Author's response to reviews

Title: Technical efficiency of peripheral health units in Pujehun district of Sierra Leone: a DEA application

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RESPONSE TO THE TWO PEER REVIEWERS REPORTS

From: Kirigia and Co-authors

TO: Editor-in-Chief, BMC Health Services Research

REF: Technical efficiency of public health centres in Sierra Leone: a DEA application.

Thank you for giving us an opportunity to submit our manuscript for consideration in BMC Health Services Research.

We are immensely grateful for the constructive comments and suggestions of Robert Rosenman and Antonio Guiffrida.

We have tried to revise our manuscript to incorporate most of the suggested revisions to the best of our abilities. We explain below how we have responded to each of the reviewers comments.

Since in Sierra Leone the health centers are called Peripheral Health Units (PHUs), we have slightly amended the title to read as follows: "Technical efficiency of peripheral health units in Pujehun district of Sierra Leone: a DEA application". The study was conducted in one of the 13 districts of Sierra Leone.

Reviewer: Robert Rosenman

Response to General Comments:

Comment: "...The authors provide that context, it turns out, in discussing how the public health centres could provide so much more care if they were all efficient, and in fact, that promoting the use in part of their job, but do not even allude to it in the abstract."

To reflect this, the conclusion part in the abstract has been re-written as follows:

It is concluded that with the existing high levels of pure technical and scale inefficiency, scaling up of interventions to achieve both global and regional targets such as the MDG and Abuja health targets becomes far-fetched. In a country with per capita expenditure on health of about US$7, and with only 30%
of its population having access to health services, it is demonstrated that efficiency savings can significantly augment the government's initiatives to provide for the unmet health care needs of the population.

The first paragraph of the Conclusions section in the main text is replaced with the following paragraph: "The study has revealed the prevalence of high levels of combined pure technical and scale inefficiencies. In a country with very low levels of per capita expenditure on health and very limited access to health services, the current levels of inefficiency would seriously impede the government's initiatives to increase the population's access to quality health care services. Furthermore, progress towards the achievement of the cherished health policy objectives, global and regional health targets would be seriously hampered. Hence, it is recommended that the causes of the inefficiencies be unpacked and necessary efficiency measures be instituted to augment the government's efforts to address the health care problems of the country. To estimate the level of efficiency savings in the overall health system, it is also advisable to undertake a similar study in all types of health facilities in the country.

Response to Major Compulsory Revisions

1. Comment: There is nothing that puts the sample of 37 Public health centres in context: In order to provide the context, under Methods section, we have included a subsection entitled "Overview of Sierra Leone Health Care delivery system" - with Table 1a and 1b. The subsection on "Data" that follows immediately have been modified. It now reads as follows "Input and output data were analysed for the year 2000. Due to research resource constraints, the planning and information department at the MOHS decided to choose one health district for the study of PHUs. The choice of the study district was done using a simple random sampling technique. This process led to the choice of Pujehun District. Even though there are 46 PHUs in Pujehun today, in the year 2000 there were only 39 PHUs. The data were collected by Pujehun District Health Team using the primary health care facility efficiency analysis data collection instrument of the WHO Regional Office for Africa [11]."

2. Comment: The output list is incomplete, because it misses one of the primary jobs of the centres - promoting the use of centres.

Changes made to accommodate this comment: None. We feel the output "health education" takes care of this. One of the objectives of health education both within the facility setting, as well as far-field services and using various strategies including the mass media is to promote the utilization of the available services. Hence, the model will not underestimate the efficiency level of those facilities that spend the bulk of their available resources into inducing the population to use the preventive/promotive services of the facilities.

3. Comment: While TE is intuitively understandable, SE is not. It would be useful for the authors to explain why we should be interested in SE - how the measurement indicates what should be changed if SE<1.

This comment is accommodated by incorporating the following text:

Under Results section, Paragraph 3, the first two sentences are replaced with the following: About 65% of the health centres were found to be scale inefficient, that is, they suffered from inefficiencies emanating from inappropriate size, i.e. being too small or too large. The average SE score for the sampled health centres was 82%. This implies that if all health centres had an optimal size, output would have increased by about 22% without increasing the input consumption.

In the Discussion section, the following paragraph is added (it becomes Paragraph 4): The predominant form of scale inefficiency is decreasing returns to scale, which is also known as diseconomies of scale. A health centre operating at decreasing returns to scale has an inefficiently large size. A percentage increase in all inputs is followed by less than a percentage change in outputs. To improve the efficiency of the inefficiently large health centres, there is a need to have more health centre of a relatively smaller size.

4. Comment: The authors correctly use an output oriented DEA, and measure how much output could be increased with current inputs. But there is little discussion of these findings, and especially some context given for radial movements and slacks. In addition, in the policy discussion, the authors focus on input reallocation, which is more a policy result from an input-oriented DEA.
Changes made to accommodate this comment: We agree that the conclusion/recommendation under the Discussion section, Paragraph 4, 2nd and 3rd sentences emanates from input-oriented DEA model. These two sentences are therefore deleted. The first sentence of the same paragraph becomes the first sentence of the next paragraph.

The following paragraph is also added to the Discussion section (becomes the last paragraph): The findings indicate that the amount of outputs could be increased tremendously without increasing the quantity of inputs used. As can be seen from Table 3, each of the outputs exhibits a tremendous increase - more than 50% in some cases. This includes both radial and slack movements. Radial movements indicate the proportional increase in outputs, that is, an increase without changing the mix of the outputs. The slack movements, which arise because of the sections of the piece-wise linear frontier that run parallel to the axes are also reported in order to give an accurate indication of the technical efficiency of the health centres. It should, however, be noted that sometimes slacks are treated as issues of allocative efficiency and therefore the focus is on the radial efficiency score. Thus, with the potential increase in outputs from the current sample of health centres, it is possible for the health system to significantly increase coverage by the different health interventions and contribute to the achievement of the various national and global health targets.

Reviewer: Antonio Giuffrida

5. Comment: Why output-oriented DEA model is used as opposed to input-oriented:

Explanation: As one can see from the Tables 1 & 5 on health indicators for Sierra Leone, there is serious population under-coverage of the various interventions. This is mainly due to critical resource constraints (e.g. per capita total expenditure on health in Sierra Leone is only US$ 7. This implies that although the communities might want more of the services, budgetary pressures make it difficult to increase inputs. Therefore, as stated in the text, we felt that output maximization is the most appropriate orientation for health centres which are given a fixed input and requested to produce as much output as possible. It is not within their reach to dispose of inputs that are under-utilised (e.g. labour).

Furthermore, the output- and input-oriented models will estimate exactly the same frontier and therefore, by definition identify the same set of firms as being efficient. It is only the efficiency measures associated with the inefficient firms that may differ between the two methods (Coelli et al 1998). In fact under the assumption of constant returns to scale, even the efficiency scores will not change. We, therefore, feel that the choice of model is not going to affect the results significantly. However, given the local reality (where there is a high level of unmet needs), we feel the output-oriented model is the preferred approach.

Comment: About staff incentives and incentive to increase output - Under discussion we have included a paragraph reading as follows: "The extent to which the PHUs can increase their output depends on whether the health workers contracts renewal and remunerations (especially annual increments) are linked to their performance. Currently, the health workers are paid salaries, which are not linked to performance. Efforts to improve health facility efficiency will need to be undertaken in tandem with reforms in health workers terms of employment. Such reforms are contemplated within the on-going public sector reforms, which are being supported by bilateral and multilateral development partners."

6. Comment: Are all outputs included?

Response: Yes the relevant outputs are included. Health centres in Sierra Leone are not involved in curative care.

Comment: Are all inputs included?

Response: Some inputs are not included (e.g. drugs and supplies), since records were not available. However, since the bulk of their budget is spent on staff costs, the various categories of staff are included.
It should also be noted that given the weak health information systems in sub-Saharan Africa, it is not always easy to get reliable information.

7. Comment: The authors should control for catchment area of the health unit

Response: Health centres have a fixed catchment population. In the case of Sierra Leone a health centre's catchment area is about 6000. Therefore, we don't expect much difference in the size of catchment populations to significantly influence the efficiency scores.

8. Comment: To increase the value of the paper, the authors should try to understand the origin of the inefficiencies (some hypotheses suggested)

Response: We completely agree with this. In fact the original intention was to undertake a two-stage analysis: first to estimate the DEA efficiency score, and second, to run a tobit regression to identify some of the factors that influence inefficiency. However, the availability of quality data is the limiting factor here (the weakness of our health information systems is a well known fact). However, we feel that by undertaking some analysis (albeit imperfect) and indicating the gaps in the necessary data, we may sensitize our policy makers to strengthen the often neglected areas that generate evidence for policy.

To accommodate this comment, we have added the following to the 'Limitations of the study' section: To increase the relevance of the study for management purposes, it would have been useful to undertake a second stage analysis of the factors influencing inefficiency using a tobit regression analysis - censored dependent variable model. However, because of the absence of good quality data on the factors hypothesized to influence inefficiency it was not possible to undertake the analysis.