PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Did expansion of health insurance coverage reduce horizontal inequity in health care finance? A decomposition analysis for China
AUTHORS	Wang, Zhonghua; Zhou, Xue; Gao, Yukuan; Chen, Mingsheng; Palmer, Andrew; Si, Lei

VERSION 1 – REVIEW

REVIEWER	Jing Wang Department of Health Management, School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Hubei, 430030, China
REVIEW RETURNED	19-Jul-2018

GENERAL COMMENTS	This paper makes an important contribution to an understudied area. China has implemented a sizeable health insurance reform in the first decade of the 21st century. Urban Employee Basic Medical Insurance (UEBMI), Urban Residents' Basic Medical Insurance (URBMI), and New Rural Cooperative Medical Scheme (NCMS) established or extended for the urban and rural residents, respectively. The coverage of these schemes has reached over 95%. Individuals with different health condition, social status, access to health care, were covered in a single health insurance scheme. It posed a potential threat to the horizontal equity of health care finance, which was always neglected by policy makers in China. I believe this paper can fill the gap. This is a significant contribution to the global literature on the financing equity in health care. The methodology is sound and consistent with the literature, allowing the findings to be readily benchmarked against findings worldwide. Below are some comments/questions and suggestions for improvement. Please feel free to treat these as you see fit, taking into account what further analysis can be conducted using your data: 1. At the beginning of Introduction, the authors provided the definition of horizontal inequity. However, the importance of horizontal inequity of health care finance should be clarified in this section. 2. This paper examined the data between 2002 and 2007 in urban and rural areas, respectively. I am not sure whether it was suitable to select and evaluate the sample of URBMI enrollees. The URBMI was initiated in 2007, and many urban residents were not covered in URBMI at that time. 3. In this paper, horizontal inequity was expressed and explained in percentage terms. However, we found that, in some case, the percentage terms of horizontal inequity decreased, whilst the corresponding absolute terms still increased over the period 2002-2007. Please explain the difference between the percentage and absolute terms of horizontal inequity. 4. In Data section, the "Per capita household expenditure adjusted

	by adult equivalence was used as the measure of ATP in our study" was not clear. Formula and more detailed explanation on "adult equivalence" will be helpful in Data analysis of this study. 5. I understand that earmarked taxes are not implemented in China. However, why did 4.12% and 5.19% of the general taxes go to health sector? How did these proportion came from? 6. In table 3-6, according to the description in Data section, I suggest using the word "expenditure" instead of "income".

REVIEWER	M Chersich WRHI
REVIEW RETURNED	05-Aug-2018

GENERAL COMMENTS	The paper presents important insights into health financing in China. It examines both horizontal and vertical equity. It provides very important insights into a system that has seen numerous changes. I am not very familiar with the statistical methods used by the researchers, and thus cannot make detailed comments on that. Please can you add a conversion to USD for the amount of OOPs in the tables, this would help the reader understand the data, and compare that with other studies, together with the GDP in the province, if available. The discussion repeats several parts of the results, rather than providing some interpretation of the results. The study limitations note that the design is cross-section and thus cannot determine causality, but goes onto do just that. The survey was large and is the same design as commonly used for other similar studies. I would say rather that the design limits the ability to draw definitive conclusions. The larger limitation is that estimates are based on utilisation and OOPs and coverage, and does not take need for services into account. It would be useful to discuss the findings of the study in the context of international literature on health financing, even just the WHO reports on this topic, and note how the vertical and horizontal levels of inequity compare with other countries. A few examples will suffice. The data presented are more than 10 years old, the authors need to provide details about the current situation in health financing in the area. One paragraph in the discussion summing how health financing has changed cine 2007, and the effects of such changes on vertical and horizontal equity. There must be some data on that topic. The authors provide only English language references. The Chinese science literature is huge and will have many useful studies on this topic. There is quite some repetition in the paper, please re-read the paper and remove repetition, the paper should be a few pages shorter than it currently is. For the results, the text repeats what is in the tables, which is not very useful for the reader, rather compare the different groups, than merely state the % equity or reranking etc. The claim that the survey was done in 2003 recording information in 2002 is hard to understand. What is meant by that? Perhaps give the actual dates of the surveys. Please provide more detail on the study measures used, how was OOP and need for services measured? What recall period, and how was socio-economic status measured exactly to determine quintiles, and were the same measures used in both surveys. Please give the % who had catastrophic OOPs.

REVIEWER	Henry Lucas Institute of Development Studies, UK
REVIEW RETURNED	25-Oct-2018

GENERAL COMMENTS	Paper addresses an important issue on which there has been limited research. It adopts a standard methodology using existing reasonably reliable data sets. The use of English is reasonably good but could be made clearer by an addition text edit. Title. It should be made clear that this paper is about equity in health financing. Abstract. The section on objectives is unnecessarily confusing. A simple definition of inequity in health financing, followed by a statement of the intention to assess the impact of changes in health insurance is all that is needed. Introduction. The first few paragraphs are repetitive, offering multiple definitions of horizontal and vertical inequity. Replace “J. Richard Aronson, Paul Johnson and Peter J. Lambert” with “Aronson, Johnson and Lambert”. Data source. “In every city or county, data were collected from eight communities or villages and sorted by economic level and geographic distribution”. Useful to clarify how the communities/villages were sampled. My understanding has always been that this was not done using probability sampling? Would be useful to comment and perhaps provide a reference on the probable quality of recorded data on “Inpatient OOP expenditures during the preceding 12 months”. Results. “As a proportion of total health care payments, horizontal inequity (H) accounted for 93.85 percentage points of the RE, whereas re-ranking (R) accounts for 165.57 percentage points … the system would have been 259.42% more redistributive without differential treatment”. I think the use of both percentage points and percentages is confusing. It would be clearer to say “In terms of total health payments, the effect of H is to reduce the RE by 26.11% and of R to reduce it by 46.06%”. Overall the RE is reduced to 27.82% of what it would have been if H and R were zero. In general, the discussion of the tables is difficult to follow. A tabular presentation of the main findings would be helpful. Discussion. The discussion raises some interesting issues in terms of emphasising the importance of horizontal inequity in health financing and suggesting some relevant explanatory factors but it seems somewhat limited from a policy perspective. The multiple public insurance schemes across China (with protocols often determined at county level) clearly play a substantial role, and greater standardisation would be of considerable benefit, but given the emphasis on local autonomy this may be a slow process. It would be useful to consider some of the tradition factors – gender, age, location, etc. – which also play a role and may be more amenable to policy intervention.

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1
Reviewer Name: Jing Wang
Institution and Country: Department of Health Management, School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Hubei, 430030, China

Please leave your comments for the authors below
This paper makes an important contribution to an understudied area. China has implemented a sizeable health insurance reform in the first decade of the 21st century. Urban Employee Basic Medical Insurance (UEBMI), Urban Residents' Basic Medical Insurance (URBMI), and New Rural Cooperative Medical Scheme (NCMS) established or extended for the urban and rural residents, respectively. The coverage of these schemes has reached over 95%. Individuals with different health condition, social status, access to health care, were covered in a single health insurance scheme. It posed a potential threat to the horizontal equity of health care finance, which was always neglected by policy makers in China. I believe this paper can fill the gap. This is a significant contribution to the global literature on the financing equity in health care. The methodology is sound and consistent with the literature, allowing the findings to be readily benchmarked against findings worldwide.
Below are some comments/questions and suggestions for improvement. Please feel free to treat these as you see fit, taking into account what further analysis can be conducted using your data:
1. At the beginning of Introduction, the authors provided the definition of horizontal inequity. However, the importance of horizontal inequity of health care finance should be clarified in this section.
Answer: We have now clarified the importance of horizontal inequity in the Introduction section (Lines 21-24, Page 6).
2. This paper examined the data between 2002 and 2007 in urban and rural areas, respectively. I am not sure whether it was suitable to select and evaluate the sample of URBMI enrollees. The URBMI was initiated in 2007, and many urban residents were not covered in URBMI at that time.
Answer: We acknowledged that not all urban residents were covered by URBMI in 2007, however, there were some urban residents enrolled in URBMI at that time (Table 1). The respondents were randomly selected from those who were covered by both URBMI and UEBMI. If we were not including URBMI, the overall financing contribution to the public health insurance would be underestimated.

3. In this paper, horizontal inequity was expressed and explained in percentage terms. However, we found that, in some case, the percentage terms of horizontal inequity decreased, whilst the corresponding absolute terms still increased over the period 2002-2007. Please explain the difference between the percentage and absolute terms of horizontal inequity.
Answer: The horizontal inequity of OOP and total payments in percentage terms (i.e. in relative scale) decreased, whilst the corresponding values in absolute terms still increased over the period 2002-2007. The decrement in horizontal inequity in relative terms was not contradictory to the increased value of horizontal inequity in absolute terms. The main reason was that the absolute size of total RE had dramatically increased over the period. We authors have also noted this phenomenon and explained it in the Discussion section (Lines 17-25, Page 34) in the original manuscript.
"Despite the fact that horizontal, vertical and reranking effects are usually expressed and explained as a percentage of the total RE, some results need to be interpreted with caution. Whilst the horizontal inequity of OOP and total payments in relative terms decreased over the period 2002–2007, in absolute terms, horizontal inequity increased over during that period in both urban and rural areas. As horizontal inequity was measured by the weighted sum of Gini coefficients in each income quintile group,1 8 the increase of horizontal inequity in the absolute term indicates a more inequitable distribution within the income quintile group."

4. In Data section, the "Per capita household expenditure adjusted by adult equivalence was used as

the measure of ATP in our study" was not clear. Formula and more detailed explanation on "adult equivalence" will be helpful in Data analysis of this study.
Answer: Thank you for your suggestion. Formula and detailed explanation on Adult Equivalence (AE) have now been added in the Method section (Lines 11-20, Page 16).

5. I understand that earmarked taxes are not implemented in China. However, why did 4.12% and 5.19% of the general taxes go to health sector? How did these proportion came from?
Answer: In most countries, including in China, the use of tax is not determined when it was collected. As a consequence, we have used the proportion of government expenditure on health as an approximation of the proportion of general tax spending on health. This method was used in the World Bank publication: O'Donnell, O., E. Van Doorslaer, et al. (2008). Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation (Chapter 16 Who Pays for Health Care? Progressivity of Health Finance).
According to the China National Health Accounts Report, the proportion of government expenditure on health was 4.12% and 5.19% of the government expenditure in 2002 and 2007, respectively. Given the government expenditure mainly came from the general taxes, we assumed that 4.12% and 5.19% of the total general taxes flowed to the health sector in 2002 and 2007, respectively.
6. In table 3-6, according to the description in Data section, I suggest using the word "expenditure" instead of "income".
Answer: We have now replaced the word "income" with" per capital household expenditure".
Reviewer: 2
Reviewer Name: M Chersich
Institution and Country: WRHI

The paper presents important insights into health financing in China. It examines both horizontal and vertical equity. It provides very important insights into a system that has seen numerous changes.
I am not very familiar with the statistical methods used by the researchers, and thus cannot make detailed comments on that.

1. Please can you add a conversion to USD for the amount of OOPs in the tables, this would help the reader understand the data, and compare that with other studies, together with the GDP in the province, if available.
Answer: OOP expressed in USD has now been added in Table 1 (Page 11) and Table 2 (Page 13). In addition, household income was also converted into USD using the exchange rate of 2002 and 2007. The per capita gross domestic product in Heilongjiang Province in 2002 and 2007 have been added in the Method section (Lines 10-12, Page 10).

2. The discussion repeats several parts of the results, rather than providing some interpretation of the results.
Answer: We have deleted the repetitive description of the results in the Discussion section and added some interpretation of the corresponding results in the Discussion section (Lines 2-6, Page 32).

3. The study limitations note that the design is cross-section and thus cannot determine causality, but goes onto do just that. The survey was large and is the same design as commonly used for other similar studies. I would say rather that the design limits the ability to draw definitive conclusions.
The larger limitation is that estimates are based on utilisation and OOPs and coverage, and does not take need for services into account.
Answer: We agree with the reviewer that the research was designed in a way not for drawing causality and the method is commonly used for other similar studies. We appreciate the reviewer's suggestion on studies limitation. Albeit need for service is key to equity of health care utilization studies, it is not considered in health care financing. Alternatively, the ability-to-pay (ATP) is an equivalent component in equity analysis on health care financing.

This has been elaborated in the World Bank publication which is a classic and up-to-date technical note on health equity. Estimation on horizontal inequity in this study was performed under the guidance of World Bank publication:
O'Donnell, O., E. Van Doorslaer, et al. (2008). Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation. Washington, DC, The World Bank, Line 3, Page 187 (health care finance) and, Line 15, Page 177 (health care delivery)
(URL: http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-household-survey-data)
In the light of the above mentioned, we have described ATP in the first paragraph in the Introduction section and indicated that the horizontal and vertical inequities are based on the ATP. In addition, we have removed the corresponding limitations from the “Strengths and limitations of this study” section.

4 It would be useful to discuss the findings of the study in the context of international literature on health financing, even just the WHO reports on this topic, and note how the vertical and horizontal levels of inequity compare with other countries. A few examples will suffice.
Answer: Thank you for this useful suggestion. We have added some references from other countries, e.g. Netherlands, Switzerland and Sweden In addition, the experience in improving pro-poor redistribution in those countries was also further discussed in the Discussion section (Lines 13-17, Page 32; Lines 1-2, Page 33; Line 13-16, Page 34).

5 The data presented are more than 10 years old, the authors need to provide details about the current situation in health financing in the area. One paragraph in the discussion summing how health financing has changed cine 2007, and the effects of such changes on vertical and horizontal equity. There must be some data on that topic.
Answer: Thank you for this suggestion. We have now discussed the change of the health care financing system and the potential effect on horizontal inequity since 2007 in the last but one paragraph in the Discussion section.
6 The authors provide only English language references. The Chinese science literature is huge and will have many useful studies on this topic.
Answer: Thank you for this suggestion. We have now added some recent literature from China in this manuscript, including:
λ 6. Wan Q, Zhai T, Zhao Y. Research on Equity of Health Financing in Some Regions (in Chinese). Chinese Health Economics 2009;28(07):14-16.
λ 11. Wang L, Li F, Zhang X. Progress and Challenges of China’s Health Financing System (in Chinese). Chinese Health Economics 2017;36(09):46-50.
λ 12. Zhou T. An Empirical Study of the Impact of Government Health Financing on Health Status From the Perspective of Transnational Comparison (in Chinese). World Economy Studies 2017(06):40-49.
λ 14. Nong Y. Financing of public health :government and private input (in Chinese). Health Economics Research 2008(10):22-24.

7 There is quite some repetition in the paper, please re-read the paper and remove repetition, the paper should be a few pages shorter than it currently is.
For the results, the text repeats what is in the tables, which is not very useful for the reader, rather compare the different groups, than merely state the % equity or reranking etc.
Answer: Many thanks for this suggestion. We have now extensively revised the Results section to avoid repetitive information. We have now interpreted the results rather than repeating the numbers from the tables (please see the main text for the revision).
In addition, repetition in the Introduction and Discussion sections has been removed.

8 The claim that the survey was done in 2003 recording information in 2002 is hard to understand. What is meant by that? Perhaps give the actual dates of the surveys.

Answer: The data collection was conducted between August and October in 2003 and 2008, respectively. However, the data was retrospective which reflected the information in 2002 and 2007. Accordingly, we have additionally added the dates of the surveys in the Methods section (Line 6, Page 10).

9 Please provide more detail on the study measures used, how was OOP and need for services measured? What recall period, and how was socio-economic status measured exactly to determine quintiles, and were the same measures used in both surveys.
Answer: The recall period of outpatient OOP was 2 weeks and the recall period of inpatient OOP was 12 months in our survey. These were endorsed by the World Bank Institute: "the recall periods…but not too long such that recall bias is large.…ambulatory care, the optimal recall period is probably in the range of 2 to 4 weeks … For inpatient care, the recall period should be longer. It is typically 12 months."
O'Donnell, O., E. Van Doorslaer, et al. (2008). Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation. Washington, DC, The World Bank, Line 28-30, Page 166
(URL: http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-household-survey-data)
As mentioned in the answer to Question 3, health care need for services was not considered in this study. Alternatively, ability-to-pay (ATP) was used to measure socioeconomic status (SES) for the determination of the quintiles. Data collection and calculation on SES was also performed in line with the guidance of the World Bank publication "Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation."
As household expenditure is generally considered a more accurate measure of ability to pay (ATP) (O'Donnell, O., E. Van Doorslaer, et al. (2008), last paragraph of Page 187), data pertaining to household expenditure was thus collected during the household interview. The collection of household expenditure data was described in "Data sources" (Lines 10-14, Page 15) in the manuscript.
In addition, we have stated that we used household expenditure as the measurement of ATP with reference on "Data analysis" on Lines 13-20 of Page 16 in the revised manuscript.
Given that the two rounds of survey adopted the same measures, we have now added this statement in the section of Data sources on Line 6 of Page 15 in the revised manuscript.

10 Please give the % who had catastrophic OOPs.
Answer: Thank you for this useful suggestion. Incidence of catastrophic health expenditure (CHE) has now been added in Table 1 (Page 11) and Table 2 (Page 13).

Reviewer: 3
Reviewer Name: Henry Lucas
Institution and Country: Institute of Development Studies, UK

Paper addresses an important issue on which there has been limited research. It adopts a standard methodology using existing reasonably reliable data sets. The use of English is reasonably good but could be made clearer by an addition text edit.
Answer: Thank you for this useful suggestion. Our manuscript has been further edited by the Charlesworth Group's language editing service (https://www.cwauthors.com/), and an editing certificate has been provided in "Attach Files."

1. Title. It should be made clear that this paper is about equity in health financing.
Answer: The title has now been changed to "Did expansion of health insurance coverage reduce horizontal inequity in health care finance? A decomposition analysis for China".
2. Abstract. The section on objectives is unnecessarily confusing. A simple definition of inequity in

health financing, followed by a statement of the intention to assess the impact of changes in health insurance is all that is needed.
Answer: The abstract has now been fine-tuned according to your suggestion.

3. Introduction. The first few paragraphs are repetitive, offering multiple definitions of horizontal and vertical inequity.
Answer: We have now fine-tuned the texts of horizontal and vertical inequity in the first and the second paragraphs in the Introduction section.

4. Replace “J. Richard Aronson, Paul Johnson and Peter J. Lambert” with “Aronson, Johnson and Lambert”.
Answer: We have now replaced “J. Richard Aronson, Paul Johnson and Peter J. Lambert” with “Aronson, Johnson and Lambert”.

5. Data source. “In every city or county, data were collected from eight communities or villages and sorted by economic level and geographic distribution”. Useful to clarify how the communities/villages were sampled. My understanding has always been that this was not done using probability sampling?
Answer: The communities/villages were randomly selected from participating cities/counties. We have now clarified the sampling method in the Data source (Lines 13-16, Page 10).

6. Would be useful to comment and perhaps provide a reference on the probable quality of recorded data on “Inpatient OOP expenditures during the preceding 12 months”.
Answer: We have now added a reference with regard to the recall period of inpatient OOP expenditures.
The recall period of inpatient OOP was 12 months in our survey, which was supported by the World Bank Institute: “the recall periods…but not too long such that recall bias is large.…ambulatory care, the optimal recall period is probably in the range of 2 to 4 weeks … For inpatient care, the recall period should be longer. It is typically 12 months.”
O'Donnell, O., E. Van Doorslaer, et al. (2008). Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and Their Implementation. Washington, DC, The World Bank, Line 28-30, Page 166
(URL: http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-household-survey-data)
We have now added the reference in the revised manuscript.

7. Results. “As a proportion of total health care payments, horizontal inequity (H) accounted for 93.85 percentage points of the RE, whereas re-ranking (R) accounts for 165.57 percentage points … the system would have been 259.42% more redistributive without differential treatment”. I think the use of both percentage points and percentages is confusing. It would be clearer to say “In terms of total health payments, the effect of H is to reduce the RE by 26.11% and of R to reduce it by 46.06%”. Overall the RE is reduced to 27.82% of what it would have been if H and R were zero.
Answer: Thank you for your suggestion. We have now only used % as suggested. In addition, we have extensively rewritten the Results section to avoid the confusions and repetitions.

8. In general, the discussion of the tables is difficult to follow. A tabular presentation of the main findings would be helpful.
Answer: Many thanks for this suggestion. We admit the discussion of the tables is difficult to follow - echoed by the second reviewer. We have now extensively revised and simplified the description of the main findings in the Results section.
The main findings were presented in Table 3-6 in the original manuscript. However, we did not present the main findings in a tabular manner. Alternatively we have rewritten the description of the findings more structurally.

9. Discussion. The discussion raises some interesting issues in terms of emphasising the importance of horizontal inequity in health financing and suggesting some relevant explanatory factors but it seems somewhat limited from a policy perspective. The multiple public insurance schemes across China (with protocols often determined at county level) clearly play a substantial role, and greater standardisation would be of considerable benefit, but given the emphasis on local autonomy this may be a slow process. It would be useful to consider some of the tradition factors – gender, age, location, etc. – which also play a role and may be more amenable to policy intervention.
Answer: We appreciate the reviewer's suggestion on policy indications that the health financing should be tailored based on local autonomy and the standardization to a larger scale will be of considerable benefit. We agree that the local government often make policies by taking into account traditional factors such as sex, age, location and so on. However, over considering these factors might bring horizontal inequity in health financing. In this paper, we tried to show that there should be a balance of horizontal and vertical equity when making health financing policies and the reviewer's comment definitely provided an insight to this.
Accordingly, we have added the following texts in the Discussion section:
“In addition, some public insurance schemes are financed at the county level and it is also important to consider other amenable factors such as sex, age and location in policy interventions.”

FORMATTING AMENDMENTS FROM EDITORIAL OFFICE:
- Palmer, Andrew J. is not in the contributorship statement. Please provide complete affiliations (institutions and department) for all the authors both in the manuscript and in the submission system (Scholar One).
Answer: We have now added the contribution by Andrew J. Palmer in the Section of Authors’ contributions in the manuscript. We also completed the corresponding information in the submission system (Scholar One)
- We have implemented an additional requirement to all articles to include 'Patient and Public Involvement’ statement within the main text of your main document. Authors must include a statement in the methods section of the manuscript under the sub-heading 'Patient and Public Involvement'. This should provide a brief response to the following questions:
How was the development of the research question and outcome measures informed by patients’ priorities, experience, and preferences?
How did you involve patients in the design of this study?
Were patients involved in the recruitment to and conduct of the study?
How will the results be disseminated to study participants?
For randomised controlled trials, was the burden of the intervention assessed by patients themselves?
Patient advisers should also be thanked in the contributorship statement/acknowledgements.
If patients and or public were not involved please state this.
Answer: Thank you for the suggestion. We have now stated the “Patient and public involvement” in the Methods section.

VERSION 2 – REVIEW

REVIEWER	Jing Wang Department of Health Management, School of Medicine and Health Management, Tongji Medical College, Huazhong University of Science and Technology, Hubei, 430030, China
REVIEW RETURNED	05-Dec-2018

GENERAL COMMENTS	According to the revised manuscript, I recommend to accept it for publication.

REVIEWER	Henry Lucas

	Institute of Development Studies UK
REVIEW RETURNED	05-Dec-2018

GENERAL COMMENTS	Previous comments have been appropriately addressed.