Author's response to reviews

Title: Household Catastrophic Medical Expenses in Eastern China: Determinants and Policy Implications

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Author's response to reviews: see over
Dear editors,

We have revised the manuscript “Household Catastrophic Medical Expenses in Eastern China: Determinants and Policy Implications” (MS: 1645109107778197) according to reviewers’ comments and formatting request. If you have any further requirements, please let us know, thanks.

Best regards,

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Answers to reviewers’ comments

Answers to Reviewer Dr Subhash Pokhrel’s comments

a) Reviewer’s comment: Because this survey data is not openly available, the authors must demonstrate that it is a valid survey. It would be immensely helpful to compare the summary statistics of this sample with other available sources of data (e.g.
regional statistics obtained from Statistics Office or other surveys).

Authors' response to the comment: We have added information on comparison between data in this study and public data in the results (the 2nd paragraph in the results on page 9) and Table 3.

b) Please provide detailed account of the Survey and include sample design flow-diagram, sample size calculation, response rate and questionnaires as an additional file.

Authors' response to the comment: We added more details in the methods. Now methods are divided into several parts. The parts of “Sampling” and “Organization of survey” are relevant to this comment, which are on page 4, 5 and 6. Figure 1 is the flow diagram of sampling.

c) Please provide a description as to what was the basis for including the reported questions, where they were sourced from (e.g. previous surveys/studies or research team’s deliberation based on theory/ a priori expectations/hypotheses), etc. This is important to show that the survey was conducted using best research practice.

Authors' response to the comment: Since 1995, we have conducted health service utilization and expenses survey in Shanghai city, Shandong province and Jiangsu province about every five years. In the long-term study we find that although the three provinces (municipalities) belong to eastern China, there is still a big difference on the economic level and health services.

The existing literature on catastrophic medical expenditures, most of them focused on one province, especially in undeveloped areas. Based on our research experiences and literature review, we put forward the questions that this paper is expected to solve: what are the incidence and determinants of household catastrophic medical expenses in eastern China? It is important to identify the influencing factors, which helps find the specific approaches to solve the problems. Now the information is added in the last paragraph on page 3.
d) In the discussions, please include a reflection of conducting such surveys in relatively developed areas (including for example response rate and how it compares with other similar surveys within China and abroad).

**Authors' response to the comment:** We have added information on comparison between our survey and other large-scale survey in the discussion in paragraph 3 on page 13.

e) Although you refer to a previous study for methods to estimate catastrophic expenditure, it would still be helpful to have a brief description of this method in the text.

**Authors' response to the comment:** We added detailed information on methods to estimate catastrophic medical expenses in the methods in paragraph 3, 4 and 5 on page 7.

f) For the readers’ benefit, please explain in more details how multi-level regression is particularly relevant here. For example, there are other simple methods such as use of robust standard errors but you used multi-level modelling because it has XX advantages over other such methods.... etc. and your data, the way it was generated, met the assumptions underlying this method (explain what they were). Also, comment on the fact that by applying this method, you were actually able to control for area and household level variations in the probability of one having a catastrophic illness, which is not common in the literature (if applicable), etc.

**Authors' response to the comment:** We added explanation on why we choose the multi-level model in paragraph 2 and 3 on page 8.

g) Explain the basis for including only the reported independent variables. What variables were considered but dropped/not included and why?

**Authors' response to the comment:** We selected independent variables mainly based on the literature. Table 1 of the previous article did not show all the independent
variables, now we list all the independent variables in the Table 1. The information is added in paragraph 1 on page 8 and Table 1.

h) Comment on the validity of the regression model based on model diagnostics reported in Table 4. To what extent the model fit the data and a reflection as to whether multi-level modelling was actually appropriate in your case.

**Authors' response to the comment:** We added comment on validity of the model in the last paragraph on page 9.

i) A comment on whether ordinary logistic model would have given you similar conclusion would be helpful. You don’t need to report the quantitative details of this finding but a comment (based on this additional analysis) may add to the justification of choosing multi-level model.

**Authors' response to the comment:** We added comment on ordinary logistic model in paragraph 2 on page 13.

j) The jump from what you find (results) and what you recommend (e.g. community-based insurance) is huge, particularly in the absence of enough details (in the Introduction or Discussion section itself) around why this particular type of health financing helps prevent incidence of catastrophic illness. Please back up with earlier evidence from China or abroad. This applies to all other policy recommendations that you make. Please do not assume that readers of this Journal would have enough understanding about these policy options (e.g. community-based insurance).

**Authors' response to the comment:** We have revised it in the conclusions on page 13 and 14.

k) I suspect that some of the inconsistent findings you report and discuss are the outcome of your survey sample being different from those earlier studies. This is why demonstrating early on that your survey is valid is so critical.
Authors' response to the comment: Reasons for that our findings are different from others: (1) this article is based on a larger sample, which helps estimate parameters more accurately, (2) this article included more independent variables based on literature review, (3)data on this article are from different provinces, which reflects variation in regions. Details on the study design have been illustrated in the method.

Answers to Reviewer Dr Hengjin Dong’s comment

1. Reviewer’s comment: Why the sampling techniques in the three cities are not the same?
   Authors' response to the comment: When sampling in the three areas, we used sample size calculation formula to calculate the required sample size and the information is now added in the methods on page 4, 5, 6 and Figure 1. However, some areas, local governments were willing to provide organizational support, therefore we expanded the sample size.

2. Reviewer’s comment: How to calculate the one year expenditures? by direct asking or by some indicators? if by direct asking, how to deal with the recall bias?
   Authors' response to the comment: We designed some questions about expenditures in the questionnaire. There were 7 questions, one was the total expenditure in the last year, and the other six questions were on annual expenditure of different kinds of daily life. The questions were: (1) how much did the household spend on daily living in the last year? (2) food expenditure, (3) clothing and daily necessities expenditure, (3) traffic and communications expenditure, (4) housing, water, electricity and fuel expenditure, (5) culture, education and entertainment expenditure, (6) medicines, medical services and supplies expenditure, (7) other.
It is inevitable that there will be recall bias in the survey. What we could do was to try our best to reduce the recall bias. We trained the investigators so that they would understand the questionnaire exactly and the general situation of the surveyed areas especially the common daily expenditures of the local residents, and they would also master the methods to communicate with the local residents. During the face-to-face interview, the investigators would explain carefully the detailed meaning of all the questions. In addition, as shown above, we asked them about their total annual household expenditure, and we also inquired about specific kinds of expenditure, which helped us check the data. We added this information in the part of “organization of survey” on page 6.

3. **Reviewer’s comment**: How to choose the independent variables? by experience, by literature or by assumptions?

   **Authors' response to the comment**: We selected independent variables mainly based on the literature. Table 1 of the previous article did not show all the independent variables, now we listed all the independent variables in the Table 1. The information is added in paragraph 1 on page 8 and Table 1.

4. **Reviewer’s comment**: What are the assumptions in the logistic model?

   **Authors' response to the comment**: The basic assumption in the logistic model is that whether a household incurs household catastrophic medical expenditures is influenced by the independent variables. The data in this article are characteristic of hierarchy structure. These independent variables can be divided into household-level variables and area-level variables, so we choose a multi-level model.

   We assume that whether a household incur catastrophic medical expenditures is impacted by the area-level variables as well as the household-level variables. There is correlation in the households in the same area in terms of catastrophic medical expenditures. We have added detailed explanation of using of the multi-level model in the method in paragraph 2 and 3 on page 8.
5. **Reviewer’s comment:** do not repeat the OR and CI in the text, because the tables have already given them.

   **Authors' response to the comment:** We have revised it in the results.

6. **Reviewer’s comment:** The last two paragraphs of Discussion are not closely related to the results. I suggest the authors may rewrite it or delete it.

   **Authors' response to the comment:** We have revised it in the conclusions on page 13 and 14.