

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Differences in regional distribution and inequality in health-resource allocation at hospital and primary health center levels: A longitudinal study in Shanghai, China
AUTHORS	dong, enhong; liu, shipeng; chen, minjie; Wang, Hongmei; Chen, Li-Wu; xu, ting; wang, tao; zhang, lufa

VERSION 1 – REVIEW

REVIEWER	Laura Anselmi University of Manchester - Division of Population Health, Health Services Research and Primary Care
REVIEW RETURNED	03-Dec-2019

GENERAL COMMENTS	<p>I enjoyed reading the paper “A hierarchical regional difference and inequality of health resource allocation in Shanghai from 2010 to 2016”. The study describes changes over seven years in the distribution and in inequality of resources across the city and 16 districts within Shanghai. Resources are measured by 10 indicators of staffing and equipment per 1,000 people. An illustration of trends and changes in the inequality, measured by the Theil index, is provided. The study shows that resources have increased and inequality decreased. Results are of high relevance for Shanghai and can help in identifying regions of underinvestment. The relevance for a broader audience is however limited.</p> <p>I have some general comments that I hope can help in improving the paper.</p> <p>I feel that the introduction could benefit from a more detailed description of the health system in China and Shanghai (how the system is organised and if/ how any referral system is in place), the Chinese health care reform, and from a stronger justification of why inequalities in resource distribution are an important issue. I wonder if the BMJ issue on China Health reform issued in July 2019 would contain helpful material to set the scene.</p> <p>I would suggest to include a box with all indicators, their definitions and the way they are measured, as Table 1 but with a bit more details.</p> <p>There could be some reference reporting measures of health inequalities. It could even be a text book. There could be definitely more up to date references from the international literature. The choice of the Theil over other indices should be justified, and perhaps advantages and disadvantages highlighted in the discussion session.</p> <p>Some of the indicators could be calculated also per hospitak or per health centre rather than per 1,000 people</p> <p>In terms of reporting results, it would be helpful to have minimum, maximum, mean and median on the indicators. The authors could also have a graph with 10 panels, one per each indicator, reporting</p>
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	<p>changes for each indicator with whiskers box plot per every year. Finally there are some weird expressions, so a language editing could be beneficial.</p> <p>Minor comments Page 6. Line 39: The objectives are not clear. In particular the expression depict hierarchically is not clear and the provision of policy implications are not clear (also I find that the paper does not ultimately do that). Also I find the reference to hierarchical perspective is a bit confusing. Page 7: When reporting values in Y, provide also valued in USD or GBP, to facilitate international readers.</p>
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REVIEWER	Benson Hsu University of South Dakota School of Medicine United States of America
REVIEW RETURNED	08-Feb-2020

GENERAL COMMENTS	<p>Overall, I found this study an interesting one that serves as a mailing descriptive study on the growth of health and medical resources used in and around Shanghai, China. I had no issues with the study design and the use of the Theil Index was new to me so I recommend a specialist statistical review. I am, however, concerned with some confusion aspects of the abstract, introduction, and discussion where the authors imply that health resources and health quality / outcomes are somewhat related. Just the presence of more resources does not necessarily represent an improvement of health quality, outcomes, or equity. I recommend that the authors review the manuscript to eliminate these considerations and specifically note that the study reflects purely resource allocation. Aspects of my confusion may also have to do with the writings and clarity of thought in using English. I would recommend that the authors take care in editing (capitalization, punctuation, sentence structure). Additionally, in the context of writing, there were some phrases used that were unfamiliar to me - for instance, "new-round medical reform." As a descriptive analysis of resource growth, the paper makes some interesting results. As it stands, I would recommend major revisions on the basis of clarification on specific research goals, presentation of results, and careful edits.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Laura Anselmi

Institution and Country: University of Manchester - Division of Population Health, Health Services Research and Primary Care

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

I enjoyed reading the paper "A hierarchical regional difference and inequality of health resource allocation in Shanghai from 2010 to 2016". The study describes changes over seven years in the distribution and in inequality of resources across the city and 16 districts within Shanghai. Resources are measured by 10 indicators of staffing and equipment per 1,000 people. An illustration of trends and changes in the inequality, measured by the Theil index, is provided. The study shows that resources have increased and inequality decreased. Results are of high relevance for Shanghai and can help in identifying regions of underinvestment. The relevance for a broader audience is however limited.

I have some general comments that I hope can help in improving the paper.

1. I feel that the introduction could benefit from a more detailed description of the health system in China and Shanghai (how the system is organised and if/ how any referral system is in place), the Chinese health care reform, and from a stronger justification of why inequalities in resource distribution are an important issue. I wonder if the BMJ issue on China Health reform issued in July 2019 would contain helpful material to set the scene.

Response: We added a description of Chinese healthcare system, hierarchical medical system and justification of importance of inequalities in resource distribution in first paragraph of introduction, please see highlighted lines in it.

2. I would suggest to include a box with all indicators, their definitions and the way they are measured, as Table 1 but with a bit more details.

Response: table 1 was enriched according to your advice. Please see the table 1 for the details.

3. There could be some reference reporting measures of health inequalities. It could even be a text book. There could be definitely more up to date references from the international literature. The choice of the Theil over other indices should be justified, and perhaps advantages and disadvantages highlighted in the discussion session.

Response: We added some highlighted lines in fourth paragraph of the discussion session regarding the advantages and disadvantages, please see in it for more details.

4. Some of the indicators could be calculated also per hospital or per health centre rather than per 1,000 people

Response: According to some previous studies(1-5), health resource allocation indicators are also calculated in two ways: absolute and relative, the former is calculated in terms of the actual numbers or monetary values, the latter is standardized by population size, in terms of the actual numbers or monetary values per capita, such as per 1000 population or per 10000 population, which is a common method of calculation to measure the health resource allocation or distribution as well as used in this paper. We prefer this population size-standardize measurement. Moreover, we can also recalculate these indicators if you request.

[1] Wang S, Xu J, Jiang X, et al. Trends in health resource disparities in primary health care institutions in Liaoning Province in Northeast China[J]. *International Journal for Equity in Health*, 2018, 17(1).

[2] Lu L, Zeng J. Inequalities in the geographic distribution of hospital beds and doctors in traditional Chinese medicine from 2004 to 2014[J]. 2018.

[3] Zhang T, Xu Y, Ren J, et al. Inequality in the distribution of health resources and health services in China: hospitals versus primary care institutions[J]. *International Journal for Equity in Health*, 2017, 16(1):42.

[4] Xu X, Zhou L, Antwi H A, et al. Evaluation of health resource utilization efficiency in community health centers of Jiangsu Province, China[J]. *Hum Resour Health*, 2018, 16(1):13.

[5] Pan J, Shallcross D. Geographic distribution of hospital beds throughout China: a county-level econometric analysis[J]. *International Journal for Equity in Health*, 2016, 15(1):179.

5. In terms of reporting results, it would be helpful to have minimum, maximum, mean and median on the indicators. The authors could also have a graph with 10 panels, one per each indicator, reporting changes for each indicator with whiskers box plot per every year.

Response: we supplemented the information upon your request in first paragraph of results section with table 2 in the revised manuscript and appendix 1 in the additional file.

6. Finally there are some weird expressions, so a language editing could be beneficial.

Response: we have done language editing work according to your advice.

Minor comments

6. Page 6. Line 39: The objectives are not clear. In particular the expression depict hierarchically is not clear and the provision of policy implications are not clear (also I find that the paper does not ultimately do that). Also I find the reference to hierarchical perspective is a bit confusing.

Response: According to your advice, I revised the purpose of this study in the third paragraph of the introduction section, please see highlighted lines in it.

“The hierarchical perspective “in this paper refers to from a hospital- PHC perspective, i.e. from higher levels of hospitals (including secondary hospitals and tertiary hospitals that provide the secondary care and tertiary care respectively) to lower level of PHCs(the first level of medical institutions that provide the primary care). This has been clarified in the first paragraph of the introduction section.

7. Page 7: When reporting values in Y, provide also valued in USD or GBP, to facilitate international readers.

Response: I have added values in the parentheses with the “US \$ “unit in the revised manuscript.

Reviewer: 2

Reviewer Name: Benson Hsu

Institution and Country:

University of South Dakota School of Medicine

United States of America

1. Please state any competing interests or state ‘None declared’: None declared

Please leave your comments for the authors below

1. Overall, I found this study an interesting one that serves as a mailing descriptive study on the growth of health and medical resources used in and around Shanghai, China. I had no issues with the study design and the use of the Theil Index was new to me so I recommend a specialist statistical review. I am, however, concerned with some confusion aspects of the abstract, introduction, and discussion where the authors imply that health resources and health quality / outcomes are somewhat related. Just the presence of more resources does not necessarily represent an improvement of health quality, outcomes, or equity. I recommend that the authors review the manuscript to eliminate these considerations and specifically note that the study reflects purely resource allocation.

Response: we have eliminated some considerations unrelated to healthcare resource allocation in the revised manuscript and focused the purpose of the study according to your recommendation.

2. Aspects of my confusion may also have to do with the writings and clarity of thought in using English. I would recommend that the authors take care in editing (capitalization, punctuation, sentence structure). Additionally, in the context of writing, there were some phrases used that were unfamiliar to me - for instance, "new-round medical reform." As a descriptive analysis of resource growth, the paper makes some interesting results. As it stands, I would recommend major revisions on the basis of clarification on specific research goals, presentation of results, and careful edits.

Response: we have done a thorough language editing work for the revised manuscript according to your advice. The "new-round medical reform" in this paper refers to the healthcare reform in China since 2009, which has been modified to “new round of healthcare reform” to be clearly expressed. Moreover, we clarified specific research goals, presentation of results of this study according to your advice.

VERSION 2 – REVIEW

REVIEWER	Laura Anselmi University of Manchester
REVIEW RETURNED	02-Apr-2020

GENERAL COMMENTS	<p>Thank you for addressing most of the comments. I still have some minor comments.</p> <p>Please re-consider an editing of the manuscript. Sentences like this "This study did not analyse factors that may have affected the results, such as the mutual effect between the population's health status and health-resource allocation." are difficult to understand. I get that you mean that the measurement of inequality in the allocation of resources does not account for differences in health status and need for health care, but that is not immediately understandable.</p> <p>The following description of the Chinese health care system is really quite generic. For instance it could be applied to most countries. You may want to replace this with something more specific. How are revenues collected and distributed? Then the system is hierarchical, but is the referral system really working? For example, Isn't there an attempt now to strengthen primary care to reduce self referral to hospitals in the cities?</p> <p>"The Chinese healthcare system is composed of a health financing system, a health service delivery system, and a health supervision system. Although relatively independent, these subsystems are interrelated, and different actors have their function in them. The health service delivery system consists of the public health system and medical service delivery system; the medical service delivery system includes hospitals at the provincial, city, and county levels, as well as primary health centers (PHCs). "</p> <p>Please rephrase the statement of association of the reform and changes in inequality. The study is not assessing an association , but is describing inequality over time to see if it has changed after the reform.</p> <p>Now that I see details of the definition, In table 1 there are a lot of repetitions. What is really needed is just a definition of equipment, human resources etc by listing what is included. You have done it now, but there is no need to include text in every row to tell the reader to look at the above row. Perhaps include the definitions in a note at the end of the table.</p> <p>at the end of the data analysis section can you please add an explanation of how to interpret the Theil index? What values does it take, what is the range, and what do they mean?</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Laura Anselmi

Institution and Country: University of Manchester

Please state any competing interests or state 'None declared': None

Response: we have revised that.

Please leave your comments for the authors below

Thank you for addressing most of the comments.
I still have some minor comments.

Please re-consider an editing of the manuscript.

Sentences like this "This study did not analyse factors that may have affected the results, such as the mutual effect between the population's health status and health-resource allocation." are difficult to understand. I get that you mean that the measurement of inequality in the allocation of resources does not account for differences in health status and need for health care, but that is not immediately understandable.

Response: Sure, we have replaced this sentences according to your advice, please see the highlighted lines in Strengths and limitations of this study section.

The following description of the Chinese health care system is really quite generic. For instance it could be applied to most countries. You may want to replace this with something more specific. How are revenues collected and distributed? Then the system is hierarchical, but is the referral system really working? For example, Isn't there an attempt now to strengthen primary care to reduce self referral to hospitals in the cities?

"The Chinese healthcare system is composed of a health financing system, a health service delivery system, and a health supervision system. Although relatively independent, these subsystems are interrelated, and different actors have their function in them. The health service delivery system consists of the public health system and medical service delivery system; the medical service delivery system includes hospitals at the provincial, city, and county levels, as well as primary health centers (PHCs). "

Response: we included the contents of clarifying the specific features of Chinese medical system and whether the referral system really works to achieve the goal of assuring the basic medical security system for the population in China. Please see highlighted line in the first paragraph of introduction section.

Please rephrase the statement of association of the reform and changes in inequality. The study is not assessing an association , but is describing inequality over time to see if it has changed after the reform.

Response: we have rephrased the statement of association of the reform and changes in inequality, and replace it with to describe inequality over time to see if it has changed after the reform. please see the highlighted lines in the last paragraph of Introduction section.

Now that I see details of the definition, In table 1 there are a lot of repetitions. What is really needed is just a definition of equipment, human resources etc. by listing what is included. You have done it now, but there is no need to include text in every row to tell the reader to look at the above row. Perhaps include the definitions in a note at the end of the table.

Response: we have done that according to your notes, please see the details of definitions in table 1 and footnotes under the table 1.

at the end of the data analysis section can you please add an explanation of how to interpret the Theil index? What values does it take, what is the range, and what do they mean?

Response: we have added that at the end of data analysis section. Please see highlighted lines in that section.