Reviewer's report

Title: Equity and efficiency of medical service systems at the provincial level of China's mainland: A comparative study from 2009 to 2014

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Reviewer: Jose Luis Alvarez

Reviewer's report:

This is a very interesting article and I think it highlights many important points and will be of interest to many readers across the world. Furthermore the introduction clearly states the current situation and the analyses and data shown, even if limited due to data availability, are highly interesting and the recommendations made by the authors very relevant. I strongly encourage BMC to publish it however I have some concerns that I believe will improve this piece and its comprehension.

I have two major points

Firstly, please review the whole piece to ensure that it is clear when you are talking about regions and when you are talking about provincial data. I have highlighted it is some specific sections below but it remains confusion across the whole piece. For example in Figure 1 foot note it says "31 regional medical service systems", but should this not be "provincial". Similar the term DMU (well describe in the methods otherwise) refers sometimes to "provincial DMU" and others to "regional DMU". Even the abstract gets a little bit confusing with statements like "the difference of efficiency was great among regional medical service systems but minor across regions" which is difference between regions and regional here?

Secondly, a further detail limitation sections would help to focus the perspective of this piece, specially regarding the inequality analyses in this paper. I understand the limitations of data availability and the scope of this piece but inequalities explored here are mainly based on geographical comparisons of descriptive data among provinces. Inequalities within provinces, across different populations (rural vs urban, purchasing power, ethnical groups etc) and at different levels though mentioned in the introduction (line 79) are never discussed later and should be at least recognised in the limitations
And some specific points

Line 91 it says "hospitals, [are] the most common medical facilities in the medical service system," normally primary health centres are more common in health systems, maybe you refer to "data from hospital facilities is more common"? please clarify

Line 122 provinces "can be divided into three groups according to economic status and geographical location" and you explain well the three groups based on their geographical location but what not regarding their economic status. I venture to say that the eastern group has a poorer economical status but this may not be clear for many readers specially those less familiar with China. please clarify.

Line 100 maybe instead of using "competitor" use "neighbour" since different regions should be supporting each other

Line 193 "X5 represents the number of resources invested into the medical service system and was measured by the percentage of per capita health expenditure of the per capita GDP" but isn’t the independent variable here also taking into account the per capita expenditure on health (inpatient care only) making it an obvious and biased connection between dependent and independent variables?

Line 200, can you reference this statement here with some other analyses done in the literature? this seems like a bold statement and central to some later discussions so it will be good to cement it here, also because it may not be relevant in other countries and difficult to generalise.

Figures like titles and maps lack legends and units which makes them difficult to read

Line 322 "Picture b of Figure 3 shows a scatter plot for the time trend of the average efficiency of 31 DMUs" I can only see that from the regions and national average here, not a scatter plot of 31 provinces

Table 1, why not show the results of all variables if results were not significant even if p>0.05? variable X1, X3 and X6 are missing. Otherwise explain why they are not included and change the table title explaining that only significant results of the regression analyses are shown

Line 391 and following "If the input line is completely superimposed with the population line in pictures A-2,B-2 and C-2 of Figure 1, the distribution of health resource is equitable according to the distribution of the population; otherwise it is not equitable. If the input line is higher than the
population line, the scale of input is greater than those people require, which leads to waste; conversely, if the input line is lower than the population line, the scale of input is smaller than those people require, which leads to shortage" this explanation is very relevant and will help many readers to understand the figures but should be placed in the result section when describing these figures and not here.

Line 435 and following, it says that efficiency scores were very good in general but can the authors compare this with other studies in china or other countries and add some references to have some perspective of what values of the score are considered good and bad? I am not particularly familiar with this score and I think the paper will benefit for some clarifications here

**Are the methods appropriate and well described?**  
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**  
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**  
If not, please explain in your comments to the authors.

Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**  
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I recommend additional statistical review

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