Reviewer's report

Title: Rural-urban differentials in pregnancy-related mortality in Zambia: estimates using data collected in a census

Version: 1 Date: 30 March 2015

Reviewer: Nicholas Kassebaum

Reviewer's report:

1. Is the question posed by the authors new and well defined?
   The research question(s) posed by the authors are quite important, as they provide additional insight into pregnancy-related mortality in Zambia. Further, this in-depth approach to analyzing census data for pregnancy-related mortality is an important contribution to the literature.

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work?
   Yes, the methods are appropriate and quite detailed, which is excellent. Other parts of the manuscript are not as detailed and well-written (in terms of flow and cohesiveness) as the methods.

3. Are the data sound and well controlled?
   Yes, the authors make excellent use of the available data and have undertaken appropriate analyses of it.

4. Do the figures appear to be genuine, i.e. without evidence of manipulation?
   Yes, the figures and tables appear to be genuine. I do have some questions about the selection and presentation of figures and tables, however, as detailed below. Some potentially very interesting and insightful figures have been omitted.

5. Does the manuscript adhere to the relevant standards for reporting and data deposition?
   Yes.

6. Are the discussion and conclusions well balanced and adequately supported by the data?
   The discussion is the weakest part of the paper and does not adequately address the mismatch between the authors findings and previous pregnancy-related/maternal mortality in Zambia. Many of the appropriate discussion points are present at some point, but the flow/cohesiveness is not yet there.

7. Do the title and abstract accurately convey what has been found?
   Yes, the title is appropriate.

8. Is the writing acceptable?
The writing style is excellent! Sentences are, for the most part, perfectly constructed and clear. The authors have an excellent writing voice. Other than my concerns about the content and flow of the discussion (described above and below), the writing needs no overhaul.

Please make your report as constructive and detailed as possible in your comments so that authors have the opportunity to overcome any serious deficiencies that you find and please also divide your comments into the following categories:

• Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)

• Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

• Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)

Once you have done this, there are also some questions for you to answer, including one that asks your advice on publication.

When you have completed your report, please upload it using the online form, accessible using the ‘Continue’ button below.

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Comments on paper:

Major

1. General comment: The authors are presenting their results as the average experience from 2000-2010. However, as only the 2010 census recorded all cause and pregnancy-related mortality in the previous 12 months, this would more accurately reported as the mortality experience in 2010 (or the actual time range covered by the census).

Results

2. General comment: Results should be presented in the same order that analyses are described in the methods section.

3. Page 8: Two tables and four figures dedicated just to the adjustment statistics is a lot. The authors should combine/ consolidate to leave more space/ time to explore other findings.

4. Page 9, sentence beginning “Among reproductive age women” and the remainder of the paragraph: Why 80+ life expectancy is relevant to the topic at hand (pregnancy-related mortality). More to the point, there is no data shown to support anything but the final statement. I presume the authors are referring to the age pattern of deaths that they later present in figures 5 and 6? If so, the age
pattern description should be accompanied by a reference to the Figures or moved to the section where those figures are described. If this is distinct from Figures 5 and 6, then there need to be some figures or tables referenced that support these statements.

5. Table 4/ Page 9, second paragraph: The column titles (Option I/II/III) in Table 4 are not clear from the descriptions in the text. Are these meant to be GGB, SEG, and GGB-SEG? Or are they the no adjustment/partial adjustment (deaths only)/full adjustment (deaths and births). I’m guessing the latter, but this is quite confusing. Please either change the column titles or add references to “Option I/II/III” to the text where appropriate. Also, this is by far the most important information in the entire paper, but the authors spend very little time exploring the information in this table.

6. Page 9, the description of age-related births and mortality: This section is confusing. Are the authors presenting PR or the proportion of total deaths/births? If the latter, then a single figure for all of Zambia would be sufficient as there are not big differences between urban and rural. This does bring up another point, however. Namely, presenting proportion of total confounds age-specific fertility differences and age-specific differences in mortality risk. It would be more useful, or at the very least a good complement to this figure, to also include a graphical representation of how PR, fertility rate, and PRMR change with age (the info in Table 4). That way the authors can demonstrate that despite a mortality risk that is ~3x higher in older women, a majority of deaths are still occurring in younger women. They describe it in the second to last paragraph of the results, but this should be in figure form.

7. Figure 7: Is this the timing of maternal deaths? This is introduced without any previous explanation by the authors (it should be mentioned in the methods as one of the analyses). Also, while the use of lay terminology is fine to supplement, appropriate terminology should also be invoked if appropriate. “While pregnant” = antepartum. “During childbirth” = Intrapartum. “Within 6 weeks of pregnancy termination” = postpartum. If the authors believe using such terminology is inappropriate, the reasons should also be included in the text.

Discussion

8. General comment: The flow of the discussion is not very good. Individual paragraphs are mostly fine, but don’t seem to tie together with the overall stated aims of the paper or the context of the findings.

9. Page 10 last paragraph/ page 11, first paragraph: The authors list do an inadequate job of exploring the reasons for differences between their estimate and that of the 2007 DHS. Why bother mention the UN analytic method for all cause mortality here? What about other methods, e.g. IHME? Why does that make a difference? Why is the authors’ urban result very similar to that of the DHS? What is the reason that the Brass PF method might underestimate? Do the authors think the 2007 DHS underreported deaths? It appears they do think that, but just state is as fact. What is the evidence that the 2007 DHS missed deaths? Were those missing also more likely to have been from rural areas? What if the same correction were applied to the DHS? Would the results be
comparable then??

10. General comment: Two other groups also recently published 2010 MMR figures for Zambia (WHO MMEIG = 315 and IHME = 379). Why are those numbers so different from what the authors found?

11. Page 11, paragraph about HIV: This paragraph is a bit out of place. How does the HIV story in Zambia fit/ not fit with the pregnancy-related mortality in Zambia? Are the authors trying to say HIV is one of the reasons the census and DHS are different?

12. General comment: The authors found that urban death reporting was much greater than 100%, but have made no effort to explain the possible reasons why this is so. Are rural women dying in urban areas? Is there a mechanism by which double-counting has occurred? It would be helpful to see a brief discussion of this topic.

Minor

1. Page 5, sentence beginning “The stable population”. The wording in this sentence is confusing. Please fix.

Results

2. Page 9, sentence beginning “The ratio of deaths”. The ratio of deaths to what? In early vs. late adulthood I presume? Please consider changing this sentence to be more clear.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests.