Author’s response to reviews

**Title:** Approaches and impact of non-academic research capacity strengthening training models in sub-Saharan Africa: a systematic review

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**Version:** 2  **Date:** 25 March 2015

**Author’s response to reviews:** see over
March 25, 2015

To the Editorial Board of Health Research and Policy Systems:

I am pleased to re-submit our revised manuscript titled “Approaches and impact of non-academic research capacity strengthening training models in sub-Saharan Africa: a systematic review” along with point-by-point responses to the reviewers for consideration of publication in Health Research and Policy Systems journal. In this study we explored strengths and weaknesses of various research capacity strengthening trainings in non-academic settings and we provide critical factors to consider for future development of successful programs.

We have submitted the first version of the manuscript in July 2014 and our reviewers found it interesting so we were invited to re-submit the revised manuscript. Reviewers’ comments were comprehensive and helped us to improve of the manuscript. In fact we have provided point-by-point response and made corresponding changes in the manuscript and we believe that the revised paper will achieve its impact. Changes in the manuscript have been underlined and responses to the reviewers are contained in subsequent pages of this document.

We believe that this review will be of interest to readers of Health Research and Policy Systems for the following reasons: First, the paper provides a summary of existing approaches of non-academic research capacity strengthening activities which stimulates ideas for other organizations interested in this mission. Second, one of the important messages of this paper is to encourage organizations with existing research capacity strengthening activities to share complete information about their programs in public domain to help the replicability.

In conducting this systematic review, we have learned much about research capacity strengthening activities and we are convinced that publication in Health Research and Policy Systems journal will disseminate these lessons to the interested audience. Looking forward to your feedback.

Sincerely,

Lambert Mugabo

Corresponding Author

Note to reviewers: I am thankful for your thoughtful and useful review of this manuscript. Below are responses to each comment and changes in the manuscript are highlighted.
First Reviewer's report
Title: Approaches and impact of research capacity strengthening training models in sub-Saharan Africa: a systematic review
Version: 1
Date: 1 October 2014
Reviewer: Alan Boyd

Reviewer's report:

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

Revision 1:
The introduction needs to better situate the focus on individual capacity strengthening through training within the wider context of the need for capacity strengthening at organizational and systems levels (E.g. through provision of infrastructure, networking), and the provision of other types of capacity building for individuals (E.g. mentoring – this is mentioned later in the article, but not drawn out sufficiently). Either the research needs to be extended to cover more ground (see below), or the title and abstract need modifying to reflect the actual scope of topic which has been investigated, which is narrower. The use of “models” in the title doesn’t seem accurate either.

Response:
Thank you for this feedback, and we understand the reviewer’s concern. We agree that research capacity strengthening should include activities beyond the trainings but feel that each of the examples provided (networks, mentorship) could be a focus of a review. Therefore, we have decided to keep the focus of our review to include trainings and to clarify this point to the reader, we have made the following changes.

Title: We have changed the word “models” to “training models” and this now reads as:
“Approaches and impact of non-academic research capacity strengthening training models in sub-Saharan Africa: a systematic review”

Abstract background: We have added words to show that research capacity strengthening is more than just trainings but that we will focus on the trainings. This now reads as: “In the last decade, non-academic research capacity strengthening trainings in sub-Saharan Africa, coupled with developing research infrastructure and providing individual mentorship support, have been used to build skills of health workers.”

Finally, in the background of the paper: We have added words to show that research capacity strengthening is more than just trainings but that we will focus on the trainings. This now reads as: “Strengthening research capacity in non-academic settings encompasses a variety of activities including trainings to support individuals to acquire research skills in addition to developing research infrastructure at an institutional level, creating research partnerships/networks and providing individual support and mentorship. In this paper, we focus specifically on the training activities in the research capacity strengthening programs.”
Revision 2:
I am not sure that the review has found all of the relevant literature. A couple of possible examples that I am aware of:


I would like to be reassured that the search/inclusion criteria have covered the field.

Response:
We understand your concern that some relevant articles may have not been captured. In this review we have made efforts to capture relevant articles including using multiple terms such as capacity strengthening, capacity building and capacity development, etc. In addition, we used a snowballing process. That said, the two aforementioned articles were captured through the initial search of this review and were dropped after first review. Per your recommendation, we took the opportunity to review them again and provide explanations of why they were included in this review.

In the first article Vian et al. focuses on the partnership between Pfizer Corporation and International AIDS Vaccine Institute (IAVI) through Global Health Fellows program. The eight fellows mentioned in the article have contributed to IAVI work and local partners through developing in-house training modules and conduct GCP training, developing monitoring systems, data management, and preparation for audit and inspections. However, the training activities were not described at length. Though we agree that there was likely strengthening of research capacity, the article does not comply with the first inclusion criteria of the review in that it does not explicitly describe research capacity strengthening activities.

In the second article, Bates et al. discuss training on HIV testing and counselling, increased internet availability, training on community health, etc. This also does not describe in detail the training activities and so was not included.

Revision 3:
Related to this, not including grey literature is a major limitation in my view, in a piece of research that aims to describe the field and does not conduct any explicit quality assessment of the evaluations included in the review.

The article correctly identifies limitations of the review, but then casts these as limitations of previous researchers and evaluators, in not providing sufficient contextual information and not publishing in academic journals. In doing this, there is no recognition of the format of academic journals (albeit less so these days, with online publishing of tables, datasets etc.) constraining authors’ reporting of context. In my view, instead of bemoaning this, which is of little value, the researchers should have engaged with the grey literature.

Response:
We agree that the grey literature contains useful information. However, in this review we focused on peer-reviewed articles for several reasons. First, before publication, a peer-reviewed article goes through a rigorous process which involves an external review. We believe this is one (though not always perfect) way to ensure the article is a more reliable source of information. In addition, one of the key messages in this review is that we want to encourage peer-review publications as a way of disseminating best practices and lessons learned. When we share information on our programs in the grey literature, it can be difficult for other programs to know about these activities. To emphasize our motivation and our recommendation for better dissemination, we have added the following: “We focused on articles published in peer-reviewed journals as we believe such publications will ensure broader dissemination and possible replication of activities than grey literature alone. The limited number of articles and the limited detail in the articles serves as a call-to-action for individuals developing and leading such research capacity strengthening activities to ensure that approaches and lessons learnt are shared more widely and with enough details to facilitate the replication of their activities in other settings.”

Revision 4:
The lack of quality assessment makes it hard to know how much credence to place in the challenges that the evaluations, and hence the review, identify. The review appears to take the evaluations at face value rather than critiquing them, although later in the article the need for better evaluations is referred to. More critique and analysis of the evaluations would strengthen the article and help to ground the conclusions.

Detailing numbers of outputs from the capacity building (Eg 357 research studies conducted) is not very helpful as a way of indicating impact. How many individuals received training, and over what periods were the outputs measured? Some of this information is provided in Table 1, but it could be better structured even here. The presentation needs rethinking.

Response:
We have addressed this issue in two ways. First, we have changed the presentation by splitting previous Table 1 into two tables with current Table 2 focusing on assessment of the evaluations using Cook’s framework. Now Table 2 provides much detailed information about evaluations. Shorter period evaluations are separated from longer period evaluations. Study’s evaluation approach gives information on whether evaluation framework was used, what evaluation method and tools were used. It also provides information on specific indicators which help to measure of effectiveness of RCS based on Cooke’s framework.

In addition we provide a critical view of evaluations under discussion section. It reads: “Self-report surveys, pre/post-tests, interviews, email questionnaires, system approaches were all found to have been used. Self-report surveys and pre/post-tests were used by shorter trainings and
administered during or shortly after the completion of training program. That period was not enough for such training to have had an impact on participants rather they reported on perception of participants about the course and whether changes in the knowledge have occurred. Longer trainings on the other hand were more likely to follow-up participants through implementation of research projects over which additional technical assistance and mentorship are provided. Specific deliverables for most of those trainings which include writing a protocol and/or writing and publishing a manuscript enable them to determine the level of their success. Understandably long period of implementation in addition to both technical and financial support provided to complete research projects is likely to increase the number of protocols written, research projects conducted and published, influence change in policy and practices among others. However much needs to be done to fully understand impact of such capacity strengthening trainings. For instance better baseline assessment using comprehensive tools such as those employed by systems approach [26] are needed and whether there were other outside enabling factors is not well reported.”

Revision 5:
The findings need to be assessed in the light of previous research, which has identified similar challenges for research capacity strengthening. The analysis could usefully reflect on what is actually different about non-academic training compared with academic training, based on these studies. Not that much, it would appear to me ….

Response:
Thank you for the suggestion. We have added the following to the discussion section: “The challenges to research capacity strengthening identified in this review have been observed by others. Several studies report limited funding for research[6, 8, 27, 29, 30], no dedicated time for research [3, 27, 30] and lack of mentorship and institutional support [8, 13, 28]. In addition, challenges identified but not discussed in papers in this review include difficulty in carrying out quality evaluation particularly for long term outcomes and the imbalanced focus on research methods and process at the expense of research advocacy, promotion, negotiation and resource mobilization[31]. These challenges are complex and call for sustainable partnerships and commitment to the goals of research capacity strengthening in Africa.”

“While academic and non-academic training programs face similar challenges, some of the challenges such as lack of institutional support or research leadership are more pronounced in non-academic settings. Our review identified one program with institutional support [13] that also had the significant and quantified impact on society through policy and practice changes. We believe that research developed as part of academic trainings is more likely to be published because of the existence of such support. Furthermore, trainees in academic program tend to have time separated out for research and thus do not face the similar challenge of balancing work and research training at concurrently. Academic programs may also be appealing because of the existing accreditation process that is difficult for the non-academic program.”

However, our background provides more motivation for our choice to focus on non-academic training as it reads “However, there are several limitations to academic programs as the sole means for capacity strengthening in sub-Saharan Africa. They can be long to complete and expensive, and they present potential risk of drawing national researchers from program settings
into academia, especially if no strong partnerships exist between academia and local programs [3]. Further, academic research tends to miss operational perspectives from programs [3].”

**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)

**Discretionary revision 1:** I would have liked to have seen more justification of the restriction to sub-Saharan Africa, or, preferably, an extension of the research to cover developing countries in Asia and Latin America. Why would research capacity strengthening of people in such countries not be of interest, especially considering the “descriptive” aim of the review?

**Response:** We agree that capacity strengthening in Asia and Latin America would be of interest but each region faces unique challenges in terms of existing infrastructure and resources. We highlight this and recommend exploring research capacity strengthening activities in those areas with the following sentence “We thus recommend further research into feasible methods of tracking medium term and long term research impact. This paper focused on non-academic activities in sub-Saharan Africa because the resources and challenges are unique compared to other contexts. However, future reviews could explore activities in other regions.”

**Discretionary revision 2:** The description of the nine search terms is repetitive (“research and Africa and health” appears numerous times) and doesn’t communicate the form of the search very well. A diagrammatic representation would be better.

**Response:** Thank you for this recommendation; we have now added a visual representation in Figure 1 (see manuscript).

**Discretionary revision 3:** I would have liked the authors to have identified topics/questions for further research as part of their discussion.

**Response:** As per your recommendation we have identified topic for further research and we phrased that in the conclusion as follow “We thus recommend further research into feasible methods of tracking medium term and long term research impact. This paper focused on non-academic activities in sub-Saharan Africa because the resources and challenges are unique compared to other contexts. However, future reviews could explore activities in other regions.”

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**Second Reviewer's report**
Title: Approaches and impact of research capacity strengthening training models in sub-Saharan Africa: a systematic review
Version: 1
Date: 27 November 2014
Reviewer: Helen Smith

Reviewer's report:
A potentially interesting paper; it is of benefit to others considering research capacity strengthening activities to learn about which models and approaches are successful, under what conditions, and how best to evaluate impact. However I am not sure in its current format the paper fully achieves this. It needs a conceptual framework that outlines the different factors that influence the impact of research capacity strengthening programmes; this would help to inform the analysis and make it more meaningful.

Major Compulsory Revisions

Revision 1:
The review is missing a conceptual framework to organise the arguments around research capacity strengthening in SSA, and to help structure the analysis. What definition of research capacity strengthening (CS) is being used in the paper? And how does this compare to broader scientific capacity strengthening? I think sometimes the two terms are confused in the paper. The background/conceptual framework also needs to acknowledge different levels of capacity strengthening; currently the paper assumes CS involves individual skills and training only. Costs of implementing CS programmes, and the timing of programmes are also important considerations for impact. There are plenty of published models and frameworks for evaluating impact of CS programmes, and the authors need to situate their review in the context of these.

Response:
Thank you for this feedback, which is very similar to comments from Reviewer 1. We agree that it is important to define research capacity strengthening. Our paper uses the conceptual framework developed by Pang et al and further highlighted by Lansang et al, which shows one among the functions of research capacity strengthening as creating and sustaining resources.

We have addressed this feedback in the title, abstract background and the paper background to emphasize our focus on trainings while acknowledging the broader scientific approaches to CS. We focused on individual trainings since this is the foundation of quality research products, playing a critical role in building the human capacity needed for research production.

Title: We have changed the word “models” to “training models” and this now reads as: “Approaches and impact of non-academic research capacity strengthening training models in sub-Saharan Africa: a systematic review”

Abstract background: We have added words to show the research capacity strengthening is more than just trainings but that we will focus on the trainings. This now reads as: “In the last decade, non-academic research capacity strengthening trainings in sub-Saharan Africa, coupled with developing research infrastructure and providing individual mentorship support, have been used to build skills of health workers.”

Finally, in the background of the paper: We have added words to highlight the conceptual framework we use and show that research capacity strengthening is more than just trainings but
that we will focus on the trainings. This now reads as: “Strengthening research capacity in non-academic settings encompasses a variety of activities including trainings to support individuals to acquire research skills in addition to developing research infrastructure at an institutional level, creating research partnerships/networks and providing individual support and mentorship. In this paper, we focus specifically on the training activities in the research capacity strengthening programs.”

We agree that a variety of frameworks for evaluating impact of CS programmes exist. In Table 2, we show that the papers reviewed used a variety of evaluation approaches. Most however, did focus on research outputs. We used an evaluation framework developed by Cooke J that highlights six principles on individual and team trainings component of CS activities. To clarify, we have added words in the results in the section of evaluation methods that now to now read: “Of the 14 trainings, 6 fell in the category of short-term evaluation period and 8 in the long-term evaluation period. For the short-term evaluation period trainings, two trainings were not evaluated and only one (16.7%) used a recognized framework for evaluation. These trainings used quantitative evaluation methods, mainly surveys and tests. Of the trainings with long-term evaluation periods, 37.5% (n=3) used a framework. All of these trainings were evaluated, using quantitative or qualitative methods including interviews, surveys, and systems approach framework”.

We agree that cost and timing of the CS activities are important considerations and we addressed these issues in the discussion. “Alternatively, trainings which are more comprehensive yield better outcomes in terms of the number of research projects conducted and resulting publications. They are offered over a longer period and often require ongoing mentorship/support. The demands on both human and financial resources make such trainings more expensive and time consuming and therefore less accessible to many organizations.”

**Revision 2:**
The methods of the review need further explanation. It is usual to demonstrate the rigor of a systematic review by including description of inclusion criteria, study selection process, assessment of study quality, and analysis and synthesis methods – all of these are missing or not elaborated sufficiently in the methods section. An example search strategy used to search one database would be helpful to illustrate how terms were combined; there is no mention of which databases were searched. The inclusion criteria should be described, along with who was responsible for applying them, how this was done, and what decisions were made and why.

**Response:**
We understand your concern and we have restructured the methods section by including sub-sections-identification of data sources, study selection, data extraction and analysis- and we provide more explanation under each.

Under identification of data sources it now reads as follow “The PubMed database was searched by the principal investigator (LM) for articles describing research capacity strengthening training activities in Africa. The following search terms were used (illustrated in Figure 1): words that indicate an increase in competency (“building”, “development”, “strengthening” and “training”) combined with “capacity” as well as the terms “Africa” and “health” and “research”. Further
search criteria were: 1) papers published between 2000 and 2013, 2) both abstract and full paper available in English. The results were saved into a Mendeley library."

Study selection in now better clarified. It reads as this: “The titles and abstracts were reviewed by the principal investigator (LM) to ensure they met the following inclusion criteria: 1) research capacity strengthening training activities are explicitly described, including information on program duration, target audience, immediate program outputs and outcomes, 2) all or part of the training program took place in sub-Saharan African countries, and 3) the training activities are not a formal academic program. When all criteria were met, or more information was needed, articles were retained for full text review (Figure 2). Articles were also assessed after full text review and dropped if not meeting all eligibility criteria. Articles not captured in the original search were added, either because they were known to the authors or were identified through a snowballing process of reviewing the reference list of retained articles.”

Further, sub-section about data extraction and analysis now reads as this: “Two independent reviewers extracted data from the full text articles, which was captured in a three-part data collection form. The form was developed based on the research team’s experience in conducting research strengthening activities and adapted based on themes that emerged during the review of articles. The first part covered program description information, including: name of the program, program duration, target audience, objectives of the training, frequency of the training, qualification of the trainers, resources required for the training and where the training took place. The second part used Cooke’s evaluation framework that is to assess the effectiveness of the trainings[9]. Cooke’s framework was chosen because it comprehensively describes the indicators for individual training in research capacity building based on six principles: research skills, practice implications, partnerships, dissemination, infrastructure and sustainability. We grouped the trainings based on their evaluation period. The short term evaluation period was defined as evaluations conducted up to 18 months after the training. Long-term evaluation period was any period greater than 18 months.”

“Finally, data were extracted on challenges faced, innovations used, and recommendations proposed for future programs. Data extractions from both reviewers were entered into a Microsoft Access database and compared for consistency. When inter-reviewer discrepancies were found, they were resolved by a third party review of the paper.”

**Revision 3:**
What types of study designs were included for each objective of the review? This usually determines the analysis and synthesis methods used. For example, for the objective on ‘challenges’ what types of study were included and what method of synthesis was used and why? The reference to independent data extraction and ‘consistency’ of data is not clear – what is meant by consistency?

**Response:**
First we were looking for information which would help understand dynamics within research strengthening training activities. Who were involved in the training, what target competencies are covered and with which aims, what resources are required; that would describe how people approach training activities in different ways. Evaluation approaches of these trainings were
explored. Specifically data were collected on tools used for evaluation, when the evaluation took place and what were the results of the evaluation. Also challenges as well as innovations to overcome those challenges, described by the authors, were captured. To clarify we have added the following sentence under data extraction and analysis “The form was developed based on the research team’s experience in conducting research strengthening activities and adapted based on themes that emerged during the review of articles.” We also wanted themes and sub-themes that we thought would help us achieve our aim of encouraging people involved in such activities to share that critical information that would enable replication of their activities to other settings. For each objective we described what was reported in each paper in Table 1 and summarized when similar themes or responses emerged in the results. Since not all papers reported on every element of interest, we provide references for each theme we report on.

Secondly, by independent data extraction we mean that two individuals reviewed articles separately from one another and collected data using identical form. Then afterwards data collected by the two reviewers were compared to check if data were identical, that is what meant by consistency. We have restructured the phrase and it reads as follow: “Data extractions from both reviewers were entered into a Microsoft Access database and compared for consistency. When inter-reviewer discrepancies were found, they were resolved by a third party review of the paper.”

Revision 4:
It is usual in a review to describe the characteristics of included studies at the beginning of the results – for example a summary of where these programmes were implemented, when, by whom, and what was their main purpose would be helpful before launching into the review findings by objective.

Response:
As per your recommendation we have added this paragraph to result section under description of RCS programs. It reads as follow: “Fourteen research capacity strengthening trainings described in these papers include four which started in 1990s [10–13] and the rest from 2000 or later [14–21]. Most programs took place in Southern Africa region[10, 12, 13, 20] followed by Uganda[16, 18]. Malawi[21], Nigeria[14], Cameroon[17], and Democratic Republic of Congo[19] are also represented. For two trainings, some of the training took place in the United States of America [15] or Europe [11]. Most of the training activities were implemented multiple times [10–16, 20, 22].”

Revision 5:
For objective 1 relating to the approaches and models, it would be helpful for others considering such approaches if the authors could provide critical evaluation of the sources of funding of these programmes and their costs, what level of capacity they targeted, whether the approaches were informed by any theory of change or logic model, and the nature of the partnership or collaboration in which the training is carried out.

Response:
Thank you for this feedback. In Table 1 we have added a column for funding and partnerships that report cost of the training if reported and sources of funds and partners. In the Table 2 it is also reported if any framework or theory of change used in the paper was reported.

From the Table 1, you will observe that very few programs report program implementation costs, although many mention sources of funding and partnerships. For levels of capacity targeted, we present the levels of the targeted trainees in Table 1, and state the following in the results:

“Trainees of these programs were of very different backgrounds and qualifications. Participants included clinical staff, health officers and managers working within health programs, university students and faculty, and experienced researchers. Generally, participants were selected based on their potential to influence health systems and management processes, ability to conduct research activities, and their involvement or expertise in the field. Only two training programs had a rigorous selection process whereby criteria such as years of experience in research ethics, number of publications, institutional support, and personal commitment were considered [15, 23]. For eleven of the 14 programs, participants were from the country where the training took place. However, three of the programs required out-of-country travel of the participants to the training site. For these, one was in sub-Saharan Africa [10] and two in Europe or USA [15, 23].”

We have added this sentence to page 13 on the discussion to reinforce these points: “Most of the studies in our review did not report on the program implementation costs. When reported, these costs varied widely between $500 - $20,000 per project depending on scope of the project, location and duration of training. While actual costing of programs is difficult, reporting of the estimated expenditure are important to other people planning these training activities, particularly because resource allocation is among the major barriers in research capacity strengthening activities. Except for one program that was national program[21], programs primary relied on North-South partnerships for funding highlighting the need for strengthening partnerships with more focus on South research agenda [25] as well as galvanizing national resources and increasing South-South research collaboration.”

**Revision 6:**
For the synthesis of methods used to evaluate CS activities, this currently contains very little analysis of the methods used…it would be informative to synthesize in addition - what evaluation design was used, what was the purpose of the evaluation, and was the design adequate, what monitoring and evaluation tools were employed to assess impact, was the evaluation only at endline or were more sophisticated monitoring tools used? These aspects of impact evaluation are currently widely debated in the literature.

**Response:**

We have addressed the issue of evaluation approach by creating Table 2 based on Cooke’s framework to assess the quality of evaluations. It provides details information about evaluations. Shorter period evaluations are separated from longer period evaluations. Study’s evaluation approach gives information on whether evaluation framework was used, what evaluation method and tools were used. It also provides information on specific indicators which help to measure of effectiveness of RCS.
Also in Table 1 we have added information on overall training goal in the column of training goal and specific competencies. Further, we provide a critical view on evaluation approach on page 14. It reads “Self-report surveys, pre/post-tests, interviews, email questionnaires, system approaches were all found to have been used. Self-report surveys and pre/post-tests were used by shorter trainings and administered during or shortly after the completion of training program. That period was not enough for such training to have had an impact on participants rather they reported on perception of participants about the course and whether changes in the knowledge have occurred. Longer trainings on the other hand were more likely to follow-up participants through implementation of research projects over which additional technical assistance and mentorship are provided. Specific deliverables for most of those trainings which include writing a protocol and/or writing and publishing a manuscript enable them to determine the level of their success. Understandably long period of implementation in addition to both technical and financial support provided to complete research projects is likely to increase the number of protocols written, research projects conducted and published, influence change in policy and practices among others. However much needs to be done to fully understand impact of such capacity strengthening trainings. For instance better baseline assessment using comprehensive tools such as those employed by systems approach [26] are needed and whether there were other outside enabling factors is not well reported.”

Revision 7:
The section on challenges to research CS activities is very brief, seems to skim over quite complex issues related to the feasibility of research capacity strengthening activities and doesn’t appear to distinguish between challenges faced by those providing CS activities, or the recipients; perspectives on the value of these activities as well as the potential challenges to implementing and sustaining them are likely to vary depending on the standpoint of different actors. The source of the recommendations and innovations is not clear – is this author opinion or based on information in the papers reviewed? Please consider the feasibility of some of the suggestions, i.e. ‘provide essential resources such as internet’ – this is not an easy or straightforward solution, who would fund this? How would providing additional human resources alleviate the challenge of insufficient time for research? In busy clinical environments it is difficult to release staff for research activity. Developing institutional infrastructure and leadership for research is a huge resource intensive long term activity – and whose responsibility is it?

Response:
Thank you for the feedback. Now Table 3 clarifies who faces what challenge and source of information is referenced. Now the table distinguishes challenges faced by recipients of training and those faced by organizers or facilitators. Also in order to distinguish information from papers reviewed and author’s ideas we provide references for each challenge and innovation or recommendation from the papers reviewed. We have also changed the text to result section under challenges, innovations and recommendations. It now reads as this: “This review identified major themes regarding challenges to research capacity strengthening activities and corresponding innovations and recommendations to address the challenges are suggested either from papers reviewed or authors (Table 3). Common challenges to capacity strengthening are lack of mentorship and institutional support [10, 13, 16, 18, 20, 21, 23]; insufficient time for research activities and drop out [10, 16, 18, 20, 21]; lack of sufficient budget for research.
activities [11, 13, 18, 23]; poor research infrastructure[12, 13, 17, 18, 23]; and difficulty in publishing to international journals [11, 21, 23]. Three papers did not report any challenges [16,18,21].”

“Challenges faced by participants are distinguished to those faced by facilitators and organizers. On the one hand participants who lack support and mentorship from supervisors and managers are more likely to drop out of the training or their research projects are likely are delayed. On the other hand training organizers and facilitators find it difficult when participants are pulled out of the training because of other work responsibilities particularly when training organizers and organization where a participant works do not have a memorandum of understanding. Infrastructural challenges such as poor internet, inadequate space and equipment affect both participants and facilitators’ performances. Also when participants have heavy workloads they are likely to drop out of the training which affects trainers as well as organizers who had invested effort. Lack of funding implies that any research requiring funds will not be done and training activities could be hampered for example when participants need transport and do not have money. For organizers lack of funding could mark the end of training activities otherwise they face shortages of materials and facilitators, and poor infrastructure.”

“Various recommendations and innovations are proposed to address the challenges to research capacity strengthening. Institutional support and mentorship is achieved in different ways such as provision of mentorship and supervision visits by programme managers [10, 16], developing strong professional network [15], and seeking commitment from stakeholders [13, 16, 18]. Increased time for research [18, 23], suitable training schedule [18], and creating web-based training helps to tackle the challenge of insufficient time. Building more funding resources for research activities [11], embedding research into a health program[21], and integrating courses into existing curriculum [16, 20] are recommended as strategies to address lack of funding. The challenge of publication could be addressed through provision of mentorship on publication process [24] and finding other means of dissemination than international journals [21], for example through special meetings with stakeholders. Provision of further training to improve writing skills of young researchers would increase the likelihood of having manuscript accepted for publication.”

We agree that some of innovations and strategies recommended might be not easy or straightforward. However since we provide reference to the source of that information, we believe that this opens up debates from which feasible solutions could be identified and adopted.

In addition we have added discussion around challenges which reads as follow: “The challenges to research capacity strengthening identified in this review have been observed by others. Several studies report limited funding for research[6, 8, 27, 29, 30], no dedicated time for research [3, 27, 30] and lack of mentorship and institutional support [8, 13, 28]. In addition, challenges identified but not discussed in papers in this review include difficulty in carrying out quality evaluation particularly for long term outcomes and the imbalanced focus on research methods and process at the expense of research advocacy, promotion, negotiation and resource mobilization[31]. These challenges are complex and call for sustainable partnerships and commitment to the goals of research capacity strengthening in Africa.”
Also, to your question about providing sufficient human resources: By providing additional human resource, Zachariah et al (2011) meant re-allocation of staff, liaising with collaborating partners, including NGOs and implementing agencies, to support the programme with additional staff, or creating (a) new and permanent research post(s).

For your question about these activities in a busy environment: We have experience about research training in busy clinical environment and one possible ways forward is to provide alternative option in web based modules for those who miss meeting classes to catch up.

Further, we agree that developing institutional support for research activities is long term and costly; however, it is a necessary component for the sustainability of research capacity strengthening activities and an important consideration for non-academic institutions that are considering research capacity building. However, still without identifying who bears what challenge and who is responsible for which recommendation such as provision of internet access, we have left these open to our readers as critical components for a successful trainings that they would need to consider and innovate around.

Revision 8:
In the discussion reference is made to debate about ways of evaluating the impact of research capacity strengthening activities and whether this should be measured in number of papers published or changes to policy or practice – the important point here is that the measure used depends on the purpose of the CS activity (and the purpose of the evaluation). Refer to previous comment about the differences between research capacity strengthening (ability to undertake and disseminate research) and scientific capacity strengthening (ability to support and make use of research and scientific outputs in policy decisions).

Response:
We have made changes to strengthen the discussion. On page 14 it now reads as follows: “The evaluation metrics for research capacity strengthening programs are debated in the literature. Some suggest that success should be measured in terms of papers published [27]; however, this implies that writing a paper is the ultimate goal for the training or target competency desired by the individual. Others advise that change in policy and practice should be the end goal of research capacity strengthening activities in order to improve the quality of service delivery [28]. There are a few training programs that cover all necessary competencies to write and publish a research paper which is also an indicator of success. To achieve that requires not only substantial resources in terms of trainers and mentors, time, and money but also strong candidates and limiting the number of training participants. Also, using research to change policy is difficult, requiring ongoing engagement and co-operation between all stakeholders, and documenting such change in a concrete and objective way is even more challenging. Alternatively, Harries et al [21] advocate for embedding research training activities into existing health programs. This suggests that training is budgeted for as any other activity of the program and oftentimes participants in that training are staff who know and understand and work within health programs.”
Minor Essential Revisions

**Minor revision 1:** The term ‘capacity building’ used in the title and throughout the paper implies that programmes are starting from scratch, ‘building’ a new structure or platform. For research capacity. However, more recent conceptualisation of research capacity emphasizes the importance of ‘strengthening’ or ‘developing’ capacity, acknowledging that a level of capacity exists already in health programmes; therefore ‘capacity strengthening’ is a more commonly used and acceptable term. I would encourage the authors to consider this.

**Response:** We have made that change. Now capacity strengthening is used throughout the paper.

**Minor revision 2:** In the abstract the authors refer to ‘systematic review’ and ‘careful review’ without actually elaborating the actual methods of the review. The only method described here is literature searching.

**Response:** We have reformulated the method paragraph of the abstract and it reads as follow: “PubMed database was searched using nine search terms and articles were included if: 1) they explicitly describe research capacity strengthening training activities, including information on program duration, target audience, immediate program outputs and outcomes, 2) all or part of the training program took place in sub-Saharan African countries, and 3) the training activities are not a formal academic program. Other search criteria were 1) papers published between 2000 and 2013, 2) both abstract and full paper available in English. A data extraction form was developed based on the research team’s experience and adapted based on themes that emerged during the review of articles.”

**Minor revision 3:** In the background, pg 4, the authors provide the example of TB research to illustrate disproportionate research output from African researchers – is this typical? What is the level of African research output for other diseases or public health topics?

**Response:** Thank you for your comment. Unfortunately this is typical. We have added this sentence to reinforce our point. “In 2004, research about Africa represented less than 1% of scientific publications [4] growing gradually to 10% as of 2011 [5].”