Dartmouth College Geisel School of Medicine

Comments to the Author:

This is very interesting paper on very interesting topic of use of ANC visits in SSA. I think authors have done well in analysis they have performed and overall generated a very interesting manuscript depicting this topic. Overall, I think this manuscript needs to be presented better and fine tuned further.

**Response:** Thank you so much. We highly appreciate for your critical reading, highlighting the importance of the work and your comments to improve the manuscript.

Abstract

**Comment -Generally, abstract could be written better.**

**Response:** Thank you for this comment. We agree and the abstract is modified.

**Comment -Objective is good, it conveys the intention of the study, but would phrase it better.**

**Response:** Agree. The objective of the abstract is modified and changed from “To examine the factors associated with four or more antenatal care attendance in nine sub-Sahara African countries” to “Literature on determinants of four or more antenatal care (4+ANC) visits among women in the sub-Sahara African remains limited. The aim of this study is to explore the factors associated with 4+ANC visits.”

**Comment -Participants need more detail. Like which countries. What women, what year they have given birth. Has to be more specific.**

**Response:** Thank you for the comment. We agree with this, however because of the word count limit in the abstract we could not include the following complete statement. “56002 women aged 15-49 years who gave birth three years preceding the survey from Ghana (3224), Kenya (10981), Malawi (9541), Namibia (2286), Rwanda (4416), Senegal (6552), Tanzania (5536), Uganda (7979), and Zambia (5487) conducted between 2013-2019 were analyzed. ANC provided by non-health professionals were excluded.” Therefore we modified as “56002 women aged 15-49 years who gave birth three years preceding the survey (2013-2019) from Ghana, Kenya, Malawi, Namibia, Rwanda, Senegal, Tanzania, Uganda, and Zambia were analyzed.”

**Comment -Methods. DHS what year/s?**

**Response:** Thank you for this question. Year/s of DHS study was included in the participant section of the abstract.

**Comment -Results. I would improve the sequence of sentences. You start with descriptive then move to regressions and associations. Do not mix them. Go back and forth.**

**Response:** Thank you for pointing this out. Agree and we modified the result section of the abstract. The changes we made is, this “Only 55.52% (95% CI; 55.11 to 55.93) of all women had four or more antenatal care visits. Multivariable analysis shows that all sociodemographic variables were significantly associated with four or more antenatal care visits ( $p < 0.001$ ). Four or more antenatal care visits vary widely across the studied countries. The highest visits were in Ghana (85.6%) and Namibia (78.9%), and the lowest was in Rwanda (44.5%) and Senegal (45.3%). In country-specific analysis, the odds of lower uptake of four or more antenatal care attendance was significant among women from a rural residence in Kenya, Malawi, and Senegal: no schooling in Kenya, Malawi, Rwanda, and Zambia; un-employed in Ghana and Uganda; poorest households in Ghana, Kenya, Malawi, Senegal, Tanzania and Uganda; and lack of access to media in all the studied countries except in Malawi, Rwanda, Senegal, and Zambia. Overall, women from low socioeconomic status

(rural place of residence, no schooling, unemployed, poor household, and no media access) were less likely to uptake the required antenatal care visits.” is changed to “Overall 55.52% (95% CI: 55.11 to 55.93) of women had 4+ANC visits. ANC visits vary widely across the studied countries. The highest was in Ghana (85.6%) and Namibia (78.9%), and the lowest was in Senegal (45.3%) and Rwanda (44.5%). Young women 15-19 years had the lowest uptake of 4+ANCs in seven of the nine countries and the difference was significant in Ghana, Kenya, Malawi, Senegal, and Namibia. Multivariable analysis showed that, the odds of 4+ANC visits were 14% lower among rural women than urban (AOR: 0.86; 95% CI: 0.81 to 0.91) and this difference was significant in Kenya, Malawi, and Senegal. Unlike all countries the odds of 4+ANC visits was 48% higher (AOR: 1.48; 95% CI: 1.2 to 1.82) among rural women in Zambia. Women with higher educational level had more than two-fold higher odds of 4+ANC visits in seven countries, and was significant in Kenya, Malawi, Rwanda, and Zambia. Compared to the poorest households, odds of 4+ANC visits increased by 12% (AOR: 1.12; 95% CI: 1.06 to 1.19), 18% (AOR: 1.18; 95% CI: 1.11 to 1.26), 32% (AOR: 1.32; 95% CI: 1.23 to 1.42), and 41% (AOR=1.41, 95% CI 1.29 to 1.55) for every 20% variation on the wealth quantile. Women of first time pregnancy had higher odds of 4+ANC visit than second and above birth orders across all countries and women who had access to media at least once a week had 22% higher 4+ANC visit than women who have not at all (AOR: 1.22; 95%CI: 1.15 to 1.29).”

**Comment -Conclusion should be better written. For example, second sentence in conclusion is not that clear although I understand where authors want to go. I am not that sure how it reflects analysis.**

**Response:** Thank you again. Your comments are highly appreciated and the conclusion is modified as follow, “Conclusion: The overall antenatal care visits is not adequate, with substantial variation among the studied countries. Program priority for women of low economic status and poor social development on antenatal care must be implemented. Integrated interventions addressing multiple factors and the whole region is needed.” is changed to “Conclusion: Despite its importance; ANC service utilization was low among women of the SSA countries. Therefore, regional and country-specific maternal health program focused to women of rural resident, had no schooled, no outside home occupation, low- economic status, non-first-time pregnancy, and had no access to media are required.”

**Comment -Strengths and limitations of the study**

You state: “To the best of our knowledge, no prior study has analyzed the determinants of antenatal care use in segregated and pooled data forms in a single study”. Have you performed a review of literature to know this? A bit of surprise for me.

**Response:** Thank you for the suggestions. Now we modified the first and third bullets as follow:-

- The analytical approach both as pooled data support the outcome to be valid and the merit in segregating data allows to focus on aspects of ANC visits that may remain hidden in intra-national/national level indicators
- The cross-sectional nature of the study design cannot affirm the cause-effect or direction of association of the predictors.

**Comment -Introduction**

Could be written better. I like the first paragraph leads well to research question but then it starts to get busy and not that clear.

**Response:** Thank you for this comment. Agree and we modified the introduction

**Comment -Please be systematic in use of DHS. You use sometimes Demographic Health Surveys, sometimes Demographic health surveys.**

**Response:** Thank you for mentioning this point. We agree with this. Now it is corrected.

**Comment -Materials and methods**

Not sure if I see Figure 1 in methods section or results section. You can also not use that figure at all but just describe it in the text to save figure/table limit.

**Response:** Thank you for the suggestions. We agree and Figure 1 is removed from the text and all your suggestions are incorporated in the main text.

**Comment -Page 5. Line 53. Link should be provided in references.**

**Response:** Thanks for the suggestions. However, we suggest the reference (#30) has a complete information and we remove the link from the text.

**Comment -What year you have used DHS for each country. This is valuable information that should be present in the section you describe DHS use.**

**Response:** Thank you for asking this question. It is well considered and the following one paragraph is added in the DHS use section “The nine countries included in this analysis and their respective year of survey are; Ghana (DHS 2014), Kenya (DHS 2014) Malawi (DHS 2015/2016),

Namibia (DHS 2013), Rwanda (DHS 2014/2015) Senegal (DHS 2017), Tanzania (DHS 2015/2016), Uganda (DHS 2016) and Zambia (DHS 2018/2019). Countries were selected based on the availability of recent standard DHS data after 2010 and representing the four different sub-regions of the Sub-Saharan Africa, i.e. Western, Central, Southern, and Eastern Africa.”

**Comment** -I find figure 2 very useful in sample selection but authors should explain better figure 2 in the text section about participant. Also why use of such criteria. Based on what?

**Response:** Agree, and we have made the following changes. Figure-2 is changed to figure-1 and this statement is incorporated in the text before figure 1:- “In the DHS survey, information about antenatal care is only collected for the youngest child under-five years. Therefore, to minimize the degree of error due to recall bias; we have limited our analysis to those births happened three years before the survey. Overall and country wise contribution of study participants is presented in Figure 1.”

**Comment** -You state “ANC provided by non-health professionals such as traditional birth attendants were excluded” (Page 6, Lines 18-20). Why is this not explained in exclusion criteria? Why you put it at outcome description which is nicely explained?

**Response:** We thank for this point you mentioned. We agree and we have added a separate sub-heading of exclusion criteria and the statement was placed below it as follows: - “ANC provided by non-health professionals such as traditional birth attendants were excluded from the present analysis”.

**Comment** -Explanatory variables. How did you select the variables? Knowing DHS has many other information? Can the authors explain how did they select variables? What conceptual/theoretical/evidence framework they used to make decision on what variables to include or exclude?

**Response:** Thank you for raising this interesting question. We have Adopted Anderson's behavioral model; a theoretical framework on factors associated with utilization of medical care service in developing countries. However, after we assessed the data, factors on community level factors (place of residence, urban or rural), and predisposing level factors including socio-demographic (maternal and husband education, household wealth status, and marital status) and health knowledge (frequency of reading newspaper/ magazine/ listening radio or watching TV) were complete. Information on enabling factors(permission to visit health facility, distance, presence of companion and money) and need factors( contraceptive use, future plan to have a child) were found with many missing values and we think it is less representative and were excluded from the analysis.

**Comment** -I don't think sentence “Data sets were segregated according to the nine countries in the SSA region. There is merit in segregating data, for it allows us to focus on aspects of ANC visits that may remain hidden in intra-national/national level indicators” belongs in the description of variables section.

**Response:** Thank you for the comment. We agree. We have removed this statement.

**Comment** -I think section Data sources/measurements should go after study design section or merge with it.

**Response:** Thank you for this comment again: We agree, and the statement “Data sources/measurements” is moved and placed after the study design.

**Comment** -Data analysis seems to have been done and described properly.

**Response:** Thank you for pointing this out: Authors are grateful for the reviewer's critical review and approval of the data analysis section.

**Comment** -Results

I think the paper exceed limits for figures and tables. Some figures or tables may have to be excluded from manuscript (for example figure 3 as information is already described in the text) or maybe move to an online appendix.

**Response:** Agree. To emphasize this points, Figure 1 is removed, Figure 3 is added to an online, and Table 1(supplementary) is added with Table 2. Now the result seems improved.

**Comment** -Presentation of results can be better organized and more systematic in reporting of statistical measures. Overall, I find tables (2-4) very well presented and clear while text could improve in organization and detail. For the later (stat measures), for example, sometimes there is only mention of effect of certain variables and sometimes statistician measures are reported for such effect.

**Response:** Thank you again. We agree with this and we have incorporated your suggestion throughout the manuscript.

**Comment** -I see no use in Table 1. Can be just an overall column in table 2.



**Response:** Thank you for your thoughtful suggestions. We agree. As per the suggestion, Table-1 is deleted and the information in Table 1 is combined with Table-2 by creating one column (N (%)) and table number and the main text is modified accordingly.

**Comment -Table 2.** *I think you need another row describing what column data are. Bellow the country. I think I understand the figures. But you need to make that visible to the reader.*

**Response:** Agree. As per the suggestion, we have added one row below the countries and the number of participants from each country is placed on it and main table is modified.

**Comment -Table 3.** *Have you checked the data for this outcome “33.59(4.7,241.59)” on Ghana? Seems unusual.*

**Response:** Thank you for your critical review and bringing this to our notice. Now it is modified as 3.51(2.86, 4.17).

**Comment -Discussion**

Doesn't follow a clear structure. It needs a major revision. I suggest you use following structure:

- Summary of results
- Strengths and limitations of your study
- Context... your findings in context of other studies
- How do you explain your results?
- What are implications of your results for policy, clinical care, and research?

**Response:** Thank you for the important suggestions. We agree with the reviewer suggestion and the discussion section is fully revised. However, authors still suggest that it would be better if the Strength and limitation is moved to the last section of the discussion just before the conclusion and recommendation.

**Comment -Conclusion and recommendations**

I find it hard to see how results and discussion coverts into current form of conclusions and recommendations. Suggest e major revision here also. What you recommend here has to link with data. I would not recommend overall/general recommendations.

**Response:** Thank you for the points mentioned. We agree with this. Now the conclusion is completely revised.

Reviewer: 2

Dr. Imran Morhason-Bello, University of Ibadan College of Medicine

Comments to the Author:

I am satisfied with the current revisions. The manuscript is acceptable.

**Response:** Thank you for your comment. We agree and now the manuscript is modified.