Author's response to reviews

Title: Maternal Mortality in the informal settlements of Nairobi city: What do we know?

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Author's response to reviews: see over
Response to Reviewers Comments

The responses to the comments are in italics and are given per point raised by each reviewer.

Reviewer 1: Willibald Zeck

Abstract:
1.) The authors report that 631 maternal deaths per 100,000 live births have occurred. However, the time frame is missing here. The time frame(s) of the study have to be included in the abstract (method section).

THIS HAS BEEN IMPLEMENTED. THE FIRST LINE OF METHODS SECTION “we used data from verbal autopsies conducted on all female deaths aged 12-49 years between January 2003 and December 2005”

2.) In the abstract as well in the main paper the term “Maternal Mortality (Ratio)” has to be defined. In the abstract a short explanation might be sufficient. However, in the main paper the full definition has to be added and also a reference. In case the authors used the WHO definition, it should read: “Maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental causes”.

THIS HAS BEEN IMPLEMENTED IN THE ABSTRACT AND LAST SENTENCE ON PAGE 4, AND READS THUS “The ICD-10 definition of maternal death, “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or accidental causes”, was employed.”

Main paper:
Background section:
1.) Again definitions + references concerning direct and indirect causes of maternal deaths are needed. The authors should explain the terms.

IMPLEMENTED, FIRST SENTENCE PAGE 5. “We categorized maternal deaths into direct and indirect causes whereby direct obstetric deaths are defined as maternal deaths resulting from obstetric complications or their interventions of the pregnant state (pregnancy, labor, and the puerperium) while indirect obstetric deaths are those resulting from previous existing disease or disease that developed during pregnancy and which was not due to obstetric causes, but was aggravated by physiologic effects of pregnancy ”

2.) “Given that most obstetric emergencies are often unpredictable, and that life-threatening complications occur in roughly 15 percent of all pregnancies, potentially every pregnancy is at risk of developing a complication.” The last part of that sentence is not contributory. It is common knowledge that every pregnant woman is at risk. Additionally, it is not the pregnancy which is at risk rather than the women and the un/newborns. If the authors want the
sentence to be included, it should read: “….Given that most obstetric emergencies are not predictable and that life-threatening complications occur in roughly 15 percent of all pregnancies, potentially every pregnant woman is at risk of developing a complication.”

THIS HAS BEEN MODIFIED AS PROPOSED BY REVIEWER, FIRST PARAGRAPH OF THE BACKGROUND SECTION. “Given that most obstetric emergencies are often unpredictable, and that life-threatening complications occur in roughly 15% of all pregnancies, potentially every pregnant woman is at risk of developing a complication.”

3.) The last paragraph in the background section has to go into the method section.
THE LAST PARAGRAPH OF BACKGROUND HAS BEEN TRANSFERRED TO METHODS SECTION.

4.) More general information about circumstances in the slums (setting, surrounding, ethnicities etc.) is needed. Mind that this article will also be read by people who have never been in slums before! That would include that the distance from the next health facility is important as well as availability of means of transport.
MORE INFORMATION ABOUT THE SITUATION IN THE SLUMS HAS BEEN PROVIDED IN THE FIRST PARAGRAPH OF THE METHODS SECTION, THIRD SENTENCE TO THE END OF PARAGRAPH.

5.) International Organizations have been emphasizing maternal health in so-called developing countries since 2005 (MDG’s) and even before that (Safe Motherhood Initiative). These efforts should be mentioned in the introduction, in order to legitimate the study. The lack and need of reports on MM in slums should also be mentioned here.
AMENDED AS PROPOSED “Initiatives aimed at improving maternal health such as the Safe Motherhood Initiative (Nairobi, 1987); and the UN International Conference on Population and Development [ICPD] (Cairo, 1994) have previously been launched, but there has been little progress in improving maternal health, particularly in Sub-Saharan Africa”

Method section:
1.) “..questionnaire adapted from the verbal autopsy tool developed by World Health Organization.” A reference has to be quoted here. It is not sufficient to mention WHO without an appropriate reference. Where has this questionnaire been used before; is it standardized? The authors should consider an additional table displaying a rough overview of the questions concerned.
REFERENCE FOR THE VERBAL AUTOPSY HAS BEEN PROVIDED (REF 19)

2.) How long have the “trained interviewer” been trained and what was their level of education? Was only one, or were more interviewers involved? Where they part of the slum community? Could the participation of local interviewers lead to bias when questioning the persons concerned? Were study participants contacted beforehand in order to ask them whether they wanted to participate in
the study and to arrange a convenient time for an interview, if they were willing to participate? Were respondents given a time frame in order to decide whether to participate or not? How many of the considered participants refused to give consent? Did interviewers ensure that respondents were in a position to answer questions on this sensitive topic by explaining beforehand that answers to questions that made them feel uncomfortable should be refused? In fact, the interview process has to be explained more in detail.

A MORE DETAILED DESCRIPTION OF THE VERBAL AUTOPSY PROCEDURES HAVE BEEN GIVEN IN THE THIRD PARAGRAPH IN THE METHODS SECTION (Timing of VA, educational level of interviewers, VA training, etc).

3.) 10 (ICD10): a reference is needed. REFERENCE HAS BEEN GIVEN (REF 20)

Result section:
1.) “Table 1 shows the characteristics of female deaths, distinguishing between maternal deaths (during pregnancy or within 42 days of a pregnancy outcome), late maternal death (within one year of pregnancy outcome) and other, non maternal deaths.” Again, it is not clear: what is the definition of an early and late maternal death? Definitions + references on key issues are missing throughout the paper.

THIS HAS BEEN IMPLEMENTED IN THE ABSTRACT AND LAST SENTENCE PAGE 4, AND READS THUS “The ICD-10 definition of maternal death, “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or accidental causes”, was employed.” REF 20 MORE REFERENCES HAVE ALSO BEEN ADDED.

2.) “It is not clear whether the differences are due to measurement errors whereby the verbal autopsy tool over diagnoses HIV/AIDS…” Starting from that sentence down to the end of the result section: This part should go into the discussion section, as the authors are not presenting data, but already interpreting it.

RESULTS SECTION WAS REVISED AND ALL DISCUSSION POINTS WERE TRANSFERRED TO THE DISCUSSION SECTION

Discussion section:
1.) WHO and other agencies are emphasizing “skilled birth attendance for every pregnant woman”. Hence, it should be more emphasised that there is an international mandate on this issue. This would also help to legitimate the study.

THE POINT HAS BEEN EMPHASISED IN THE DISCUSSION, HIGHLIGHTING THE LOW PERCENTAGE OF MATERNAL DEATHS THAT DELIVERED WITH SKILLED ASSISTENCE.

2.) The authors are right when they state that pregnant women have limited access to emergency obstetric care. BUT: they will not seek care if their
knowledge about pregnancy and delivery is poor. It is known that most of obstetric complications occur because of delays. What are the causes of delay in such a setting according to the author’s experience? Does health education play a role? A study published in the Bulletin of the WHO in 2003 e.g. showed that at a community level, one additional year of education for household heads is associated with a 62% lower maternal death rate. What about cultural constrains? Do males in the family let pregnant women seek obstetric care when needed? Have interventions taken place to educate women in the area so far? The illiteracy rate and education in comparison to other studies should be discussed.

**THIS STUDY DID NOT ELUCIDATE THE RISK FACTORS FOR MATERNAL DEATHS AS THIS WAS NOT THE FOCUS. HOWEVER AN EARLIER STUDY IN THE SAME POPULATION IDENTIFIED PREDICATORS FOR SKILLED ASSISTENCE AT BIRTH- INCLUDING -maternal education, wealth, health education among others (REF 23)**

3.) “Finally, it is important to note that although most deliveries took place outside of a health facility, nearly all of them visited a health facility before death. This observation may imply poor quality or limited access to emergency obstetric care in this area. For most obstetric complications, timely access to life saving interventions is of paramount importance." Not only the distance from the next health facility is important but even more the availability of means of transport. Have the authors included means of transport in their assessments? Is the quality of medical care really that bad, or is it just the fact that women arrive so late at the facilities that medical personnel at the facility are just not able to intervene early enough? Maybe there are overwhelmed with cases that require emergency care.

**QUALITY OF EMERGENCY OBSTETRIC CARE FACILITIES WAS ASSESSED IN ANOTHER STUDY AND WAS FOUND TO BE REALLY BAD; LACKING ON STAFF, SKILLS, EQUIPMENT AND ESSENTIAL SUPPLIES. The slums are within 5 km of the main city hospitals and distance might not be a very big barrier but insecurity at night can be a big barrier. (REF-Ziraba)**

Furthermore, the reader needs to know how health facilities are equipped in this area. Do they contain the “eight essential obstetric functions” recommended by the WHO? If not, the implementation of these functions could be one intervention to improve the situation. 

**SEE COMMENT ABOVE**

4.) Most importantly the authors fail to consider a “way forward” from where they are now in their setting. What can we learn from the data to safe maternal lives in future? What do the results mean for decision makers in the health sector (politicians, public health experts etc?) What steps have to be taken to reduce maternal mortality in this population (education of women concerning obstetric danger signs, training for unskilled birth attendants, how can local resources be included in such interventions)? Where are gaps, how can they be filled? Hence, the emphasis of this paper should include “lessons learned” from the study and subsequent matching interventions. This is actually the most crucial point in this
paper. What are the lessons learned from the data for policy makers and public health experts in particular? What about organisations in these areas? Who is currently active and who could/should be involved in an interventional network in such a setting in the future (NGO´s, MoH, U.N. agencies??)?

**DISCUSSION SECTION HAS BEEN BEEFED UP TAKING IN ACCOUNT THE REVIEWER’S COMMENTS. WE HOWEVER RESTRICTED OUR RECOMMENDATIONS TO THE EVIDENCE FROM THIS PAPER. WE DID NOT ASSESS RISK FACTORS FOR MATERNAL MORTALITY.**

Minor essential revisions:
Table 1: a legend is needed to explain maternal, late maternal and non-maternal female deaths
*THIS HAS BEEN EXPLAINED IN THE METHODS SECTION. NON-MATERNAL DEATHS WERE REMOVED FROM THE TABLE ON THE SECOND REVIEWER’S RECOMMENDATION.*

Table 3: a legend is needed to explain the abbreviation NUHDSS
*THIS HAS BEEN DEFINED IN THE TEXT-ABSTRACT AND MAIN MANUSCRIPT*

**Level of interest:** An article of outstanding merit and interest in its field  
**Quality of written English:** Acceptable  
**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Reviewer 2: Olufemi Taiwo Oladapo**

**Reviewer's report:**  
1. Is the question posed by the authors new and well defined?  
This paper describes the burden of maternal mortality as derived by verbal autopsies of all female deaths in an informal settlement in Nairobi, Kenya. The questions posed by the author are not new but the topic is of public health significance and necessary for health policy makers in developing countries in our collective quest towards MDG-5. However, the second question is not well defined as the author compared the data derived from facility-based records with those derived from verbal autopsies within the community as against using the data “to assess maternal health experiences as captured by the facility health information system”.

**THE OBJECTIVE OF THE STUDY WAS TO ESTIMATE THE BURDEN AND IDENTIFY CAUSES OF MATERNAL MORTALITY. THE HEALTH FACILITY DATA WAS USED TO SUPPLEMENT THE VERBAL AUTOPSY DATA AND NOT TO ANSWER A SEPERATE RESEARCH QUESTION. The objective has been revised thus: “To estimate the maternal mortality burden and causes of maternal death in two slums of Nairobi, Korogocho and Viwandani”**

2. Are the methods appropriate and well described, and are sufficient details provided to replicate the work? No, see minor essential revisions. The definitions
of terms used in the project should be under the “Methods” section rather than the “Results” section. 
THIS HAS BEEN IMPLEMENTED. SEE FIRST PARAGRAPH PAGE 5

3. Are the data sound and well controlled? I consider some information unnecessary. Some elements of the “Discussion” section can be found in the “Results” section. e.g. Page 9, last sentence.

RESULT SECTION HAS BEEN REVISED AND ALL DISCUSSION POINTS HAVE BEEN PUT IN THE DISCUSSION SECTION. ALSO SEE COMMENT UNDER RESPONSE TO REVIEWER 1

4. Does the manuscript adhere to the relevant standards for reporting and data deposition? Yes, although some aspects of the discussion found their way into the Results.

SAME AS ABOVE

5. Are the discussion and conclusions well balanced and adequately supported by the data? No, this is because the data from the health facilities for the period was less than 50%, therefore it might not be too appropriate to conclusively infer from the comparison of the verbal autopsy and facility-based data. I want to assume that the general lack of similarity between the facility and the verbal autopsy data suggests that one of them is completely inaccurate.

ALTHOUGH 47% OF THE RECORDS WERE MISSING, IT WAS THE BEST AVAILABLE DATA. INDEED THE TWO DATA SOURCES CONCURRED ON THE MAJOR CAUSES OF MATERNAL DEATHS AND ONLY DIFFERED IN THE RANKING OF IMPORTANCE. WE WANT TO ATTRIBUTE THIS TO HOW THE TWO SYSTEMS CAPTURE THE DATA RATHER THAN INACCURACY OCCASIONED BY MISSING DATA OR THE VERBAL AUTOPSY TOOL WHICH HAS BEEN USED AND VALIDATED IN SEVERAL SETTINGS FOR THE SAME PURPOSE. WE ARGUE THAT BOTH DATA SOURCES HAVE WEAKNESS BUT ARE COMPLIMENTARY IN OUR SETTING WHERE ACCURATE DATA ON MATERNAL MORTALITY ARE VERY SCARCE.

6. Do the title and abstract accurately convey what has been found? The title appears appropriate although it is not in the Reproductive Health format. The abstract lacks important details from the findings of the study e.g. the total number of pregnancy-related deaths (early and late). The comparison of facility-based data and DSS verbal autopsy interviews does not support the usefulness of verbal autopsy as the tool to obtain “the much needed data on maternal mortality…in the developing world" as suggested in the concluding part of the abstract.

THE ABSTRACT HAS BEEN REVISED TO INCLUDE A BIT OF DETAIL IN THE METHODS AND RESULTS SECTIONS. THE CASE WE WERE MAKING WITH THE TWO DATA SOURCES WAS NOT TO ADVOCATE FOR ONE OVER THE OTHER BUT RATHER THE COMPLIMENTARY ROLE. FOR EXAMPLE IN COMPUTING MMR, THE VERBAL AUTOPSY APPROACH HAS A DENOMINATOR
WHICH IS HARD TO GET IN A HOSPITAL SETTINGS. ALSO GIVEN THE FACT THAT MANY DEATHS OCCUR OUTSIDE OF THE HEALTH FACILITIES, THE PICTURE CAPTURED BY HEALTH FACILITY RECORDS IS IMCOMPLETE AND MIGHT EXPLAIN THE DIFFERENCES IN THE RELATIVE MAGNITUDE OF THE VARIOUS CAUSES OF MATERNAL DEATHS FOR THE TWO DATA SOURCES.

7. Is the writing acceptable?
Acceptable if the length of the paper can be reduced to provide concise information and make inferences based on available data.

PAPER HAS BEEN SHORTENED AND INFERENCES REVISED ACCORDINGLY TO BE IN LINE WITH STUDY FINDINGS. SEE CONCLUSION SECTION

- Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)
  Abstract
  Needs to be shortened particularly the background section. The method should provide more information e.g. about the questionnaire used, the period surveyed, etc.
  MORE DETAILS ON METHODS HAS BEEN PROVIDED IN THE ABSTRACT.
  Results: See comments under number 6 above.
  Conclusion: See above.
  Background
  The readers can do without the first paragraph. Authors need to show why it is important in Kenya or why the methodology for maternal mortality measurement may be a better option in that environment. Second aim of the paper needs to be revised.
  BACKGROUND SECTION HAS BEEN REVISED TO BE MORE CONCISE. THE OBJECTIVE HAS ALSO BEEN REWORDED FOCUSSING ON MEASURING MMR AND IDENTIFYING CAUSES OF MATERNAL DEATHS.

Methods
Provide information on the background of the study area
  METHODS SECTION HAS BEEN BEEFED UP GIVING MORE DETAIL ON THE SLUM SITUATION. SEE PAGE 4
Results
Removal of non-maternal deaths from the entire paper is likely to provide a more straightforward information. Providing characteristics for non-maternal death may not be very necessary for readers to understand the content of the paper.
Besides, it was not the primary aim of the paper.

ALTHOUGH WE STRONGLY FELT THAT NON-MATERNAL DEATHS CHARACTERISTICS WOULD HELP THE READER TO COMPARE AND PUT CONTEXT TO THE FINDINGS, WE HAVE REMOVED THEM AS PER REVIEWER’S ADVICE.

Discussion: A bit long. Should not be longer than one-third of the entire manuscript. The first paragraph on page 12 could be deleted completely without losing any important information. Conclusion needs to be revised. It appears
there are too many assumptions on the reasons for the discrepancies between the facility records and the verbal autopsies. Should be based on what was found only.

THE DISCUSSION SECTION HAS BEEN REVISED AND MADE MORE CONCISE. CONCLUSIONS HAVE ALSO BEEN TONED DOWN TO MATCH FINDINGS IN THE STUDY AS ADVISED.

Tables: Data on female maternal deaths should be removed. Table 4: The same cause of maternal deaths for DSS derived data and facility based data should be on the same line to provide room for visual comparison. It is a bit difficult to appreciate the differences noted by the authors as it is.

DATA ON OTHER FEMALE DEATHS HAS COMPLETELY BEEN REMOVED. THE CAUSES OF DEATH FOR THE TWO DATA SOURCES HAVE BEEN ALIGNED FOR EASE OF COMPARISON.

- Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct). Repetitions with respect to the methods used to assess the cause of maternal death under “verbal autopsy” within the record section of the manuscript. The adapted verbal autopsy questionnaire should be included as appendix for readers to independent assess the internal validity of the study. TABLES HAVE REVISED AND LABELED MORE CLEARLY. VERBAL AUTOPSY QUESTIONNAIRE HAS BEEN ATTACHED TO THESE COMMENTS.

Grammatical errors: Kindly note that the most verbs should be written in past tense.
- Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)
Level of interest: An article of importance in its field
Quality of written English: Needs some language corrections before being published
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests:
I declare that I have no competing interests