

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	The extent and determinants of catastrophic health expenditure for tuberculosis care in Chongqing Municipality, China: a cross-sectional study
<b>AUTHORS</b>	Duan, Weixia; Zhang, Wen; Wu, Chengguo; Wang, Qingya; Yu, Ya; Lin, Hui; Liu, Ying; Hu, Daiyu

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Qian Long Global Health Research Center, Duke Kunshan University
<b>REVIEW RETURNED</b>	22-Oct-2018

<b>GENERAL COMMENTS</b>	<p>Abstract: 1) According to the results reported in the abstract, outcome measures were incidence and intensity of CHE for TB care. The study examined the association between patients' "socio-demographic and clinical characteristics" and incidence of CHE. Do clinical characteristics mean patient delay and diagnostic delay, which was reported in the abstract results. If so, it would be better to clarify in the section of outcome measures in the abstract. 2) Abstract results reported adjusted odds ratio (e.g. patient delay adjusted odds ratio 1.359 etc.), but it is not clear how adjusted analysis was performed. 3) Conclusion is vague. Moreover, the study only included four counties of Chongqing. The generation to western region should be made with cautions.</p> <p>Main body _ Introduction: 1) Generally, there are three essential health insurances in China, rural new cooperative medical scheme, urban residence basic health insurance and urban employee basic health insurance, and benefits varied by health insurance schemes. It would be better to provide background of health insurance, particularly coverage and reimbursement for TB care in the study sites. 2) Only first line anti-TB drugs was free. Please correct in page 4, line 41.</p> <p>Main body _ Methods: The description of treatment costs collection is not sufficient. The authors reported that "The treatment costs were collected every month." (page 8) Who and how collect the treatment costs every month? Does it mean that the follow-up survey was conducted with TB patients till completion of the treatment? Did patients recall out-of-pocket payment or from the invoices (page 8, line 26-27)? In addition, how the costs of pre-diagnosis and diagnosis were collected? Challenges and limitations of data collection of treatment costs should be discussed in the discussion "strengths and limitations".</p> <p>Main body _ Results: 1) As mentioned above, the coverage and benefits for TB care vary by health insurance schemes. If it is</p>
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	<p>possible, the stratification of different health insurance schemes in the analysis would be interesting. 2) Table 2 shows no reimbursement for pre-diagnosis and diagnosis. What services did patients seek before TB diagnosis? If TB suspects seek for care in health facilities, some of services may be covered by health insurance? In table 2, were these information not available or based on TB patients recall indicating no any reimbursement in the pre-diagnosis period? Please clarify.</p> <p>Main body _ Discussion: 1) What are authors' interpretations why health insurance status and hospital admission were not associated with CHE in this study. 2) In addition, what socio-economic characteristics are by local residences and migrants, which may help to explain the migrants were less likely to experience CHE?</p>
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<b>REVIEWER</b>	Chengchao Zhou China
<b>REVIEW RETURNED</b>	08-Dec-2018

<b>GENERAL COMMENTS</b>	<ol style="list-style-type: none"> <li>1. In the first paragraph of the Introduction section, the authors are recommended to cite the most recent data from Global tuberculosis report 2018.</li> <li>2. In the second half of the first paragraph of the introduction, the authors should add some sentence or new data to highlight the severity of the financial burden on TB patients, as well as a definition about the catastrophic health expenditure for tuberculosis care.</li> <li>3. In the Introduction section, the authors should give us a profile of the catastrophic health expenditure for tuberculosis care in China.</li> <li>4. In the last paragraph of the Introduction section, "As an economic and industrial hub of southwest region of China, Chongqing municipality has experienced rapid economic development", the economic development level of Chongqing is higher than other cities in southwest of China, so Chongqing can serve as the representative of southwest province? "The TB notification rate of Chongqing in 2015 has declined to 70.8 cases per 100,000 population from the peak of 106 cases per 100,000 in 2005." , since the notification rate of TB in Chongqing has decreased, why Chongqing should be chosen as the research site? The reasons for choosing Chongqing as the research site are insufficient.</li> <li>5. In the introduction section, the introduction about Chongqing should be moved to the first paragraph of the Methods section, as an introduction of the setting of this study.</li> <li>6. The aim of this study is too general. The authors should add some specific objectives of the study. For example, to explore the associations between the patient /diagnostic delay and CHE for TB care.</li> <li>7. In the methods section, the inclusion and exclusion criteria of the respondents need reasonable explanation. For example, why only active TB patients were selected as subjects?</li> <li>8. With regard to the definition of catastrophic health expenditures in the methods section, there are no references to support the 10% for the proportion of OOP in total household income. The world health organization prescribes that catastrophic health</li> </ol>
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	<p>expenditures include both direct and indirect costs, but the authors only use direct costs, please explain.</p> <p>9. In the results section, the main research results should be listed, rather than all the data in the table are described in words.</p> <p>10. In the results section, tables 1 and 4 can be combined into one table.</p> <p>11. In table 2, what is the data distribution type of the direct medical costs for TB care in different periods of services? If it is normal distribution, it is represented by mean; if it is skewed distribution, it is represented by median. Please check the results again.</p> <p>12. In the last paragraph of the results section and table5, why is there no dummy variable corresponding to the OR? Please point out what is the reference for each variable.</p> <p>13. The discussion section was poorly structured, and was insufficient. In the first paragraph, the authors should show the incidence of CHE for TB care and give its possible reasons why it is lower than other cities of China, Nigeria, and Benin and why it is still higher than other common disease or non-communicable chronic disease in China and other countries. In the second paragraph, the authors might focus on the relationships between patient/diagnosis delay and CHE of TB care among TB patients and its possible reasons. The authors might also add one to two paragraphs to discuss some other factors associated with CHE of TB care and its possible reasons. Then the authors might compare the factors of the CHE of TB care of this study with previous studies.</p> <p>14. In the first paragraph of the Discussion section, the part after "Recently, WHO changes the definition of..." should be moved to the last paragraph of the Discussion section, as a limitation of this study.</p> <p>15. In the Conclusion section, the authors should add some implications of the main findings.</p> <p>16. Please polish the language throughout the manuscript.</p>
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## VERSION 1 – AUTHOR RESPONSE

### Reply to Reviewer Long Qian

Dear professor Long:

Thank you very much for your professional and thorough review of the manuscript. We think it is quite important and valuable for improving our study. With the help of your suggestions, we have made extensive modification on the original manuscript. Here, we list our response to every question. A revised manuscript with the correction sections highlighted in red is attached as the supplemental material. Should you have any questions, please contact us.

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

Answer: We have reported competing interests on page 19 line 30.

2. Abstract: 1) According to the results reported in the abstract, outcome measures were incidence and intensity of CHE for TB care. The study examined the association between patients' "social-demographic and clinical characteristics" and incidence of CHE. Do clinical characteristics mean patient delay and diagnostic delay, which was reported in the abstract results. If so, it would be better

to clarify in the section of outcome measures in the abstract. 2) Abstract results reported adjusted odds ratio (e.g. patient delay adjusted odds ratio 1.359 etc.), but it is not clear how adjusted analysis was performed. 3) Conclusion is vague. Moreover, the study only included four counties of Chongqing. The generalization to western region should be made with cautions.

Answer: We appreciate your thorough review and agree with you.

1) In the present study, clinical characteristics contain patient delay, diagnostic delay, forms of TB, health insurance status and hospitalization. According to your advice, we revised the outcome measures in the abstract and highlighted in red in Page 2 line 9-13.

Outcome measures: The incidence and intensity of CHE for TB care were described. The association between patients' "social-demographic and clinical characteristics such as patient delay, diagnostic delay, forms of TB, health insurance status and hospitalization" and incidence of CHE were analyzed using univariate and multivariate logistic regression.

2) Firstly, we used Pearson's chi-square test for univariate analysis seen in Table 4. Then, those factors showed significant differences in univariate analysis were included in the multivariate logistic regression, including patient delay, diagnostic delay, sex, age, resident status, marital status, educational level, occupation, health insurance status, and hospitalization. Finally, we received the adjusted odds ratio. We have added the sentence in the revised manuscript and highlighted in red in Page 2 line 17-20.

3) Thanks for your advice and we agree with you. The present study was conducted only in four counties of Chongqing. Thus it may only represent Chongqing. Therefore, we revise the title and conclusion according to your suggestion and highlighted in red. The title now is: The extent and determinants of catastrophic health expenditure for tuberculosis care in Chongqing Municipality, China: a cross-sectional study.

The conclusion is revised to: The incidence and intensity of CHE for TB care are high, which provide baseline data about catastrophic costs that TB-related households faced in Chongqing of China. Variety of determinants of CHE implicate: 1) It is essential to broaden the items of free TB service policy and improve the actual reimbursement rates of health insurance. 2) Take measures to promote patients early to seek care and early diagnosed. 3) More fine-tuned interventions such as precise poverty alleviation are urgent to taken for the vulnerable population to reduce their risks of incurring CHE.

3 Main body \_ Introduction: 1) Generally, there are three essential health insurances in China, rural new cooperative medical scheme, urban residence basic health insurance and urban employee basic health insurance, and benefits varied by health insurance schemes. It would be better to provide background of health insurance, particularly coverage and reimbursement for TB care in the study sites. 2) Only first line anti-TB drugs were free. Please correct in page 4, line 41.

Main body \_ Methods: The description of treatment costs collection is not sufficient. The authors reported that "The treatment costs were collected every month." (page 8) Who and how collect the treatment costs every month? Does it mean that the follow-up survey was conducted with TB patients till completion of the treatment? Did patients recall out-of-pocket payment or from the invoices (page 8, line 26-27)? In addition, how the costs of pre-diagnosis and diagnosis were collected? Challenges and limitations of data collection of treatment costs should be discussed in the discussion "strengths and limitations".

Answer: 1) We have added a background of health insurance for TB in Chongqing in the fourth paragraph of introduction (Page 5 line 20-28) and first paragraph of methods (Page 7 line 16-18), which were highlighted in red in the revised manuscript.

The background of health insurance added in introduction: In addition, there are three essential government-led complementary health insurances to cover some extra expenditures beyond the “free-TB service policy” in China, including the New Cooperative Medical Scheme (NCMS) for rural farmers, the Medical Insurance for Urban Residents scheme (MIUR) and the Medical Insurance for Urban Employees (MIUE). Health insurance for rural farmers was the least guaranteed followed by that for local urban residents, while it for urban employees was the most. However, the financial protection remains insufficient though China has dramatically expanded health insurance coverage.

The background of health insurance added in methods: The reimbursement ratio of medical expenses was 0-60% by MIUE, 0-50% by MIUR and 0-45% by NCMS for outpatients and 65% by MIUE, 35% by MIUR and 35% by NCMS for inpatients in Chongqing.

2) We have corrected the error in the revised manuscript and highlighted in red (Page 5 line 18).

4) Thanks for your professional suggestions and advices. Yes, the follow-up survey was conducted with TB patients till completion of the treatment. The treatment costs were collected every month by the trained TB staff. The staff interviewed each participant and then checked invoices or financial accounting systems to ensure accuracy. Once a patient met the inclusion and exclusion criteria, he or she would be interviewed face to face by a trained TB staff about his or her direct medical costs during the period of pre-diagnosis and diagnosis which were further verified by invoices or financial accounting systems too. We have tried our best to reduce the recall bias. We added these details in the methods (Page 8 line 13-19).

5)

4 Main body \_ Results: 1) As mentioned above, the coverage and benefits for TB care vary by health insurance schemes. If it is possible, the stratification of different health insurance schemes in the analysis would be interesting. 2) Table 2 shows no reimbursement for pre-diagnosis and diagnosis. What services did patients seek before TB diagnosis? If TB suspects seek for care in health facilities, some of services may be covered by health insurance? In table 2, were this information not available or based on TB patients recall indicating no reimbursement in the pre-diagnosis period? Please clarify.

Answer: 1) Thanks for your suggestion, we have reanalyzed data by stratification of different health insurances, including none, NCMS, MIUR, MIUE and other insurance plan seen in table 1, 4 and 5. We added new data in results (Page 12 line 10-16) and discussed it in the discussion part (Page 15 line 21-29, Page 16 line 1-10).

2) Before TB diagnosis, almost all patients seek services in outpatient clinics; the health insurance is very limited. The direct medical costs during different periods seen in Table 2 were reported by patients and further verified by invoices or financial accounting systems. Although medical insurance has reimbursement to outpatient service at a certain proportion, a lot of areas exist to ignore reimbursement of outpatient service to varying degrees [1]. In-effective reimbursement rates of health insurance in China may be the main reason. Therefore, there was no reimbursement for pre-diagnosis and diagnosis. We discussed the reason in the discussion (Page 16 line 2-10).

5. Main body \_ Discussion: 1) What are authors' interpretations why health insurance status and hospital admission were not associated with CHE in this study. 2) In addition, what social-economic characteristics are by local residences and migrants, which may help to explain the migrants were less likely to experience CHE?

Answer: 1) Thanks for your suggestion. After stratification of different health insurance schemes, the incidence of CHE of TB patients who have a rural new cooperative medical scheme or urban residence basic health insurance was higher than those without any types of health insurance in the

univariate analysis. Patients who had NCMS was an independent factor associated with CHE after adjusted other confounding factors (aOR, 1.688; 95% CI, 1.071-2.661). We discussed the reason in the discussion (Page 15 line21-29, Page 16 line1-10) as listed below:

We found that patients covered by NCMS, compared to those without any type of health insurance, are more likely to experience CHE. A series of studies conducted in China have demonstrated that NCMS could not relieve the financial burden of TB-related medical costs and had a partial effect on protecting TB-related households from CHE. Compared with patients not covered by NCMS, patients with TB covered by the NCMS only had a 5% higher reimbursement rate regarding outpatient and total medical costs in Zhejiang and Sichuan provinces of China. NCMS is designed exclusively for rural residents particular for peasants, who are usually in low-income status. Also, the majority of patients without health insurance were migrants. In contrast with the previous study in China, we did not find MIUR or MIUE has any positive effect on reducing CHE. It may be due to in-effective reimbursement rates of health insurance in China. Although health insurance has reimbursement to both outpatient and inpatient services at a certain proportion, a lot of areas exist to ignore reimbursement to varying degrees, especially for outpatient services. In this study, there was no reimbursement for medical costs during pre-diagnosis and diagnosis, which indicated that the implementation effect of reimbursement rates was weak. Thus, so far health insurance plan did not really help to relieve the financial burden for patients with PTB in China. Consequently, the health insurance policy should be implemented effectively.

In our research, only 15.9% of patients had been hospitalized during the intensive treatment, much lower than the figure in a previous study of 55% [2]. Therefore, hospital admission was not associated with CHE in our study. We have explained the reason in the revised manuscript and highlighted in red (Page 15 line10-15).

2) We appreciate your opinion that is very helpful for our study. According to your suggestion, we have added the social-economic characteristics of migrants and inhabitants in table 1. Compared with inhabitants, migrants had a smaller proportion of patients being male, elderly, or peasant and a higher proportion of patients with high educational level. Thus, migrant patients were less likely to experience CHE compared with inhabitant patients. We have explained the reason in the revised manuscript and highlighted in red (Page 15 line16-19).

Table 1 The social-economic characteristics of migrants and inhabitants

Variables	Migrant(n=351)		Inhabitant(n=848)		Chi-square	P
	n	%	n	%		
Male	214	60.97	625	73.70	19.160	0.000
Age(≥60 years)	24	6.84	241	28.42	67.162	0.000
Junior or high	210	59.83	253	29.83	94.219	0.000
Peasant	50	14.25	303	35.73	55.169	0.000

## References

[1] Li W, Li X, Zhang H, Li R, Cheng J, Wang L. An investigation of the current health insurance status of pulmonary tuberculosis cases without drug resistance in certain areas of China. *Chin Prev Med (in Chinese)*, 2012,13(6):401-5.

[2] Zhou C, Long Q, Chen J, Xiang L, Li Q, Tang S, Huang F, Sun Q, Lucas H. Factors that determine catastrophic expenditure for tuberculosis care: a patient survey in China. *Infect Dis Poverty* 2016;5:6.

## **Reply to Reviewer Chengchao Zhou**

Dear professor Zhou:

Thank you very much for your professional and thorough review of the manuscript. We think it is quite important and valuable for improving our study. With the help of your suggestions, we have made extensive modification on the original manuscript. Here, we list our response to every question. A revised manuscript with the correction sections highlighted in red is attached as the supplemental material. Should you have any questions, please contact us.

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

Answer: We have stated competing interests on page 19 line 30.

1. In the first paragraph of the Introduction section, the authors are recommended to cite the most recent data from Global tuberculosis report 2018.

Answer: Thanks for your suggestion. We have added data from Global tuberculosis report 2018 and revised reference, which was highlighted in red in the revised manuscript (Page 4 line2-5).

The revised part listed as below: Tuberculosis (TB) is one of the top 10 causes of death and the leading cause from a single infectious agent (above HIV/AIDS) worldwide. In 2017, about 10.0 million people developed TB disease and 1.6 million deaths caused by TB globally. China has the second largest burden of TB in the world, accounting for 9% of all cases.

2. In the second half of the first paragraph of the introduction, the authors should add some sentence or new data to highlight the severity of the financial burden on TB patients, as well as a definition about the catastrophic health expenditure for tuberculosis care.

Answer: Thanks for your suggestion and we added the corresponding information in the second half of the first paragraph of introduction and highlighted in red in the revised manuscript (Page 4 line 12-17).

Achieving zero TB-induced catastrophic costs for households is too great to realize in that the financial burden for TB patients is extremely high both in low- and middle-income countries and high-income countries. For instance, the mean treatment costs per drug-sensitive(DS-TB) TB patient are \$39 to \$858 in Africa, \$149 to \$724 in China and €3,427 to €10,282 in the EU.

3. In the Introduction section, the authors should give us a profile of the catastrophic health expenditure for tuberculosis care in China.

Answer: Thanks for your suggestion and we added the corresponding information in the third paragraph of introduction and highlighted in red in the revised manuscript (Page 5 line 6-8).

The revised part listed as below: A recent systematic review indicates that approximately a third of households with a TB patient experience TB-associated catastrophic costs. For instance, the incidence of CHE for TB was 32.4% in Puducherry of India, 78.1% in Benin, and 44% in Nigeria. In

China, more than two-thirds of TB-related households experienced CHE overall and 46.7 % of the households still experienced CHE after reimbursement by NCMS in rural areas.

4. In the last paragraph of the Introduction section, “As an economic and industrial hub of the southwest region of China, Chongqing municipality has experienced rapid economic development”, the economic development level of Chongqing is higher than other cities in the southwest of China, so Chongqing can serve as the representative of the southwest province? “The TB notification rate of Chongqing in 2015 has declined to 70.8 cases per 100,000 population from the peak of 106 cases per 100,000 in 2005.”, since the notification rate of TB in Chongqing has decreased, why Chongqing should be chosen as the research site? The reasons for choosing Chongqing as the research site are insufficient.

Answer: Thanks for your suggestion and we agree with you. Chongqing cannot serve as the representative of the southwest province. Therefore, we have revised the title of the paper.

The title is revised to: The extent and determinants of catastrophic health expenditure for tuberculosis care in Chongqing Municipality, China: a cross-sectional study.

Though the notification rate of TB in Chongqing has decreased, it remains above the average level of China and ranks 10th. Considering the high TB burden and great challenges in controlling TB, as well as no baseline data about the TB-related families facing catastrophic costs in the southwest of China, we conducted a cross-sectional study to investigate the extent and determinants of CHE for TB care, taking Chongqing as an example.

5. In the introduction section, the introduction about Chongqing should be moved to the first paragraph of the Methods section, as an introduction of the setting of this study.

Answer: Thanks for your suggestion and we have moved the introduction about Chongqing to the first paragraph of the Methods section and highlighted in red in the revised manuscript (Page 7 line 4-9).

6. The aim of this study is too general. The authors should add some specific objectives of the study. For example, to explore the associations between the patient /diagnostic delay and CHE for TB care.

Answer: Thanks for your suggestion and we have added it in the abstract (Page 2 line 2-4) and the last paragraph of introduction and highlighted in red in the revised manuscript (Page 6 line 11-15).

7. In the methods section, the inclusion and exclusion criteria of the respondents need reasonable explanation. For example, why only active TB patients were selected as subjects?

Answer: Thanks for your suggestion. Because extrapulmonary TB, tuberculous pleuritis, drug-resistant pulmonary TB and PTB patients not registered in counties' designated TB medical institutes were not covered by the free TB service policy during the period of research, only registered active pulmonary TB were included. In addition, we only interviewed patients with civil capacity to ensure the reliability of the data.

We have explained the inclusion and exclusion criteria of the respondents in the middle of the second paragraph of methods and highlighted in red in the revised manuscript (Page 7 line 20-25).

8. With regard to the definition of catastrophic health expenditures in the methods section, there are no references to support the 10% for the proportion of OOP in total household income. The world



health organization prescribes that catastrophic health expenditures include both direct and indirect costs, but the authors only use direct costs, please explain.

Answer: The definition of 'catastrophic' was different in previous studies and many studies defined the OOP payments of total costs exceeding 10% of household annual income as catastrophic[1-3]. We have added the references in revised manuscript too. A consideration that the direct medical costs were easier to collect and might be more accurate than indirect medical costs, we only collected direct medical costs. Therefore, we defined CHE as the OOP payments of direct medical costs for TB care exceeding the 10% of household annual income in this study.

9. In the results section, the main research results should be listed, rather than all the data in the table are described in words.

Answer: Thanks for your suggestion. We have revised the results according to your advice.

10. In the results section, tables 1 and 4 can be combined into one table.

Answer: Thanks for your suggestion which is rational too. We want to present the social-demographic and clinical characteristics in table 1, and show the results of single factor analysis of catastrophic health expenditure in patients in table 4. For the convenience of the reader, we want to show them independently.

11. In table 2, what is the data distribution type of the direct medical costs for TB care in different periods of services? If it is a normal distribution, it is represented by mean; if it is skewed distribution, it is represented by median. Please check the results again.

Answer: We appreciate your advice. The data distribution type of the direct medical costs for TB care in different periods of services is skewed distribution. Thus, we use median and interquartile range to present them in table 2 and change the expression of results as well (Page 11 line 18-25).

12. In the last paragraph of the results section and table 5, why is there no dummy variable corresponding to the OR? Please point out what is the reference for each variable.

Answer: The dummy variable in table 5 was the same as that in table 4. According to your suggestion, we added dummy variable corresponding to the OR in the revised manuscript in table 5.

13. The discussion section was poorly structured, and was insufficient. In the first paragraph, the authors should show the incidence of CHE for TB care and give its possible reasons why it is lower than other cities of China, Nigeria, and Benin and why it is still higher than other common disease or non-communicable chronic disease in China and other countries. In the second paragraph, the authors might focus on the relationships between patient/diagnosis delay and CHE of TB care among TB patients and its possible reasons. The authors might also add one to two paragraphs to discuss some other factors associated with CHE of TB care and its possible reasons. Then the authors might compare the factors of the CHE of TB care of this study with previous studies.

Answer: We appreciate your suggestion that is very helpful for our study. We have rephrased whole discussion part according to your advice and highlighted in red in the revised manuscript (Page 13-17).

14. In the first paragraph of the Discussion section, the part after "Recently, WHO changes the definition of..." should be moved to the last paragraph of the Discussion section, as a limitation of this study.

Answer: Thanks for your suggestion. We have moved the sentence to the last paragraph of the Discussion section, as a limitation of this study in the revised manuscript and highlighted in red (Page 16 line 16-19).

15. In the Conclusion section, the authors should add some implications of the main findings.

Answer: Thanks a lot for your suggestions. We have revised the conclusion according to your suggestion and highlighted in red in the revised manuscript (Page 16 line 30-31, Page 17 line 1-9).

The conclusion is revised to: Although all patients have access to free TB service policy and the majority of them have health insurance, TB patients shoulder a high burden of OOP payments and experience high incidence and intensity of CHE for TB care in Chongqing, China. Excluding social-demographic factors, patient delay and diagnostic delay are important determinants of CHE for TB care, which highlights the significance of early care seeking and early diagnosis. In addition, NCMS aggravates the catastrophic costs. These findings implicate that it is essential to broaden the items of free TB service policy and improve the actual reimbursement rates of health insurance, especially for outpatients. More fine-tuned interventions such as precise poverty alleviation are urgent to be taken for vulnerable TB patients to reduce their catastrophic costs. Furthermore, our results have provided some baseline data about CHE for TB in China, which may provide some clues for a further prospective study.

16. Please polish the language throughout the manuscript.

Answer: Thanks for your suggestion. The revised manuscript has been polished by a native English expert.

#### References

[1] Ukwaja KN, Alobu I, Abimbola S, Hopewell PC. Household catastrophic payments for tuberculosis care in Nigeria: incidence, determinants, and policy implications for universal health coverage. *Infect Dis Poverty* 2013;2:21.

[2] Laokri S, Dramaix-Wilmet M, Kassa F, Anagonou S, Dujardin B. Assessing the economic burden of illness for tuberculosis patients in Benin: determinants and consequences of catastrophic health expenditures and inequities. *Trop Med Int Health* 2014;19:1249-1258.

[3] Wagstaff A, van Doorslaer E. Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993-1998. *Health Econ* 2003;12:921-934.

#### VERSION 2 – REVIEW

<b>REVIEWER</b>	Qian Long Global Health Research Center, Duke Kunshan University, China
<b>REVIEW RETURNED</b>	27-Jan-2019

<b>GENERAL COMMENTS</b>	<p>In the last paragraph of page 16, the authors pointed that “patients covered by NCMS, compared with those without any type of health insurance, were more likely to experience CHE.” But some contents discussed in this paragraph are not clear. For example, “Compared with patients not covered by NCMS, patients with TB covered by the NCMS only had a 5% higher reimbursement rate...”. Does it mean those without any type of health insurance coverage? In addition, what do these mean, “in-effective reimbursement rates”, “the implementation effect of reimbursement rates was weak” in the following sentence in this paragraph? Please explain or clarify.</p> <p>One minor comment is about the description of three type of health insurance. The NCMS and urban residence basic health insurance largely cover inpatient services and the benefit package for outpatient care vary widely. Please make sure the descriptions of different type of health insurance in the paper are accurate.</p>
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<b>REVIEWER</b>	Chengchao Zhou Shandong University, China
<b>REVIEW RETURNED</b>	26-Jan-2019

<b>GENERAL COMMENTS</b>	The authors have addressed all of my comments, and no add
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## VERSION 2 – AUTHOR RESPONSE

Reply to Reviewer 1 :

1. In the last paragraph of page 16, the authors pointed that “patients covered by NCMS, compared with those without any type of health insurance, were more likely to experience CHE.” But some contents discussed in this paragraph are not clear. For example, “Compared with patients not covered by NCMS, patients with TB covered by the NCMS only had a 5% higher reimbursement rate...”. Does it mean those without any type of health insurance coverage? In addition, what do these mean, “in-effective reimbursement rates”, “the implementation effect of reimbursement rates was weak” in the following sentence in this paragraph? Please explain or clarify.

One minor comment is about the description of three type of health insurance. The NCMS and urban residence basic health insurance largely cover inpatient services and the benefit package for outpatient care vary widely. Please make sure the descriptions of different type of health insurance in the paper are accurate.

Answer: “Compared with patients not covered by NCMS, patients with TB covered by the NCMS only had a 5% higher reimbursement rate...”. It does not mean those without any type of health insurance coverage. Because the author did not introduce whether patients had any other health insurances in not covered group in the cited paper.

“in-effective reimbursement rates” and “the implementation effect of reimbursement rates was weak” mean the actual reimbursement rate is low. We have rephrased the sentences and highlighted in red in the revised manuscript.

Thanks for your suggestion. We have revised the first paragraph of page 17. As listed below: It may be due to the actual reimbursement rate of health insurance is low in China. These three types of health insurances largely cover inpatient services but the benefit package for outpatient care vary

widely. In fact, a lot of areas existed to ignore reimbursements to varying degrees in China, especially for outpatient services.