

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study
AUTHORS	Myint, Aye Nyein Moe; Liabsuetrakul, Tippawan; Htay, Thein Thein; Wai, Myint Myint; Sundby, Johanne; Bjertness, Espen

VERSION 1 – REVIEW

REVIEWER	Germano Mwabu University of Nairobi, Kenya
REVIEW RETURNED	02-Mar-2018

GENERAL COMMENTS	<p>The purpose of the paper is to measure impacts of OOP on impoverishment of ANC users. Table 3 shows poverty levels before and after OOP payments. The increase of the headcount ratio after OOP payment is clear. The changes in poverty intensity are minor and can be ignored. Consider limiting the analysis to effects of OOP on poverty level (headcount ratio). It is not clear what the purpose of Table 4 is. What is meant by the overall positive gap in this table?. Apart from table 5 being hard to read, the logic behind it is problematic. It seems that the authors should first predict OOP and then analyze how the predicted OOP affects poverty. Even this line of analysis needs explanation because it seems as if it is a repetition because the effect of OOP on poverty has already been established in Table 3 without using a regression. It is very hard to read this paper because the language is not straightforward. The paper has important content but this content is not presented well. A major editing and revision of the paper is needed.</p>
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REVIEWER	John Ataguba University of Cape Town
REVIEW RETURNED	23-Mar-2018

GENERAL COMMENTS	<p>Re: Levels of impoverishment and catastrophic out-of-pocket payment for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study</p> <p>This study provides an assessment of financial protection for maternal health (antenatal and delivery) services in a region in Myanmar. Myanmar has a relatively high share of out-of-pocket payment in total health financing. There is no doubt that this will translate into an increased vulnerability to catastrophic and impoverishing out-of-pocket costs for individuals and households. In this regard, the paper provides useful information on the status of financial protection for maternal health services in Myanmar.</p>
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	<p>Major comments</p> <ol style="list-style-type: none"> 1. It is not clear how the poverty line was constructed in the paper. It was not mentioned whether the purchasing power parity (PPP) poverty line was used or the nominal poverty line. How was the US\$1.9/day converted into local Myanmar currency? It is important for the authors to explain this as it has implications for the comparison of results with other countries or settings. 2. More details are needed in terms of the data collection process. Were all household sampled or were only those with a delivery in the past 12 months sampled? The authors need to explain how the sampling proceeded in a very systematic but detailed fashion. This will provide the extent to which the findings can be generalised (within Yangon and Myanmar) and that a similar study could be done in the future. 3. Related to the above, the sampling process will enable you describe how the design and sampling weights were constructed. It is important to also describe the way that the design weights have been able to adjust for e.g. non-response, etc. 4. The discussion section is mixed up. The authors tend to compare “apples” with “oranges”. The issue is that their study was mainly about catastrophic payments and impoverishment from using antenatal and delivery services. However, most of the studies that have been compared with their findings were based on overall out-of-pocket payments. While it is relevant, it is important to that this is pointed out and that studies that looked at individual disease conditions could be used for comparisons as well as those that focused on maternal health services. I am including a list of some studies that are relevant in the reference list. There are a lot more. 5. Your Table 5 should contain other confounding variables. E.g. income or other measures of socio-economic status. What about place of residence? Etc. What about any complication at birth? This could determine the extent to which mothers spend out-of-pocket. Also, control for the number of antenatal care visits before delivery. This may be proportional to the amounts paid out-of-pocket. I really presume that you have a rich dataset that contains most of these variables. It is essential to control for these variables. 6. The paper will benefit from some policy discussions. What are the implications of the study for policy? What policies are needed to mitigate the high levels of impoverishment and financial catastrophe in paying for maternal health services in Yangon, Myanmar? What about the policy of free maternal health services in the country? Why do expectant mothers still pay out-of-pocket? These are issues that the paper needs to discuss in detail. 7. Your discussion section needs to be restructured. Firstly, begin by summarising the results, then discuss the similarities with other similar studies. If necessary, you may show patterns with general papers that look at overall impoverishment and catastrophic out-of-pocket payments and then move into comparing the results with those that assess financial protection in maternal health services (see the list contained in the references below). Thereafter, your policy recommendations should follow. These should be based on the findings of the paper and should be very specific and actionable. The strengths and limitations of the paper will follow. 8. There is a need for language editing.
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	<p>Minor comments</p> <ol style="list-style-type: none"> 1. On page 10, the authors confuse design weights with sampling weights. It seems that their weights are design weights and not sampling weights. Clarify. 2. Page 13, the study writes about a study in Uganda. That paper did not look at maternal health services but at out-of-pocket payments for overall health services in Uganda. 3. The last "limitation" stated before the conclusion section is not appropriate. It is not a limitation that your study, conducted in Myanmar, is not generalisable to other countries. It is sufficient that the study is conducted in Myanmar. What may be relevant is to note that the Yangon region may not be representative of the entire Myanmar. <p>References (This is just a selection...)</p> <p>Bonu, S., Bhushan, I., Rani, M. and Anderson, I., (2009). Incidence and correlates of 'catastrophic' maternal health care expenditure in India. <i>Health Policy and Planning</i>, 24(6), pp.445-456.</p> <p>Honda, A., Randaoharison, P. G. & Matsui, M. (2011). Affordability of emergency obstetric and neonatal care at public hospitals in Madagascar. <i>Reproductive Health Matters</i>, 19, 10-20.</p> <p>Prinja, S., Bahuguna, P., Gupta, R., Sharma, A., Rana, S.K. and Kumar, R., (2015). Coverage and financial risk protection for institutional delivery: how universal is provision of maternal health care in India?. <i>PLoS One</i>, 10(9), p.e0137315.</p>
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VERSION 1 – AUTHOR RESPONSE

Response to reviewers

Levels of impoverishment and catastrophic out-of-pocket payment for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study

(bmjopen-2018-022380)

The responses to the reviewers have been done point-by-point. The revised contents in the manuscript are shown by red color text and also noted in this response.

Responses to Reviewer 1:

1) The purpose of the paper is to measure impacts of OOP on impoverishment of ANC users. Table 3 shows poverty levels before and after OOP payments. The increase of the headcount ratio after OOP payment is clear. The changes in poverty intensity are minor and can be ignored. Consider limiting the analysis to effects of OOP on poverty level (headcount ratio). It is not clear what the purpose of Table 4 is. What is meant by the overall positive gap in this table?

Response: The mean positive gap was calculated as intensity divided by incidence indicating the proportion of OOP payment for ANC and delivery care by the catastrophic household. This explanation has been added in the Methods section on page 8. We revised Table 4 by presenting only 10% of threshold to be consistent with the Methods section.

Methods, Statistical analysis (page 8)

Catastrophic expenditure was analyzed in terms of the incidence, intensity and mean positive gap. Incidence was calculated by the proportion of households having catastrophic expenditure due to OOP payments for ANC or delivery care. Intensity was calculated by the proportion of OOP payments exceeding the threshold. The mean positive gap was calculated as intensity divided by incidence indicating the proportion of OOP payments for ANC and delivery care by the catastrophic household.²⁶
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Table 4. Catastrophic expenditures due to OOP payments for ANC and delivery care

Catastrophic expenditure	Antenatal care (%)	Delivery care (%)	Overall antenatal and delivery care (%)
Incidence	14.0	9.5	22.6
Intensity	7.7	2.0	11.2
Mean positive gap	54.7	20.8	49.6

2) Apart from table 5 being hard to read, the logic behind it is problematic. It seems that the authors should first predict OOP and then analyze how the predicted OOP affects poverty. Even this line of analysis needs explanation because it seems as if it is a repetition because the effect of OOP on poverty has already been established in Table 3 without using a regression. It is very hard to read this paper because the language is not straightforward. The paper has important content but this content is not presented well. A major editing and revision of the paper is needed.

Response: The two main outcome measures in this study were impoverishment and catastrophe. Table 3 shows the outcome of impoverishment in different terms of measurement. Table 4 presents the outcome of catastrophe in different terms of measurement. Table 5 shows the determinants of the incidence of impoverishment and catastrophe. In the analysis section of the Methods, we presented them consecutively on pages 8-9.

Method, statistical analysis (pages 8-9)

The impoverishment was analyzed in terms of the poverty impact of poverty headcount and normalized poverty gap.^{29 30} The poverty impact of the poverty headcount was calculated by subtracting pre-payment head count from post-payment head count. Similarly, the poverty impact of the normalized poverty gap was calculated by subtracting pre-payment normalized poverty gap from post-payment normalized poverty gap.²⁹ Poverty head count was defined as the proportion of households who had pre- or post-payment household annual income less than the defined poverty line. Normalized poverty gap was defined as the poverty gap divided by the poverty line. The poverty gap was calculated by the depth of payment below the poverty line. A Pen's parade graph between household income as a multiple of the poverty line (y axis) with cumulative proportion of the population ranked by household income (x axis) was plotted to show the number of non-poor households which became poor after OOP for pregnancy expenses as indicated by the vertical lines below the poverty line.

Catastrophic expenditure was analyzed in terms of the incidence, intensity and mean positive gap. Incidence was calculated by the proportion of households having catastrophic expenditure due to OOP payments for ANC or delivery care. Intensity was calculated by the proportion of OOP payments exceeding the threshold. The mean positive gap was calculated as intensity divided by incidence indicating the proportion of OOP payments for ANC and delivery care by the catastrophic household.²⁶
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The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression with the survey package to consider the design weight in cluster design. According to this analysis, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹ The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05.

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Response to Reviewer: 2

Re: Levels of impoverishment and catastrophic out-of-pocket payment for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study

This study provides an assessment of financial protection for maternal health (antenatal and delivery) services in a region in Myanmar. Myanmar has a relatively high share of out-of-pocket payment in total health financing. There is no doubt that this will translate into an increased vulnerability to catastrophic and impoverishing out-of-pocket costs for individuals and households. In this regard, the paper provides useful information on the status of financial protection for maternal health services in Myanmar.

Response: It was added in the Introduction section on page 5.

Introduction (page5)

Similarly, Myanmar has begun a program providing free essential drugs and health care for maternal health services in both public facility-based and primary health care settings in recent years, but OOP payment while accessing these services has been reported.^{12 18 19} In addition, reports on the actual financial burden in terms of impoverishment and catastrophic expenditure due to OOP payments are limited.¹³

Major comments

1. It is not clear how the poverty line was constructed in the paper. It was not mentioned whether the purchasing power parity (PPP) poverty line was used or the nominal poverty line. How was the US\$1.9/day converted into local Myanmar currency? It is important for the authors to explain this as it has implications for the comparison of results with other countries or settings.

Response: Thank you very much for this observation. We used the international poverty line so that our data could be internationally compared; an explanation of this has been added in the Methods section on page 6. Concerning the conversion of local Myanmar currency to US\$, on pages 6-7 we explain that “Household annual income and income of all household members, was recorded in Myanmar kyats and converted to US\$ using the exchange rate of 1 USD equal to 1362.63 kyats”.

Method, variables (pages 6-7)

Impoverishment and catastrophe due to OOP payment for overall ANC and delivery care were the two main outcome variables in this study. The OOP payments included all related healthcare services received during ANC and delivery care, namely hospital costs/investigation fees, drugs, consultation fees, food/living/transportation cost, productivity loss and other costs. The OOP payments were calculated for ANC and delivery care and then summed as total OOP payment for care. OOP payments for ANC were counted as the sum of all ANC visits but delivery care was counted at one time. Impoverishment was defined as a household which was forced below the international poverty line (counted as 1.9 US dollars (USD) per day purchasing power parity (PPP)) after paying for maternal health care services.^{6 25} Catastrophe was defined as OOP payment for maternal health care services exceeding a threshold of 10% of a household's annual income.²⁶

Independent variables included background characteristics of women, their husband and household information, accessibility of health services, characteristics of ANC and delivery care and details of services provided. Household annual income and income of all household members, was recorded in Myanmar kyats and converted to US\$ using the exchange rate of 1 USD equal to 1362.63 kyats.

2. More details are needed in terms of the data collection process. Were all household sampled or were only those with a delivery in the past 12 months sampled? The authors need to explain how the sampling proceeded in a very systematic but detailed fashion. This will provide the extent to which the findings can be generalised (within Yangon and Myanmar) and that a similar study could be done in the future.

Response: We have revised this section, on study design, participants and sampling methods including processes and details, on page 6.

Study design, participants and sampling method (page 6)

Three-stage cluster sampling was used to select eligible persons. For stage one, purposive selection of two districts among the four districts of Yangon region which covered both urban and rural populations was done. There were a total of 235 wards and 610 villages in the two districts. “Wards” and “villages” refer to urban and rural populations, respectively.²⁴ For stage two, 16 wards and 16 villages were randomly selected from all of the wards and villages. Households were selected regarding the number of households and a ratio of urban to rural population size in the districts considering the proportional probability sampling (PPS). For stage three, we randomly selected women who had delivered within the past 12 months in each household from selected wards and villages. For households with more than one eligible woman, one woman was selected randomly.

3. Related to the above, the sampling process will enable you describe how the design and sampling weights were constructed. It is important to also describe the way that the design weights have been able to adjust for e.g. non-response, etc.

Response: The study design and sampling process is now explained as above on page 6. The non-response rate was added in the sample size calculation in the methods section on pages 5-6. We used an un-weighted sample but we applied the analysis using a survey package for considering the design weight in the statistical analysis on pages 8-9.

Study design, participants and sampling method (page 6)

Three-stage cluster sampling was used to select eligible persons. For stage one, purposive selection of two districts among the four districts of Yangon region which covered both urban and rural populations was done. There were a total of 235 wards and 610 villages in the two districts. "Wards" and "villages" refer to urban and rural populations, respectively.²⁴ For stage two, 16 wards and 16 villages were randomly selected from all of the wards and villages. Households were selected regarding the number of households and a ratio of urban to rural population size in the districts considering the proportional probability sampling (PPS). For stage three, we randomly selected women who had delivered within the past 12 months in each household from selected wards and villages. For households with more than one eligible woman, one woman was selected randomly.

Study design, participants and sampling method (pages 5-6)

The study recruited women of reproductive age (15-49 years) with a history of birth within the previous 12 months who were residents of the study area. Those who had mental retardation or serious illness were excluded. The required sample size for the first objective was calculated using the one-proportion formula based on a rate of 9% of pregnant women with catastrophic expenditure due to OOP payments in utilization of delivery care from a previous study.^{13 23} With a precision of 4%, type I error of 1%, non-response rate of 10% and design effect of 2, at least 750 women were required.

Method, statistical analysis (pages 8-9)

The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression with the survey package to consider the design weight in cluster design. According to this analysis, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹ The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05.

4. The discussion section is mixed up. The authors tend to compare "apples" with "oranges". The issue is that their study was mainly about catastrophic payments and impoverishment from using antenatal and delivery services. However, most of the studies that have been compared with their findings were based on overall out-of-pocket payments. While it is relevant, it is important to that this is pointed out and that studies that looked at individual disease conditions could be used for comparisons as well as those that focused on maternal health services. I am including a list of some studies that are relevant in the reference list. There are a lot more.

Response: Thank you very much for your suggestions. More references (references 32, 35, 36, 37, 38, 39, 40, 41) were reviewed and the discussion revised accordingly (pages 10-12).

Discussion (pages 10-12)

Approximately one in ten women accessing ANC and one-fourth of women delivering a baby in the study area faced impoverishment or catastrophic expenditure due to OOP payments. Women with a higher number of household members or increased use of ANC visits or who accessed specialists or private services were more likely to face impoverishment or catastrophic expenditure.

Even though free maternal healthcare services are nationally available, at least three-fourths of the women incurred OOP payments, which was the same as a previous study in Myanmar in 2015.¹³ This finding was also similar to previous studies from India in 2004²⁰ and Nigeria in 2010¹⁵, though the maternal health services considered and the methods of OOP measurement were different. Similarly, a study of three African countries where free delivery care was available found that 90% of the women still paid some amount of OOP for their direct medical expenses.³² A possible explanation might be due to the existence of high informal payments or some expenses not covering by health insurance.^{12 13 15}
^{20 32} The need to turn to OOP payments has been shown to influence the utilization of maternal health

services and maternal mortality.³³ Importantly, another study reported that high OOP payments for maternal healthcare also lead households to impoverishment and catastrophic expenditure.⁴

The impoverishment rates in published studies vary depending on the methods used to measure health care expenditures and the poverty line thresholds used for calculating impoverishment. We used the international poverty line in 2011 of US\$ 1.9 per day. A study from Nepal used the international standard from a different year (the international poverty line in 2005 of US\$ 1 per day).¹⁰ The poverty headcount due to the use of institutional delivery reported was 17% which was higher results than us. In contrast, a study in India used their local poverty line and found higher impoverishment due to maternal health care expenditure than the findings of our study.³⁴ Although Yangon region is the most developed region among the states and regions of Myanmar, a lot of non-poor households face impoverishment and deep poverty which could be explained by high maternal healthcare payments without a compensation scheme.^{12 22} Two studies from India using data from 2004 and 2015 found that the impact of the poverty headcount for maternal healthcare expenditures was lower after introducing free services for delivery care in 2015.^{34 35}

Likewise, variations in the incidence of catastrophic expenditure due to maternal health care expenditures depend on the different maternal services measured, whether household income or capacity to pay is considered, and the catastrophic expenditure threshold used. One fourth of women faced catastrophic expenditure due to OOP payment for ANC and delivery care in our study, which was higher than an earlier study from Myanmar in 2015. This may be because the previous study measured catastrophic expenditure based only on OOP payments for delivery care, not ANC, and also only direct and indirect medical costs, not other costs or productivity loss.¹³ Higher incidences of catastrophic expenditure due to OOP were reported in India and Ethiopia because poorer women were included and all ANC, delivery and postnatal care services were measured.^{34 36} Prior studies from Africa and Bangladesh concluded that more than one third of women faced catastrophic expenditure due to OOP payments for emergency obstetric care because they were poor and were required to pay for drugs.³⁷⁻³⁹

Woman's occupation, number of household members, utilization of health personnel, number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments. A previous study could not identify a direct association between occupation and impoverishment and catastrophic expenditure. The significant association between woman's occupation and impoverishment and catastrophic expenditure found in our study could be explained by woman reduced working because of their pregnancy leading to lower household income. The number of household members increased the impoverishment and catastrophic expenditure in our study which was different from a previous study from India²¹ which could be explained by lower sharing financial resources among household members of our study participants. The finding of higher rates of catastrophic expenditure in women with a higher number of ANC visits in our study was the same as a study in India which included women with low economic status.⁴⁰ Other studies have found that women who used a nearby health center or facilities having specialists and private facilities for ANC and delivery care where health insurance was not available were more likely to have impoverishment and catastrophic expenditure.^{16 20 21 33 40 41}

5. Your Table 5 should contain other confounding variables. E.g. income or other measures of socio-economic status. What about place of residence? Etc. What about any complication at birth? This could determine the extent to which mothers spend out-of-pocket. Also, control for the number of antenatal care visits before delivery. This may be proportional to the amounts paid out-of-pocket. I really presume that you have a rich dataset that contains most of these variables. It is essential to control for these variables.

Response: Thank you. We have added place of residence, complications during pregnancy and child birth, and number of ANC visits as suggested in the Methods section, page 7, Results page 9 for Table 1, Results page 10 for Table 5 and Discussion pages 10-13.

Method, variables (page 7)

Independent variables included background characteristics of the women and their husbands and household information, accessibility of health services, characteristics of ANC and delivery care and details of services provided. Household annual income was recorded in Myanmar kyats and converted to US\$ using the exchange rate of 1 USD equal to 1362.63 kyats. The information pertaining to accessibility to health services included availability of a health center, distance as measured in walking minutes (number of walking minutes from the woman's house to a formal health center) and types of transportation (women who used any transport to visit a health center). Characteristics of ANC

and delivery care included complications during pregnancy and child birth and number of ANC visits. Details of services provided included health personnel, place of care, affordability, and OOP payments.

Results (page 9)

A total of 759 women were included in this study. More than two-thirds of the women lived in an urban area. Half of the women were aged 24- 35 years and 71% were housewives. More than two-thirds of their husbands had above primary school level education and 60% of them worked as daily wage-earners. Most of the households had less than five household members and 89% of them had an annual household income above 1275 US dollars (USD), and 60.3% of the households had debt. More than 80% of the women said that a health center was available for them to get ANC services within 30 minutes walking distance. Only 21.2% of the women had less than four ANC visits and 15% and 23% of them faced complications during pregnancy and child birth, respectively (Table 1).

Results (page 10)

The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Woman's occupation, number of household members, number of ANC visits, different health personnel providing delivery services, and place of ANC received were the significant determinants of both impoverishment and catastrophic expenditure for overall ANC and delivery care. Using delivery services from a private facility was a significant determinant of impoverishment, but not of catastrophic expenditure.

Discussion (pages 10-13)

Approximately one in ten women accessing ANC and one-fourth of women delivering a baby in the study area faced impoverishment or catastrophic expenditure due to OOP payments. Women with a higher number of household members or increased use of ANC visits or who accessed specialists or private services were more likely to face impoverishment or catastrophic expenditure.

Even though free maternal healthcare services are nationally available, at least three-fourths of the women incurred OOP payments, which was the same as a previous study in Myanmar in 2015.¹³ This finding was also similar to previous studies from India in 2004²⁰ and Nigeria in 2010¹⁵, though the maternal health services considered and the methods of OOP measurement were different. Similarly, a study of three African countries where free delivery care was available found that 90% of the women still paid some amount of OOP for their direct medical expenses.³² A possible explanation might be due to the existence of high informal payments or some expenses not covering by health insurance.^{12 13 15 20 32} The need to turn to OOP payments has been shown to influence the utilization of maternal health services and maternal mortality.³³ Importantly, another study reported that high OOP payments for maternal healthcare also lead households to impoverishment and catastrophic expenditure.⁴

The impoverishment rates in published studies vary depending on the methods used to measure health care expenditures and the poverty line thresholds used for calculating impoverishment. We used the international poverty line in 2011 of US\$ 1.9 per day. A study from Nepal used the international standard from a different year (the international poverty line in 2005 of US\$ 1 per day).¹⁰ The poverty headcount due to the use of institutional delivery reported was 17% which was higher results than us. In contrast, a study in India used their local poverty line and found higher impoverishment due to maternal health care expenditure than the findings of our study.³⁴ Although Yangon region is the most developed region among the states and regions of Myanmar, a lot of non-poor households face impoverishment and deep poverty which could be explained by high maternal healthcare payments without a compensation scheme.^{12 22} Two studies from India using data from 2004 and 2015 found that the impact of the poverty headcount for maternal healthcare expenditures was lower after introducing free services for delivery care in 2015.^{34 35}

Likewise, variations in the incidence of catastrophic expenditure due to maternal health care expenditures depend on the different maternal services measured, whether household income or capacity to pay is considered, and the catastrophic expenditure threshold used. One fourth of women faced catastrophic expenditure due to OOP payment for ANC and delivery care in our study, which was higher than an earlier study from Myanmar in 2015. This may be because the previous study measured catastrophic expenditure based only on OOP payments for delivery care, not ANC, and also only direct and indirect medical costs, not other costs or productivity loss.¹³ Higher incidences of catastrophic expenditure due to OOP were reported in India and Ethiopia because poorer women were included and all ANC, delivery and postnatal care services were measured.^{34 36} Prior studies from Africa and Bangladesh concluded that more than one third of women faced catastrophic expenditure due to OOP payments for emergency obstetric care because they were poor and were required to pay for drugs.³⁷⁻

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Woman's occupation, number of household members, utilization of health personnel, number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments. A previous study could not identify a direct association between occupation and impoverishment and catastrophic expenditure. The significant association between woman's occupation and impoverishment and catastrophic expenditure found in our study could be explained by woman reduced working because of their pregnancy leading to lower household income. The number of household members increased the impoverishment and catastrophic expenditure in our study which was different from a previous study from India²¹ which could be explained by lower sharing financial resources among household members of our study participants. The finding of higher rates of catastrophic expenditure in women with a higher number of ANC visits in our study was the same as a study in India which included women with low economic status.⁴⁰ Other studies have found that women who used a nearby health center or facilities having specialists and private facilities for ANC and delivery care where health insurance was not available were more likely to have impoverishment and catastrophic expenditure.^{16 20 21 33 40 41}

Only one previous study from Myanmar in rural areas of a township in Ayeyarwaddy region measured catastrophic health expenditure resulting from maternal health care.¹³ Our study included both rural and urban areas of Yangon region, and provides important information on these factors for policy makers to help them consider financial burdens leading to impoverishment or catastrophic expenditure.

6. The paper will benefit from some policy discussions. What are the implications of the study for policy? What policies are needed to mitigate the high levels of impoverishment and financial catastrophe in paying for maternal health services in Yangon, Myanmar? What about the policy of free maternal health services in the country? Why do expectant mothers still pay out-of-pocket? These are issues that the paper needs to discuss in detail.

Response: The policy of free maternal health services in the country was added in the Introduction on page 5. The explanation of why expectant women in Myanmar still pay out-of-pocket expenses was added in the Discussion on pages 10-11. The implications for policy recommendations was added to the Discussion on pages 12-13.

Introduction (page 5)

Similarly, Myanmar has begun a program providing free essential drugs and health care for maternal health services in both public facility-based and primary health care settings in recent years, but OOP payment while accessing these services has been reported.^{12 18 19} In addition, reports on the actual financial burden in terms of impoverishment and catastrophic expenditure due to OOP payments are limited.¹³

Discussion (pages 10-11)

Even though free maternal healthcare services are nationally available, at least three-fourths of the women incurred OOP payments, which was the same as a previous study in Myanmar in 2015.¹³ This finding was also similar to previous studies from India in 2004²⁰ and Nigeria in 2010¹⁵, though the maternal health services considered and the methods of OOP measurement were different. Similarly, a study of three African countries where free delivery care was available found that 90% of the women still paid some amount of OOP for their direct medical expenses.³² A possible explanation might be due to the existence of high informal payments or some expenses not covering by health insurance.^{12 13 15 20 32} The need to turn to OOP payments has been shown to influence the utilization of maternal health services and maternal mortality.³³ Importantly, another study reported that high OOP payments for maternal healthcare also lead households to impoverishment and catastrophic expenditure.⁴

Discussion (page 12-13)

Only one previous study from Myanmar in rural areas of a township in Ayeyarwaddy region measured catastrophic health expenditure resulting from maternal health care.¹³ Our study included both rural and urban areas of Yangon region, and provides important information on these factors for policy makers to help them consider financial burdens leading to impoverishment or catastrophic expenditure.

7. Your discussion section needs to be restructured. Firstly, begin by summarising the results, then discuss the similarities with other similar studies. If necessary, you may show patterns with general papers that look at overall impoverishment and catastrophic out-of-pocket payments and then move into comparing the results with those that assess financial protection in maternal health services (see

the list contained in the references below). Thereafter, your policy recommendations should follow. These should be based on the findings of the paper and should be very specific and actionable. The strengths and limitations of the paper will follow.

Response: We have followed these suggestions and restructured the discussion in pages 10-13, as explained in answer No. 5.

8. There is a need for language editing.

Response: The paper has been edited by a native speaker.

Minor comments

1. On page 10, the authors confuse design weights with sampling weights. It seems that their weights are design weights and not sampling weights. Clarify.

Response: It was design weight and we corrected as suggested in pages 8-9.

Statistical analysis (pages 8-9)

The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression with the survey package to consider the design weight in cluster design. According to this analysis, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹

2. Page 13, the study writes about a study in Uganda. That paper did not look at maternal health services but at out-of-pocket payments for overall health services in Uganda.

Response: It was our mistake and we revised as suggested on pages 10-11.

Discussion (pages 10-11)

Even though free maternal healthcare services are nationally available, at least three-fourths of women were incurred OOP payments, which was not changed from a previous study in Myanmar in 2015.¹³ This finding was also similar to previous studies from India in 2004²⁰ and Nigeria in 2010¹⁵, though the maternal health services considered and the methods of OOP measurement were different. Similarly, a study of three African countries where a free of charges for delivery care was presented showed more than 90% of women paid OOP for direct medical expenses.³² A possible explanation might be due to the fact that there were high informal payments when health facilities were in short supply with no health insurance system.^{12 13 15 20 32} The need to turn to OOP payments has been shown to influence the utilization of maternal health services and maternal mortality.³³ Importantly, another study reported that high OOP payments for maternal healthcare also lead households to impoverishment and catastrophe.⁴

3. The last "limitation" stated before the conclusion section is not appropriate. It is not a limitation that your study, conducted in Myanmar, is not generalisable to other countries. It is sufficient that the study is conducted in Myanmar. What may be relevant is to note that the Yangon region may not be representative of the entire Myanmar.

Response: It was revised as suggested in the discussion on page 13.

Discussion (page 13)

The study had some limitations. First, this was a cross sectional study, thus the causal relationship between the determinants and level of impoverishment and catastrophic expenditure due to OOP payments for ANC and delivery care could not be firmly identified. Second, household annual income and payments for healthcare services were self-reported, therefore, there may have been over- or under-reporting. Third, the payment of total ANC used the payment of last ANC visit and then multiplied by the total number of all visits. Fourth, recall bias might have occurred due to the data gathering through retrospective interviews. However, we included only women within 12 months of delivery to minimize the recall bias. Finally, the socioeconomic status of the people in the Yangon region is better than in other regions; therefore, the findings of this study are not likely representative of the entire country.

VERSION 2 – REVIEW

REVIEWER	Germano Mwabu University of Nairobi, School of Economics, P.O. Box 30197-00100 Nairobi, Kenya
REVIEW RETURNED	04-May-2018

GENERAL COMMENTS	<p>Abstract --Outcome measure: this should be headcount ratio (the proportion poor); not headcount – the number of people who are poor .</p> <p>Catastrophic expenditure measuring incidence: change to catastrophic expenditure incidence.</p> <p>The sentence starting with “Multiple logistic regression ...” is not clear and needs editing.</p> <p>Results: You say: “Of 759 women, out-of-pocket payments were used by 75% of women...”. Please change used to made .</p> <p>You say: “The impact of the poverty headcount was 5.7% for ANC, 1.5% for delivery care and 7.9% for overall ANC and delivery care”. This sentence is difficult to read; further, headcount should be headcount ratio. Consider the following revision:</p> <p>The impact of these payments was to increase poverty headcount ratio by 5.7% in the ANC sub-sample, by 1.5% among users of delivery care and by 7.9% in the total sample. (NB: it is the users of these services who were impoverished further by OOP – not the service themselves). Adjust the next sentence similarly. The next sentence starting with “Women’s occupation” ... needs editing.</p> <p>Conclusion: The first sentence is fine. The next sentence is hard to read.</p> <p>Strengths and limitations: “Multistage sampling and a survey package of analysis were used to minimize the realistic standard errors”. This sentence is hard to read – its meaning is not clear.</p> <p>“Direct and indirect expenditures for antenatal and delivery care in terms of societal perspective were collected”. Same comment as above.</p> <p>There is room to refine all the statements in this section.</p> <p>Introduction: You say: “Impoverishment is defined as ‘a non-poor household is impoverished by healthcare payment when it became poor after health care payment”. Consider rephrasing this as follows:</p> <p>“Impoverishment occurs when a non-poor household becomes poor after paying for health care”.</p> <p>You say: “Catastrophic expenditure is defined as ‘out-of-pocket (OOP) payment for health care that exceeds some estimated proportion of household income or a household’s capacity to pay”. This is excellent.</p> <p>Line 40: Variables (change to Outcome and Independent Variables)</p> <p>The outcome variables are impoverishment and catastrophic expenditure (as you state). The independent variables are the ones you mention below.</p> <p>Starting from line 44: You say: “OOP payments included [expenses on] all related healthcare services received during ANC and delivery care, namely hospital costs/investigation fees, drugs, consultation fees, food/living/transportation payments, productivity loss and other costs. Please add what is in brackets.</p> <p>Line 56: You say: “Impoverishment was defined as a household which was forced below the international poverty line(counted as</p>
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	<p>1.9 US dollars (USD) per day purchasing power parity (PPP) after paying for maternal health care services”.</p> <p>Consider changing the above sentence to: “Impoverishment was defined as a situation where a household fell below the international poverty line (1.9 US dollars in PPP) after paying for maternal health care services”.</p> <p>Line 7: You say: “The impoverishment was analyzed in terms of the poverty impact of poverty headcount and normalized poverty gap”. Although I can see what you want to say, as written, the sentence is very hard to understand. It needs to be rephrased.</p> <p>You say: “The impoverishment was analyzed in terms of the poverty impact of poverty headcount and normalized poverty gap. The poverty impact of the poverty headcount was calculated by subtracting pre-payment head count from post-payment head count. Similarly, the poverty impact of the normalized poverty gap was calculated by subtracting pre-payment normalized poverty gap from post-payment normalized poverty gap”. You are not clear at all. You also continue to confuse headcount with headcount ratio.</p> <p>Starting from line 37: “Incidence was calculated by the proportion of households having catastrophic expenditure due to OOP payments for ANC or delivery care. Intensity was calculated by the proportion of OOP payments exceeding the threshold. The mean positive gap was calculated as intensity divided by incidence indicating the proportion of OOP payments for ANC and delivery care by the catastrophic household.”</p> <p>**All these statements are unclear. It is hard to understand what is being said.</p> <p>** These statements are unclear. “The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression with the survey package to consider the design weight in cluster design. According to this analysis, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹ The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05”.</p> <p>You say: “Woman’s occupation, number of household members, utilization of health personnel, number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments”. At face value this statements seems fine, but on close examination, one can see that the authors are not communicating their findings well. For example, one of the things being said is that ‘utilization of health personnel is associated with impoverishment’. Does this mean that an</p>
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	<p>“increase in utilization of health personnel is positively associated with poverty” or does it mean an “increase in the amount paid for services of health personnel is positively associated with impoverishment”. Note that a decrease in the utilization of (services of) health personnel can also impoverish. Due care has not been taken in interpreting the regression results.</p> <p>Table 1 is fine but I do not see why the World Bank (2016) is referenced. Is the table not based on the data you collected? Table 2 is fine.</p> <p>Table 3: There is no prepayment column for delivery care. Clarify that the prepayment for delivery care is the same as for the antenatal care. It is possible for prepayments for antenatal care to be positive and those for delivery care to be zero.</p> <p>Table 4: The title for this table is catastrophic expenditure due to OOP for ANC and delivery care. It is not clear how the entries in Table are to be interpreted. For example, does the incidence of 14% mean catastrophic expenditure increased by 14% (in the spirit of the table’s title) or does 14% mean that 14% of patients were impoverished after paying for ANC. The results are not well communicated to the reader. The mean positive gap is intensity divided by incidence (multiplied by 100), which is 54.7%. Why is this calculation needed?</p> <p>Table 5: I understand table 5 better now.</p>
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VERSION 2 – AUTHOR RESPONSE

Response to reviewer

Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study (bmjopen-2018-022380.R1)

The responses of reviewers have been done point-by-point. The revised contents in the manuscript have edited by red color texts.

Response to reviewer: 1

Comments

1) Abstract

1.1 Outcome measure

- This should be headcount ratio (the proportion poor); not headcount – the number of people who are poor.
- Catastrophic expenditure measuring incidence: change to catastrophic expenditure incidence.
- The sentence starting with “Multiple logistic regression ...” is not clear and needs editing.

Response: Thank you very much for this advice. It was revised in the outcome measures of abstract.

Outcome measures

Poverty impact of out-of-pocket payments measured by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap was used to assess impoverishment with a poverty threshold of US\$1.9. Out-of-pocket payments exceeding 10% of household annual income were used to assess catastrophic expenditure incidence and intensity. The determinants of impoverishment and catastrophic expenditure due to OOP payments in the utilization of ANC and delivery care were analyzed using multiple logistic regression analysis in a survey package.

1.2 Results: Your say: “Of 759 women, out-of-pocket payments were used by 75% of women...”. Please change used to made.

Response: It was revised as suggested.

Results: Of 759 women, out-of-pocket payments were made by 75% of the women for ANC and 99.6% for delivery care.

1.3 You say: "The impact of the poverty headcount was 5.7% for ANC, 1.5% for delivery care and 7.9% for overall ANC and delivery care". This sentence is difficult to read; further, headcount should be headcount ratio. Consider the following revision: The impact of these payments was to increase poverty headcount ratio by 5.7% in the ANC sub-sample, by 1.5% among users of delivery care and by 7.9% in the total sample. (NB: it is the users of these services who were impoverished further by OOP – not the service themselves). Adjust the next sentence similarly. The next sentence starting with "Women's occupation" ... needs editing.

Response: It was revised in the results of abstract following the suggestion and considering the maximum of abstract word count of 300 words.

Results, abstract

The impact of these payments increased the poverty headcount ratio by 5.7% among women using the ANC services, 1.5% among those using delivery care and 7.9% among those using both ANC and delivery care. Similarly, these payments reflected the incidence of catastrophic expenditure by 14%, 9.5% and 22.6%, respectively. The determinants of impoverishment and catastrophic expenditure were women's occupation, number of household members, number of ANC visits, utilization of facility-based services including skilled health personnel and health facilities.

1.4 Conclusion: The first sentence is fine. The next sentence is hard to read.

Response: It was revised in the conclusion of abstract.

Abstract, conclusions

Out-of-pocket payment for all ANC and delivery care is a challenge as one-tenth of women using these services become impoverished and one-fourth face catastrophic expenditure after utilization of ANC and delivery care. Policy integration was required to reduce women's financial burden of seeking maternal health services relating social characteristics and move towards the implementation of universal health coverage in the country.

2) Strengths and limitations: "Multistage sampling and a survey package of analysis were used to minimize the realistic standard errors". This sentence is hard to read – its meaning is not clear. "Direct and indirect expenditures for antenatal and delivery care in terms of societal perspective were collected". Same comment as above. There is room to refine all the statements in this section.

Response: Thank you very much. We clarified to make clear sentences as suggested in strengths and limitations on page 3.

Strengths and limitations of the study, page 3

- Multistage sampling and the analysis using a survey package applied in this study could minimize the standard errors and better precision of an estimate of the samples.
- Potentially direct and indirect expenditures occurred during the utilization of antenatal and delivery care which presented the real situation were declared.

3) Introduction: You say: "Impoverishment is defined as 'a non-poor household is impoverished by healthcare payment when it became poor after health care payment". Consider rephrasing this as follows: "Impoverishment occurs when a non-poor household becomes poor after paying for health care". You say: "Catastrophic expenditure is defined as 'out-of-pocket (OOP) payment for health care that exceeds some estimated proportion of household income or a household's capacity to pay". This is excellent.

Response: It was revised in the introduction page 4.

Introduction, page 4

Impoverishment is defined as a non-poor household becomes poor after paying for health care.⁶

4) Methods:

4.1 Line 40: Variables (change to Outcome and Independent Variables) The outcome variables are impoverishment and catastrophic expenditure (as you state). The independent variables are the ones you mention below.

Response: It was revised as suggested on page 6.

Outcome and independent variables, page 6

Impoverishment and catastrophic expenditure due to OOP payment for overall ANC and delivery care were the two main outcome variables in this study.

4.2 Starting from line 44: You say: “OOP payments included [expenses on] all related healthcare services received during ANC and delivery care, namely hospital costs/investigation fees, drugs, consultation fees, food/living/transportation payments, productivity loss and other costs. Please add what is in brackets.

Response: It was revised as suggested on page 6.

Outcome and independent variables, page 6

OOP payments included the expenses on all related healthcare services received during ANC and delivery care, namely hospital costs/investigation fees, drugs, consultation fees, food/living/transportation payments, productivity loss and other costs.

4.3 Line 56: You say: “Impoverishment was defined as a household which was forced below the international poverty line (counted as 1.9 US dollars (USD) per day purchasing power parity (PPP)) after paying for maternal health care services”. Consider changing the above sentence to: “Impoverishment was defined as a situation where a household fell below the international poverty line (1.9 US dollars in PPP) after paying for maternal health care services”.

Response: It was revised as suggested on page 6.

Outcome and independent variables, page 6

Impoverishment was defined as a situation where a household fell below the international poverty line (1.9 US dollars in PPP) after paying for maternal health care services.^{6 25}

4.4 Line 7: You say: “The impoverishment was analyzed in terms of the poverty impact of poverty headcount and normalized poverty gap. The poverty impact of the poverty headcount was calculated by subtracting pre-payment head count from post-payment head count. Similarly, the poverty impact of the normalized poverty gap was calculated by subtracting pre-payment normalized poverty gap from post-payment normalized poverty gap”. You are not clear at all. You also continue to confuse headcount with headcount ratio.

Response: To make it concise and reduce the confusion, the poverty impact of OOP payment for measuring impoverishment was revised in the statistical analysis on page 8.

Statistical analysis, page 8

The impoverishment was measured by the poverty impact of OOP payment which was calculated by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap.^{29 30} We considered the maternal health care services from ANC to delivery care and the pre-payment period was counted at one point before utilizing the ANC, thus the pre-payment headcount ratio and normalized poverty gap for ANC and delivery care was the same value. Pre-payment and post-payment headcount ratio was measured by the proportion of households having household annual income below the poverty line before and after the women using the ANC and delivery care, respectively.

4.5 Starting from line 37: “Incidence was calculated by the proportion of households having catastrophic expenditure due to OOP payments for ANC or delivery care. Intensity was calculated by the proportion of OOP payments exceeding the threshold. The mean positive gap was calculated as intensity divided by incidence indicating the proportion of OOP payments for ANC and delivery care by the catastrophic household.”**All these statements are unclear. It is hard to understand what is being said.

Response: It was revised in the statistical analysis on page 8.

Statistical analysis, page 8

Catastrophic expenditure was measured by the incidence and intensity. Incidence was calculated by the proportion of households who face catastrophic expenditure due to OOP payments for ANC or

delivery care. Intensity was calculated by the proportion of OOP payments for ANC and delivery care exceeding the 10% threshold of household's annual income.^{26 30}

4.6 These statements are unclear. "The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression with the survey package to consider the design weight in cluster design. According to this analysis, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹ The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05".

Response: It was revised in the statistical analysis on page 8.

Methods, statistical analysis page 8

The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed by multiple logistic regression model using the survey package which the design weight is considered for a cluster sampling. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹ The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05.

5) Results:

5.1 You say: "Woman's occupation, number of household members, utilization of health personnel, number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments". At face value this statements seems fine, but on close examination, one can see that the authors are not communicating their findings well. For example, one of the things being said is that 'utilization of health personnel is associated with impoverishment'. Does this mean that an "increase in utilization of health personnel is positively associated with poverty" or does it mean an "increase in the amount paid for services of health personnel is positively associated with impoverishment". Note that a decrease in the utilization of (services of) health personnel can also impoverish. Due care has not been taken in interpreting the regression results.

Response: Due to no health insurance in Myanmar, some expenses of utilization of healthcare services are paid by the pregnant women, though some services are free of charge. To reduce the chance of wording misinterpretation, the sentence was more clarified on the results making clearly as suggested results page 10.

Results page 11

The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Housewives, lower number of household members and high costs of payment by increasing number of ANC visits, delivery care by specialists, private health facilities were positively associated with both impoverishment and catastrophic expenditure for overall ANC and delivery care. Using delivery services from a private facility with high payment comparing to public facilities was a significant determinant of impoverishment, but not of catastrophic expenditure.

5.2 Table 1 is fine but I do not see why the World Bank (2016) is referenced. Is the table not based on the data you collected?

Response: We used the value of GDP per capita of Myanmar from World Bank 2016 to classify the cut-off value of income in our study. To reduce the mistake, it was mentioned in the methods rather results on page 7.

Methods, page 7

Household annual income was classified into ≤ 1275 USD or >1275 USD according to GDP per capita of Myanmar from the data of World Bank 2016. The household annual income was recorded in Myanmar kyats and converted to US\$ using the exchange rate of 1 USD equal to 1362.63 kyats

5.3 Table 3: There is no prepayment column for delivery care. Clarify that the prepayment for delivery care is the same as for the antenatal care. It is possible for prepayments for antenatal care to be positive and those for delivery care to be zero.

Response: We considered the maternal health care services from ANC to delivery care and the pre-payment period was counted at one point before utilizing the ANC, thus the pre-payment headcount ratio and normalized poverty gap for ANC and delivery care was the same. It was added in the methods on page 8.

Methods statistical analysis page 8

The impoverishment was measured by the poverty impact of OOP payment which was calculated by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap.^{29 30} We considered the maternal health care services from ANC to delivery care and the pre-payment period was counted at one point before utilizing the ANC, thus the pre-payment headcount ratio and normalized poverty gap for ANC and delivery care was the same value.

5.4 Table 4: The title for this table is catastrophic expenditure due to OOP for ANC and delivery care. It is not clear how the entries in Table are to be interpreted. For example, does the incidence of 14% mean catastrophic expenditure increased by 14% (in the spirit of the table's title) or does 14% mean that 14% of patients were impoverished after paying for ANC. The results are not well communicated to the reader.

The mean positive gap is intensity divided by incidence (multiplied by 100), which is 54.7%. Why is this calculation needed?

Response: As we explain in the methods that incidence was calculated by the proportion of households who face catastrophic expenditure due to OOP payments for ANC or delivery care. Therefore, it indicated that 14% of households spent OOP payment exceeding 10% of threshold of household annual income for ANC. Calculation of mean positive gap can reflect both incidence and intensity of catastrophic payment especially amplify the intensity of catastrophic expenditure. However, in our study, incidence, intensity and mean positive gap were in the same direction and interpretation. To reduce the complexity, we omitted the mean positive gap from the analysis. The methods on page 8 and results on page 10 were revised accordingly.

Methods, page 8

Catastrophic expenditure was measured by the incidence and intensity. Incidence was calculated by the proportion of households who face catastrophic expenditure due to OOP payments for ANC or delivery care. Intensity was calculated by the proportion of OOP payments for ANC and delivery care exceeding the 10% threshold of household's annual income.^{26 30}

Results, page 10

Table 4 presents the data on catastrophic expenditures due to OOP payments for ANC and delivery care. The incidence of households facing catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and delivery care were 14%, 9.5% and 22.6%, respectively. Intensities of catastrophic expenditures was found in the utilizing ANC more than delivery care.

VERSION 3 – REVIEW

REVIEWER	Germano Mwabu University of Nairobi, School of Economics, P.O. Box 30197-00100 Nairobi, Kenya
REVIEW RETURNED	21-Jun-2018

GENERAL COMMENTS	Comments on: Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study 1. The title is too long. Some of what is in the title can be omitted and be dealt with in the text.
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	<p>Consider changing the title to: “Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study”. The “determinants” the determinants do not have to appear in the title. Also, notice that it is not clear (in the original title) whether these are determinants of antenatal and delivery care or also the determinants of impoverishment, catastrophic expenditures...</p> <p>2. Abstract – The objects are stated as follows: Objectives: To assess the levels of impoverishment and catastrophic expenditure due to out-of-pocket (OOP) payments for antenatal care (ANC) and delivery care in Yangon Region, Myanmar and explore their determinants. Please consider the following revision: Objectives: (i) To assess the levels of impoverishment and catastrophic expenditure due to out-of-pocket (OOP) payments for antenatal care (ANC) and delivery care in Yangon Region, Myanmar; and (ii) to explore the determinants of impoverishment and catastrophic expenditures.</p> <p>3. In the design section, consider the following revision, after the phrase... 2016 using “a three-stage cluster sampling procedure”.</p> <p>4. Outcome measures: Poverty impact of out-of-pocket payments measured by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap was used to assess impoverishment with a poverty threshold of US\$1.9. Out-of-pocket payments exceeding 10% of household annual income were used to assess catastrophic expenditure incidence and intensity. What you have above are not outcome measures. I can see why you say “poverty impact of OOP payments” is an outcome measure. I think it is better to view poverty measures as “poverty indicators” rather than as effects (impacts/changes in outcomes) arising from OOP payments. What is intended here are indicators of what the catastrophic expenditures due to OOP are influencing. Thus, they should be: “Poverty rate (headcount ratio), normalized poverty gap and catastrophic expenditure incidence”. These worsen (increase) as OOP payments rise. I believe there is no need to explain how the outcome measures were computed.</p> <p>5. What follows is not easy to understand and can be omitted, at least from the abstract. You also state: “The determinants of impoverishment and catastrophic expenditure due to OOP payments in the utilization of ANC and delivery care were analyzed using multiple logistic regression analysis in a survey package.” Notice that the meaning of the following phrase is unclear: “were analyzed using multiple logistic regression analysis in a survey package”. This is an instance where editing is needed.</p> <p>6. You say: Similarly, these payments reflected the incidence of catastrophic expenditure by 14%, 9.5%, and 22.6%, respectively. This is incorrect. You want to say increased (not reflected). Since you only have one outcome variable (incidence of catastrophic expenditure), you cannot have it increasing by 14%, 9.5% and 22.6%. Also, change reflected to “increased” in the preceding sentence. Your work needs careful editing.</p> <p>7. You say: “Policy integration was required to reduce women’s financial burden of seeking maternal health services relating social characteristics and move towards the implementation of universal health coverage in the country”. This is too general; it can be omitted.</p>
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	<p>8. Key words: this is one word: Keywords.</p> <p>9. Strengths and limitations. You do not say what the strengths are, and what the limitations are. You say: "This study measured the level of impoverishment and catastrophic expenditure due to OOP payment for antenatal and delivery care and their determinants in Myanmar, which is a low-income country". This is strength but the sentence needs rephrasing. Consider restating it as follows: This study measured impacts of OOP payments for antenatal and delivery care on levels of impoverishment and catastrophic expenditure in Myanmar, one of the few studies on this issue in a low-income country. Other determinants of impoverishment and catastrophic expenditure were also analyzed using logistic regression and found to be important.</p> <p>10. NB: OOP payment is a determinant of impoverishment and catastrophic expenditure. So in (9) above, you are analyzing other determinants. You seem to ignore this aspect.</p> <p>11. Multistage sampling and the analysis using a survey package applied in this study could minimize the standard errors and better precision of an estimate of the samples. (This is another strength but which is not well stated).</p> <p>12. Potentially direct and indirect expenditures occurred during the utilization of antenatal and delivery care which presented the real situation were declared.</p> <ul style="list-style-type: none"> • Recall bias might have occurred due to the data collection based on retrospective interviews. • Self-reported household annual income and payments for healthcare services may have been slightly over- or under-reported. <p>(The above 3 are limitations but need to be stated in a better way).</p> <p>12. Impoverishment is defined as a non-poor household becomes poor after paying for health care. (Avoid definitions at this stage. In any case, your definition is problematic; you ignore the possibility that OOPs can deepen poverty).</p> <p>13. Outcome and independent variables. You say: "Impoverishment and catastrophic expenditure due to OOP payment for overall ANC and delivery care were the two main outcome variables in this study" (the emphasis is mine). This is not correct. Catastrophic expenditure can be due to other factors as well. For example, payment of 20 kyats for antenatal care can result in a catastrophic expenditure for a mother from a low-income household but not for one from a rich family. Moreover, what is at issue is poverty. It does not whether a household falls into poverty due to dental expense or to an antenatal outlay. The aim is to avoid catastrophic health care expenditure of any kind.</p> <p>14. You say: Categorical variables are presented by frequencies and percentages and continuous variables are shown in median with interquartile range. This is not clear; please edit.</p> <p>15. You state: "The impoverishment was measured by the poverty impact of OOP payment which was calculated by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap". This is not clear at all. You have already defined impoverishment. This sentence can be omitted.</p> <p>16. You say: "Pre-payment and post-payment headcount ratio was measured by the proportion of households having household annual income below the poverty line before and after the women using the ANC and delivery care, respectively. Normalized poverty gap was calculated by the depth of OOP payment below the</p>
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	<p>poverty line divided by the poverty line". This is not easy to follow. It is not correct to say that poverty gap was 'calculated' by the depth of OOP. The whole sentence is misleading. Careful editing is needed.</p> <p>17. You state: "The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed by multiple logistic regression model using the survey package which the design weight is considered for a cluster sampling. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.³¹The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05".</p> <p>Comment: Notice that when you say that "The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed...", you are saying that you related incidences of impoverishment and catastrophic expenditure to some covariates, e.g., occupation and income. That is, the incidences are the dependent variables and the covariates (occupation, housework etc) are explanatory variables. But the connecting phrase "by multiple logistic regression model using the survey package which the design weight is considered for a cluster sampling. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district", is not relevant. You need the logistic regression to analyze how the covariates affect the incidences and you also need the weights to ensure that the estimation sample is representative of the parent population. This paragraph is not relevant and could also be misleading. The reader does not see how the logistic regression is being used. For example, are incidences of impoverishment and catastrophic expenditures dummies or proportions. The text suggests that the incidences are "proportions". If incidences are proportions or percentages, why is logistic regression being used? You also do not show the list of covariates. (Refer the reader to table 5 for a list of covariates. I have also realized from Table 5 that what you call incidences are dummies).</p> <p>18. You say: The incidence of households facing catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and delivery care were 14%, 9.5% and 22.6%, respectively. (Why 14%, 9.5% and 22.6%)?</p> <p>19. You say: "The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Housewives, lower number of household members and high costs of payment by increasing number of ANC visits, delivery care by specialists, private health facilities were positively associated with both impoverishment and catastrophic expenditure for overall ANC and delivery care. Using delivery services from a private facility with high payment comparing to public facilities was a significant determinant of impoverishment, but not of catastrophic expenditure.</p>
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	<p>(Change the text that follows as suggested below). “Housewives, lower number of household members and high costs of payment by increasing number of ANC visits, delivery care by specialists, private health facilities were positively associated with both impoverishment and catastrophic expenditure for overall ANC and delivery care”</p> <p>(Suggestions: Impoverishment and catastrophic expenditures are positively or negatively correlated with being housework, with the number of household members, with OOP payments, the number of ANC visits, delivery by specialists, and with care at a private health facility. In particular, using delivery services from a private facility is associated with impoverishment but not with catastrophic expenditure.) Perhaps you can explain why this is so (but this is optional).</p> <p>Discussion: Approximately one in ten women accessing ANC and one-fourth of women delivering a baby in the study area faced impoverishment or catastrophic expenditure due to OOP payments. Women with a higher number of household members or increased use of ANC visits or who accessed specialists or private services were more likely to face impoverishment or catastrophic expenditure. THIS IS VERY GOOD. But the rest of the discussion needs some editing.</p> <p>Conclusion and acknowledgements: These need some editing.</p> <p>Table 3: Change impact to “change”. (You have already acknowledged that the nature of your data does not allow you to detect impact).</p>
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VERSION 3 – AUTHOR RESPONSE

Response to reviewer

Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study (bmjopen-2018-022380.R2)

The responses of reviewers have been done point-by-point. The revised contents in the manuscript have edited by red color texts.

Response to reviewer: 1

I appreciate very much for thoughtful suggestions and comments of the reviewer to improve our manuscript.

Comments

1). Title

1.1. The title is too long. Some of what is in the title can be omitted and be dealt with in the text. Consider changing the title to: “Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study”. The “determinants” the determinants do not have to appear in the title. Also, notice that it is not clear (in the original title) whether these are determinants of antenatal and delivery care or also the determinants of impoverishment, catastrophic expenditures...

Response: Thank you very much. The revision was done as suggested.

Title

“Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study”

2). Abstract

2.1 Abstract – The objects are stated as follows: Objectives: To assess the levels of impoverishment and catastrophic expenditure due to out-of-pocket (OOP) payments for antenatal are (ANC) and

delivery care in Yangon Region, Myanmar and explore their determinants. Please consider the following revision: Objectives: (i) To assess the levels of impoverishment and catastrophic expenditure due to out-of-pocket (OOP) payments for antenatal care (ANC) and delivery care in Yangon Region, Myanmar; and (ii) to explore the determinants of impoverishment and catastrophic expenditures.

Response: It was revised as suggested in abstract page2.

Abstract

Objectives: (i) To assess the levels of impoverishment and catastrophic expenditure due to out-of-pocket (OOP) payments for antenatal care (ANC) and delivery care in Yangon Region, Myanmar; and (ii) to explore the determinants of impoverishment and catastrophic expenditures.

2.2. In the design section, consider the following revision, after the phrase... 2016 using “a three-stage cluster sampling procedure”.

Response: It was revised as suggested.

Design, setting and participants: A community-based cross-sectional survey among women giving birth within the past 12 months in Yangon, Myanmar was conducted during October-November 2016 using three-stage cluster sampling procedure.

2.3. Outcome measures: Poverty impact of out-of-pocket payments measured by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap was used to assess impoverishment with a poverty threshold of US\$1.9. Out-of-pocket payments exceeding 10% of household annual income were used to assess catastrophic expenditure incidence and intensity. What you have above are not outcome measures. I can see why you say “poverty impact of OOP payments” is an outcome measure. I think it is better to view poverty measures as “poverty indicators” rather than as effects (impacts/changes in outcomes) arising from OOP payments. What is intended here are indicators of what the catastrophic expenditures due to OOP are influencing. Thus, they should be: “Poverty rate (headcount ratio), normalized poverty gap and catastrophic expenditure incidence”. These worse (increase) as OOP payments rise. I believe there is no need to explain how the outcome measures were computed.

Response: It was revised as suggested.

Outcome measures: Poverty headcount ratio, normalized poverty gap and catastrophic expenditure incidence due to OOP payments in the utilization of ANC and delivery care were the main outcomes.

2.4. What follows is not easy to understand and can be omitted, at least from the abstract. You also state: “The determinants of impoverishment and catastrophic expenditure due to OOP payments in the utilization of ANC and delivery care were analyzed using multiple logistic regression analysis in a survey package.” Notice that the meaning of the following phrase is unclear: “were analyzed using multiple logistic regression analysis in a survey package”. This is an instance where editing is needed.

Response: Thank you very much. Due to word limit in the abstract, the survey package of analysis was omitted.

Outcome measures: The determinants of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression analysis.

2.5. You say: Similarly, these payments reflected the incidence of catastrophic expenditure by 14%, 9.5%, and 22.6%, respectively. This is incorrect. You want to say increased (not reflected). Since you only have one outcome variable (incidence of catastrophic expenditure), you cannot have it increasing by 14%, 9.5% and 22.6%. Also, change reflected to “increased” in the preceding sentence. Your work needs careful editing.

Response: That sentence did not mean the increasing incidence of CHE as listed but they were the incidence of CHE from the utilization of ANC, delivery care and both antenatal and delivery care, respectively. Thus it was revised to make clearer. The analysis of OOP payments was revised by omitting the costs of productivity loss, therefore, the figures of main outcome measures throughout manuscript were slightly changed.

Results: Of 759 women, out-of-pocket payments were made by 75% of the women for ANC and 99.6% for delivery care. The changes of poverty headcount ratio after payments were shown by 4.3% among women using the ANC services, 1.3% among those using delivery care and 6.1% among those using

both ANC and delivery care. The incidences of catastrophic expenditure after payments were found by 12% for ANC, 9.1% for delivery care, and 20.9% for both ANC and delivery care.

2.6. You say: "Policy integration was required to reduce women's financial burden of seeking maternal health services relating social characteristics and move towards the implementation of universal health coverage in the country". This is too general; it can be omitted.

Response: It was omitted as suggested.

Conclusions: Out-of-pocket payment for all ANC and delivery care is a challenge as one-tenth of women using these services become impoverished and one-fourth face catastrophic expenditure after utilization of ANC and delivery care.

2.7. Key words: this is one word: Keywords.

Response: It was revised as suggested.

Keywords: impoverishment, catastrophic expenditure, out-of-pocket payment, antenatal care, delivery care

3). Strengths and limitations

3.1. Strengths and limitations. You do not say what the strengths are, and what the limitations are. You say: "This study measured the level of impoverishment and catastrophic expenditure due to OOP payment for antenatal and delivery care and their determinants in Myanmar, which is a low-income country". This is strength but the sentence needs rephrasing. Consider restating it as follows: This study measured impacts of OOP payments for antenatal and delivery care on levels of impoverishment and catastrophic expenditure in Myanmar, one of the few studies on this issue in a low-income country. Other determinants of impoverishment and catastrophic expenditure were also analyzed using logistic regression and found to be important.

Response: It was revised as suggested in strengths and limitations on page 3.

Strengths, page 3

- This study measured impacts of OOP payments for antenatal and delivery care on levels of impoverishment and catastrophic expenditure in Myanmar, one of the few studies on this issue in a low-income country. Other determinants of impoverishment and catastrophic expenditure were also analyzed using logistic regression and found to be important.
- Multistage sampling design and the use of adjusted standard errors in the analysis minimized the bias and provided more precise estimates.
- The factors related in terms of social determinants of OOP payments for antenatal and delivery care were collected in this study.

3.2. NB: OOP payment is a determinant of impoverishment and catastrophic expenditure. So in (9) above, you are analyzing other determinants. You seem to ignore this aspect.

Response: OOP payment was included in calculation of impoverishment and catastrophic expenditure. So, we cannot put into analysis model.

3.3. Multistage sampling and the analysis using a survey package applied in this study could minimize the standard errors and better precision of an estimate of the samples. (This is another strength but which is not well stated).

Response: It was revised as suggested the response above (3.1).

3.4. Potentially direct and indirect expenditures occurred during the utilization of antenatal and delivery care which presented the real situation were declared. • Recall bias might have occurred due to the data collection based on retrospective interviews. • Self-reported household annual income and payments for healthcare services may have been slightly over- or under-reported. (The above 3 are limitations but need to be stated in a better way).

Response: It was revised as suggested in limitation in page 3.

Limitations, page 3

- The data on the expenditure of antenatal and delivery care were obtained by women's self-reported experiences, which could have resulted in some recall bias.

- Household annual income and payments for healthcare services were self-reported, therefore, there may have been over- or under-reporting.

4. Impoverishment is defined as a non-poor household becomes poor after paying for health care. (Avoid definitions at this stage. In any case, your definition is problematic; you ignore the possibility that OOPs can deepen poverty).

Response: The sentences of definition were omitted from the Introduction section as suggested on page 4

5. Outcome and independent variables. You say: "Impoverishment and catastrophic expenditure due to OOP payment for overall ANC and delivery care were the two main outcome variables in this study" (the emphasis is mine). This is not correct. Catastrophic expenditure can be due to other factors as well. For example, payment of 20 kyats for antenatal care can result in a catastrophic expenditure for a mother from a low-income household but not for one from a rich family. Moreover, what is at issue is poverty. It does not whether a household falls into poverty due to dental expense or to an antenatal outlay. The aim is to avoid catastrophic health care expenditure of any kind.

Response: We agreed. That was why the factors associated with impoverishment and catastrophic expenditure as the poverty, not only affected by OOP payments but also other factors were analyzed. The main outcomes in the Methods section on page 6 were revised as your suggestion in the abstract.

Outcome and independent variables, page 6

Main outcome measures were the poverty headcount ratio, normalized poverty gap and catastrophic expenditure incidence due to OOP payments in the utilization of ANC and delivery care.

6. You say: Categorical variables are presented by frequencies and percentages and continuous variables are shown in median with interquartile range. This is not clear; please edit.

Response: That sentence showed the descriptive presentation of independent variables but I reconsidered that it was for general statistics thus it was deleted in the Methods on page 7.

7. You state: "The impoverishment was measured by the poverty impact of OOP payment which was calculated by the differences between the pre-payment and post-payment headcount ratio and normalized poverty gap". This is not clear at all. You have already defined impoverishment. This sentence can be omitted.

Response: It was omitted as suggested in Methods section, statistical analysis on page 8.

8. You say: "Pre-payment and post-payment headcount ratio was measured by the proportion of households having household annual income below the poverty line before and after the women using the ANC and delivery care, respectively. Normalized poverty gap was calculated by the depth of OOP payment below the poverty line divided by the poverty line". This is not easy to follow. It is not correct to say that poverty gap was 'calculated' by the depth of OOP. The whole sentence is misleading. Careful editing is needed.

Response: It was revised as suggested in Methods section, statistical analysis on page 8.

Methods, page 8

The average of the relative income shortfall of the poor from the poverty line was calculated to represent a normalized poverty gap.

9. Notice that when you say that "The determinants of the incidences of impoverishment and catastrophic expenditure were analyzed...", you are saying that you related incidences of impoverishment and catastrophic expenditure to some covariates, e.g., occupation and income. That is, the incidences are the dependent variables and the covariates (occupation, housework etc) are explanatory variables. But the connecting phrase "by multiple logistic regression model using the survey package which the design weight is considered for a cluster sampling. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district", is not relevant. You need the logistic regression to analyze how the covariates affect the incidences and you also need the weights to ensure that the estimation sample is representative of the

parent population. This paragraph is not relevant and could also be misleading. The reader does not see how the logistic regression is being used. For example, are incidences of impoverishment and catastrophic expenditures dummies or proportions. The text suggests that the incidences are “proportions”. If incidences are proportions or percentages, why is logistic regression being used? You also do not show the list of covariates. (Refer the reader to table 5 for a list of covariates. I have also realized from Table 5 that what you call incidences are dummies).

Response: The impoverishment or catastrophic expenditure of the household was measured as the binary outcome variable either yes or no, therefore, the logistic regression was used. The covariates used in the multiple logistic regression was emphasized thus it was revised in statistical analysis on page 8.

Statistical analysis, page 8

All independent variables collected were used to test for the determinants of the incidences of impoverishment and catastrophic expenditure. A multiple logistic regression model with sampling weights was applied to adjust for the cluster sampling design.

10. You say: The incidence of households facing catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and delivery care were 14%, 9.5% and 22.6%, respectively. (Why 14%, 9.5% and 22.6%)?

Response: Sorry that the sentences made you the mistakes. It was revised in the Results section on pages 9-10

Results, pages 9-10

Table 3 shows impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. The change of poverty headcount ratio comparing post-payment with pre-payment for women using both ANC and delivery care was shown by 6.1% of which 4.3% was for ANC and 1.3% for delivery care. The change of the normalized poverty gap was quite similar to the poverty headcount ratio that it was 1.25% for ANC and 0.49% for delivery care.

11. You say: “The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Housewives, lower number of household members and high costs of payment by increasing number of ANC visits, delivery care by specialists, private health facilities were positively associated with both impoverishment and catastrophic expenditure for overall ANC and delivery care. Using delivery services from a private facility with high payment comparing to public facilities was a significant determinant of impoverishment, but not of catastrophic expenditure. (Change the text that follows as suggested below). “Housewives, lower number of household members and high costs of payment by increasing number of ANC visits, delivery care by specialists, private health facilities were positively associated with both impoverishment and catastrophic expenditure for overall ANC and delivery care” (Suggestions: Impoverishment and catastrophic expenditures are positively or negatively correlated with being housework, with the number of household members, with OOP payments, the number of ANC visits, delivery by specialists, and with care at a private health facility. In particular, using delivery services from a private facility is associated with impoverishment but not with catastrophic expenditure.) Perhaps you can explain why this is so (but this is optional).

Response: Sorry to make you the mistakes. Those sentences were revised in the Results section on page 10.

Results, page 10

The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Women who were housewives, had lower number of household members, used more ANC visits and had delivery care by specialists or had ANC at private health facilities were more likely to face the impoverishment and catastrophic expenditure due to OOP payments for ANC and delivery care. Women who used delivery care at private facilities comparing to public facilities increased the odds of impoverishment, but not with catastrophic expenditure.

12. Discussion: Approximately one in ten women accessing ANC and one-fourth of women delivering a baby in the study area faced impoverishment or catastrophic expenditure due to OOP payments. Women with a higher number of household members or increased use of ANC visits or who accessed

specialists or private services were more likely to face impoverishment or catastrophic expenditure. THIS IS VERY GOOD. But the rest of the discussion needs some editing.

Response: Thank you very much. We revised to make more clear sentences throughout the Discussion.

13. Conclusion and acknowledgements: These need some editing.

Response: Thank you very much for your comments. We clarified to make clear sentences as suggested in conclusion and acknowledgements on page 14.

Conclusions, page 14

High OOP payments for utilization of ANC and delivery care in the Yangon region of Myanmar resulted in one-tenth of the women becoming impoverished and one-fourth suffering a catastrophic expenditure. Women with lower number of household members or increased use of ANC visits or who accessed specialists or private services were more likely to face impoverishment or catastrophic expenditure.

Acknowledgements, page 14

This study was a part of the thesis of the first author to fulfill the requirements of a doctoral degree in Epidemiology at Prince of Songkla University. We would like to thank the Ministry of Health and Sports and Regional Department of Yangon for their permission and support in data collection.

14. Table 3: Change impact to “change”. (You have already acknowledged that the nature of your data does not allow you to detect impact).

Response: It was revised as suggested in result texts and on Table 3.

VERSION 4 – REVIEW

REVIEWER	Germano Mwabu University of Nairobi, Kenya
REVIEW RETURNED	25-Aug-2018

GENERAL COMMENTS	<p>Comments to the editor: Paper is strongly recommended for publication but language must be fixed either by the Journal or by authors' language expert. There is a limit to what I can do in this regard.</p> <p>Comments to both authors and the editors: These are shown below and in an attachment.</p> <ol style="list-style-type: none"> 1. Title: Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study This title is fine. 2. Outcome measures:Poverty headcount ratio, normalized poverty gap and catastrophic expenditure incidence due to OOP payments in the utilization of ANC and delivery care. (were the main outcomes – omit this part as it is redundant). 3. The determinants of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression. (omit “analysis”as it’s repetitively used).. 4. Please change the following sentence as indicated. The poverty headcount ratios after payments increased to 4.3% among women using the ANC services, to 1.3% among those using delivery care and to 6.1% among those using both ANC and delivery care. The incidences of catastrophic expenditure after payments were found to be 12% for ANC,9.1% for delivery care,and 20.9% for both ANC and delivery care. (PLEASE CHECK IF THIS IS THE INTENDED MEANING).
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	<p>5. The determinants of impoverishment and catastrophic expenditure in the study sites include women’s occupation, number of household members, number of ANC visits, and utilization of skilled health personnel and health facilities. Please add: The associations of the outcomes with these variables bear both negative and positive signs”.</p> <p>6. Conclusions: Out-of-pocket payment for all ANC and delivery care is a challenge as one-tenth of women using these services become impoverished and one-fourth face catastrophic expenditure after utilization of ANC and delivery care. Please change this to: “Conclusion: Out-of-pocket payments for all ANC and delivery care services are a challenge to women, as one-tenth of them become impoverished and a further one-fourth incur catastrophic expenditures after visiting facilities that offer these services”.</p> <p>7. Please replace the associated sentence with: “Multistage sampling design and the use of adjusted standard errors in the analysis minimized the sampling bias and provided reliable and policy relevant estimates”.</p> <p>8. Please replace relevant sentence with: The data on social determinants of OOP payments for antenatal and delivery care were also collected and the evidence from their analysis has been incorporated in this study”.</p> <p>9. Limitations: Please change as indicated below:- • “The data on expenditures of antenatal and delivery care are based on women’s self-reported experiences during service utilization, and may thus contain some recall bias”. • “Household annual incomes as well OOP payments for healthcare services are self-reported and may suffer from over- or under-reporting”.</p> <p>This was a community-based cross-sectional survey conducted in Yangon Region of Myanmar during October and November 2016. Change to: “The study is based on a community-based cross-sectional survey conducted in Yangon Region of Myanmar during October and November 2016”.</p> <p>10. The average of the relative income shortfall of the poor from the poverty line was calculated to represent a normalized poverty gap Please change to: “The average of the relative income shortfall of the poor from the poverty line is the normalized poverty gap”.</p> <p>11. “All independent variables collected were used to test for the determinants of the incidences of impoverishment and catastrophic expenditure. A multiple logistic regression model with sampling weights was applied to adjust for the cluster sampling design. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.²⁹The adjusted Odd Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05”.</p>
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Please change as follows:
 “Data on dependent variables (impoverishment and catastrophic expenditures) and on independent variables (the determinants) were collected and analyzed using multiple logistic regression, with sampling weights being applied to adjust for the cluster sampling design. The first-stage adjustment weight was calculated by dividing the total number of wards and villages in each district by the selected number of wards and villages. The second-stage weight was calculated by dividing the total number of women by the selected number of women in each ward and village. The final stage weight was calculated by multiplying the first stage and second stage weights.²⁹ The adjusted Odds Ratios (OR) at 95% confidence intervals that are presented are from the final estimates that are statistically significant at the 0.05 level or less”.

12. Patient and Public Involvement
 “Women and household members or the public were not involved in the development of the research questions, design of the study or recruitment. The results are not directly disseminated to study participants.” Please change to:
 Involvement of patients and the general public in the study
 “Women and household members and the public were not involved in the development of the research questions, in design of the fieldwork or in the recruitment of research assistants. The results reported in the paper were not disseminated to study participants”.

13. Table 3 shows impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. The change of poverty headcount ratio comparing post-payment with pre-payment for women using both ANC and delivery care was shown by 6.1% of which 4.3% was for ANC and 1.3% for delivery care. The change of the normalized poverty gap was quite similar to the poverty headcount ratio that it was 1.25% for ANC and 0.49% for delivery care. Individual pre-payment and post-payment income for OOP of overall ANC and delivery care is shown in a Pen’s parade graph (Fig 1). Overall OOP payments for ANC and delivery care lead to some extent of poverty regardless of household income level. Table 4 presents the data on catastrophic expenditure due to OOP payments for ANC and delivery care. The incidence of households facing catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and delivery care were 12%, 9.1% and 20.9%, respectively. Intensities of catastrophic expenditures was found in the utilizing ANC more than delivery care.

Please change to:
 “Table 3 shows the change in impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. A look at the poverty headcount ratio and the post-payment and pre-payment ratios for women using both ANC and delivery care shows that poverty increased to 6.1% after service utilization. The decomposition of the new headcount ratio shows that 4.3% was for ANC and 1.3% for delivery care. The increase in the normalized poverty gap shows similar trend, as 1.25% is associated with ANC and 0.49% is for delivery care services. The individual pre-payment and post-payment incomes associated with OOP of both ANC and delivery care are shown in the Pen’s parade (Fig 1). Overall, the OOP payments for ANC and delivery care lead to poverty regardless of household income levels. Table 4 presents the evidence on catastrophic expenditures

due to OOP payments for ANC and delivery care. The poverty incidence for households incurring catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and for delivery care were 12%, 9.1% and 20.9%, respectively. Intensities of catastrophic expenditures were greater among women consuming ANC services than those using the delivery care”.

14. The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC and delivery care are shown in Table 5. Housewives, and women who used more ANC services and those who were delivered by specialists or had ANC at private health facilities were more likely than their counterparts to face the impoverishment and catastrophic expenditure due to OOP payments. Women who used delivery care at private facilities had elevated odds ratios for impoverishment, but notably not for incurring catastrophic expenditures.

15. Two studies from India using data from 2004 and 2015 found that the change of the poverty headcount ratio for maternal healthcare expenditures was lower after introducing free services for delivery care in 2015. Change to:

“Two studies from India using data from 2004 and 2015 found that the poverty headcount ratio for maternal healthcare expenditures declined after introducing free services for delivery care in 2015”.

15. Woman’s occupation, with lower number of household members, utilization of health personnel, increased number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments. Please change to:

“Woman’s characteristics, rates of service usage, among other factors, were associated with impoverishment and catastrophic expenditure due to OOP payments”. (WHAT YOU HAVE NOW IS REPETITIVE AND UNCLEAR).

Change the relevant sentence to: “The significant association between woman’s occupation, impoverishment and catastrophic expenditure found in our study, could be explained by woman’s low levels of employment”. (IF WOMEN ARE NOT WORKING, IT MEANS THEIR INCOMES ARE LOW, OTHER THINGS BEING HELD CONSTANT. SO THE LAST PART OF SENTENCE CAN BE DELETED, AS DONE ABOVE).

16. Change last sentence to: “Women with few household members, or with a large number of ANC visits, or who had been attended by specialists or had used private services were more likely than other women to face impoverishment or catastrophic expenditures”.

17. Acknowledgements

Change to: “This study was a part of the doctoral thesis of the first author in Epidemiology at Prince of Songkla University. We would like to thank the Ministry of Health and Sports and Regional Department of Yangon for their permission and support during the data collection phase of this work”.

18. Figure 1. Pen’s parade of pre- and post-payment income of overall antenatal and delivery care. (THIS FIGURE IS MISSING; IT SHOULD BE INCLUDED IN THE PROPER PLACE IN THE PAPER AND BE WELL LABELED AND INTERPRETED).

VERSION 4 – AUTHOR RESPONSE

Response to reviewer

Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care and their determinants in Yangon region, Myanmar: a cross-sectional study (bmjopen-2018-022380.R3)

Below are our responses to the reviewer's comments, point-by-point. The revised sections in the manuscript are shown in red text.

Response to reviewer: 1

We appreciate very much the thoughtful suggestions and comments of the reviewer to improve our manuscript.

Comments

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

Response: Declaration added on page 15.

Competing interests, page 15

None declared.

Please leave your comments for the authors below

Comments to the editor: Paper is strongly recommended for publication but language must be fixed either by the Journal or by authors' language expert. There is a limit to what I can do in this regard.

Response: The language was edited by a native English speaker at the International Affairs Office of our Faculty of Medicine. However, this revised version was sent for English editing again.

Comments to both authors and the editors: These are shown below and in an attachment.

2). Title:

Impoverishment and catastrophic expenditures due to out-of-pocket payments for antenatal and delivery care in Yangon region, Myanmar: a cross-sectional study

This title is fine.

Response: Thank you.

3). Outcome measures: Poverty headcount ratio, normalized poverty gap and catastrophic expenditure incidence due to OOP payments in the utilization of ANC and delivery care. (were the main outcomes – omit this part as it is redundant).

Response: It has been omitted as suggested in the Abstract, page 2.

Abstract, page 2

Outcome measures: Poverty headcount ratio, normalized poverty gap and catastrophic expenditure incidence due to OOP payments in the utilization of ANC and delivery care as well as the determinants of impoverishment and catastrophic expenditure.

4). The determinants of impoverishment and catastrophic expenditure were analyzed using multiple logistic regression. (omit "analysis" as it's repetitively used).

Response: Omitted as suggested in the response no. 3).

5). Please change the following sentence as indicated. The poverty headcount ratios after payments increased to 4.3% among women using the ANC services, to 1.3% among those using delivery care and to 6.1% among those using both ANC and delivery care. The incidences of catastrophic expenditure after payments were found to be 12% for ANC, 9.1% for delivery care, and 20.9% for both ANC and delivery care. (PLEASE CHECK IF THIS IS THE INTENDED MEANING).

Response: Thank you for your suggestion. This was the intended meaning, and the sentence has been changed as suggested in the Abstract, page 2.

Abstract, page 2

Results: Of 759 women, out-of-pocket payments were made by 75% of the women for ANC and 99.6% for delivery care. The poverty headcount ratios after payments increased to 4.3% among women using the ANC services, to 1.3% among those using delivery care and to 6.1% among those

using both ANC and delivery care. The incidences of catastrophic expenditure after payments were found to be 12% for ANC, 9.1% for delivery care, and 20.9% for both ANC and delivery care. The determinants of impoverishment and catastrophic expenditure were women's occupation, number of household members, number of ANC visits, and utilization of skilled health personnel and health facilities. The associations of the outcomes with these variables bear both negative and positive signs.

6). The determinants of impoverishment and catastrophic expenditure in the study sites include women's occupation, number of household members, number of ANC visits, and utilization of skilled health personnel and health facilities. Please add: The associations of the outcomes with these variables bear both negative and positive signs.

Response: This information has been added as suggested in Response no. 5 above.

7). Conclusions: Out-of-pocket payment for all ANC and delivery care is a challenge as one-tenth of women using these services become impoverished and one-fourth face catastrophic expenditure after utilization of ANC and delivery care. Please change this to:

"Conclusion: Out-of-pocket payments for all ANC and delivery care services are a challenge to women, as one-tenth of them become impoverished and a further one-fourth incur catastrophic expenditures after visiting facilities that offer these services".

Response: The sentence has been changed as suggested.

Abstract, page 2

Conclusions: Out-of-pocket payments for all ANC and delivery care services are a challenge to women, as one-tenth of them become impoverished and a further one-fourth incur catastrophic expenditures after visiting facilities that offer these services.

8). Please replace the associated sentence with: "Multistage sampling design and the use of adjusted standard errors in the analysis minimized the sampling bias and provided reliable and policy relevant estimates".

Response: The sentence has been replaced as suggested in the strengths section, page 3.

Strengths, page 3

- This study measured impacts of OOP payments for antenatal and delivery care on levels of impoverishment and catastrophic expenditure in Myanmar, one of the few studies on this issue in a low-income country. Other determinants of impoverishment and catastrophic expenditure were also analyzed using logistic regression and found to be important.
- Multistage sampling design and the use of adjusted standard errors in the analysis minimized the sampling bias and provided reliable and policy relevant estimates.
- The data on social determinants of OOP payments for antenatal and delivery care were also collected and the evidence from their analysis has been incorporated in this study.

9). Please replace relevant sentence with: The data on social determinants of OOP payments for antenatal and delivery care were also collected and the evidence from their analysis has been incorporated in this study".

Response: It has been replaced as suggested in the response no. 8.

10). Limitations: Please change as indicated below:-

- "The data on expenditures of antenatal and delivery care are based on women's self-reported experiences during service utilization, and may thus contain some recall bias".
- "Household annual incomes as well OOP payments for healthcare services are self-reported and may suffer from over- or under-reporting".

Response: The sentences have been changed as suggested in the limitations section, page 3.

Limitations, page 3

- The data on expenditures of antenatal and delivery care are based on women's self-reported experiences during service utilization, and may thus contain some recall bias.
- Household annual incomes as well OOP payments for healthcare services are self-reported and may suffer from over- or under-reporting.

11). This was a community-based cross-sectional survey conducted in Yangon Region of Myanmar

during October and November 2016. Change to: “The study is based on a community-based cross-sectional survey conducted in Yangon Region of Myanmar during October and November 2016”.

Response: Thank you very much for your suggestion. This sentence has been changed as suggested in the Methods section on page 5.

Methods, Study design, participants and sampling method, page 5

The study was based on a community-based cross-sectional survey conducted in Yangon Region of Myanmar during October and November 2016. According to the 2014 census report, Yangon region had the largest population among the regions of Myanmar.²⁰

12). The average of the relative income shortfall of the poor from the poverty line was calculated to represent a normalized poverty gap

Please change to: “The average of the relative income shortfall of the poor from the poverty line is the normalized poverty gap”.

Response: The sentence has been changed as suggested in the Methods, statistical analysis on page 8.

Methods, statistical analysis, page 8

We considered the maternal health care services from ANC to delivery care and the pre-payment period was counted at one point before utilizing the ANC, thus the pre-payment headcount ratio and normalized poverty gap for ANC and delivery care were the same. Pre-payment and post-payment headcount ratios were measured by the proportion of households having household annual income below the poverty line before and after the women used the ANC and delivery care, respectively. The average of the relative income shortfall of the poor from the poverty line is the normalized poverty gap.

13). “All independent variables collected were used to test for the determinants of the incidences of impoverishment and catastrophic expenditure. A multiple logistic regression model with sampling weights was applied to adjust for the cluster sampling design. For analyzing the weighted samples, the first-stage weight was calculated by the total number of wards and villages divided by the selected number of wards and villages by each district and the second-stage weight was calculated by the total number of women divided by the selected number of women in each ward and village by each district. The final stage weight was calculated by multiplying the first stage and second stage weights.²⁹The adjusted Odds Ratios (OR) and 95% confidence intervals were presented in the final models with the significance value less than 0.05”.

Please change as follows:

“Data on dependent variables (impoverishment and catastrophic expenditures) and on independent variables (the determinants) were collected and analyzed using multiple logistic regression, with sampling weights being applied to adjust for the cluster sampling design. The first-stage adjustment weight was calculated by dividing the total number of wards and villages in each district by the selected number of wards and villages. The second-stage weight was calculated by dividing the total number of women by the selected number of women in each ward and village. The final stage weight was calculated by multiplying the first stage and second stage weights.²⁹ The adjusted Odds Ratios (OR) at 95% confidence intervals that are presented are from the final estimates that are statistically significant at the 0.05 level or less”.

Response: The paragraph has been revised as suggested on pages 8-9.

Methods, statistical analysis, page 8-9

Data on dependent variables (impoverishment and catastrophic expenditures) and on independent variables (the determinants) were collected and analyzed using multiple logistic regression, with sampling weights being applied to adjust for the cluster sampling design. The first-stage adjustment weight was calculated by dividing the total number of wards and villages in each district by the selected number of wards and villages. The second-stage weight was calculated by dividing the total number of women by the selected number of women in each ward and village. The final stage weight was calculated by multiplying the first stage and second stage weights.²⁹ The adjusted Odds Ratios (OR) and 95% confidence intervals were used for presenting the final estimates. A p value less than 0.05 was considered to be statistically significant.

14). Patient and Public Involvement

“Women and household members or the public were not involved in the development of the research

questions, design of the study or recruitment. The results are not directly disseminated to study participants.” Please change to:

Involvement of patients and the general public in the study

“Women and household members and the public were not involved in the development of the research questions, in design of the fieldwork or in the recruitment of research assistants. The results reported in the paper were not disseminated to study participants”.

Response: Thank you very much for your suggestion. The revision has been made as suggested in the Methods, page 6.

Methods, page 6

Involvement of patients and the general public in the study

Women and household members and the public were not involved in the development of the research questions, in design of the fieldwork or in the recruitment of research assistants. The results reported in the paper were not disseminated to study participants.

15). Table 3 shows impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. The change of poverty headcount ratio comparing post-payment with pre-payment for women using both ANC and delivery care was shown by 6.1% of which 4.3% was for ANC and 1.3% for delivery care. The change of the normalized poverty gap was quite similar to the poverty headcount ratio that it was 1.25% for ANC and 0.49% for delivery care. Individual pre-payment and post-payment income for OOP of overall ANC and delivery care is shown in a Pen's parade graph (Fig 1). Overall OOP payments for ANC and delivery care lead to some extent of poverty regardless of household income level. Table 4 presents the data on catastrophic expenditure due to OOP payments for ANC and delivery care. The incidence of households facing catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and delivery care were 12%, 9.1% and 20.9%, respectively. Intensities of catastrophic expenditures was found in the utilizing ANC more than delivery care.

Please change to:

“Table 3 shows the change in impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. A look at the poverty headcount ratio and the post-payment and pre-payment ratios for women using both ANC and delivery care shows that poverty increased to 6.1% after service utilization. The decomposition of the new headcount ratio shows that 4.3% was for ANC and 1.3% for delivery care. The increase in the normalized poverty gap shows similar trend, as 1.25% is associated with ANC and 0.49% is for delivery care services. The individual pre-payment and post-payment incomes associated with OOP of both ANC and delivery care are shown in the Pen's parade (Fig 1). Overall, the OOP payments for ANC and delivery care lead to poverty regardless of household income levels. Table 4 presents the evidence on catastrophic expenditures due to OOP payments for ANC and delivery care. The poverty incidence for households incurring catastrophic expenditure due to OOP payments for ANC, delivery care and overall ANC and for delivery care were 12%, 9.1% and 20.9%, respectively. Intensities of catastrophic expenditures were greater among women consuming ANC services than those using the delivery care”.

Response: It has been changed as suggested in the Results on pages 9-10.

Results, pages 9-10

Table 3 shows the changes in impoverishment due to OOP payments for ANC and delivery care. The poverty headcount ratio at pre-payment was 2.4%. The poverty headcount ratio considering the post-payment and pre-payment for women using both ANC and delivery care showed that poverty increased to 6.1% after service utilization with the decomposition of 4.3% for ANC and 1.3% for delivery care. The increase in the normalized poverty gap showed a similar trend, with 1.25% for ANC and 0.49% for delivery care services. The individual pre-payment and post-payment incomes associated with OOP of both ANC and delivery care are shown in the Pen's parade (Fig 1). Overall, the OOP payments for ANC and delivery care lead to poverty regardless of household income levels. Table 4 presents the evidence on catastrophic expenditures due to OOP payments for ANC and delivery care. The incidence for households incurring catastrophic expenditure due to OOP payments for ANC, delivery care and overall for ANC and delivery care combined were 12%, 9.1% and 20.9%, respectively. Intensities of catastrophic expenditures were greater among women using ANC services than for those using delivery care.

16). The determinants of impoverishment and catastrophic expenditure due to OOP payment for ANC

and delivery care are shown in Table 5. Housewives, and women who used more ANC services and those who were delivered by specialists or had ANC at private health facilities were more likely than their counterparts to face the impoverishment and catastrophic expenditure due to OOP payments. Women who used delivery care at private facilities had elevated odds ratios for impoverishment, but notably not for incurring catastrophic expenditures.

Response: It has been changed as suggested in the Results on page 10.

Results, page 10

The determinants of impoverishment and catastrophic expenditure due to OOP payments for ANC and delivery care are shown in Table 5. Housewives, women who had lower numbers of household members, and those who used more ANC services and those who were delivered by specialists or had ANC at private health facilities were more likely than their counterparts to face impoverishment and/or catastrophic expenditures due to OOP payments. Women who used delivery care at private facilities had elevated odds ratios for impoverishment, but notably not for incurring catastrophic expenditures.

17). Two studies from India using data from 2004 and 2015 found that the change of the poverty headcount ratio for maternal healthcare expenditures was lower after introducing free services for delivery care in 2015. Change to:

“Two studies from India using data from 2004 and 2015 found that the poverty headcount ratio for maternal healthcare expenditures declined after introducing free services for delivery care in 2015”,

Response: It has been changed as suggested in the Discussion on page 12.

Discussion, page 12

Although Yangon region is the most developed region in Myanmar, a lot of non-poor households face impoverishment and deep poverty which could be explained by high maternal healthcare payments without a compensation scheme.^{10 20} Two studies from India using data from 2004 and 2015 found that the poverty headcount ratio for maternal healthcare expenditures declined after introducing free services for delivery care in 2015.^{32 33}

18). Woman’s occupation, with lower number of household members, utilization of health personnel, increased number of ANC visits and place of care were associated with impoverishment and catastrophic expenditure due to OOP payments. Please change to:

“Woman’s characteristics, rates of service usage, among other factors, were associated with impoverishment and catastrophic expenditure due to OOP payments”. (WHAT YOU HAVE NOW IS REPETITIVE AND UNCLEAR).

Change the relevant sentence to: “The significant association between woman’s occupation, impoverishment and catastrophic expenditure found in our study, could be explained by woman’s low levels of employment”. (IF WOMEN ARE NOT WORKING, IT MEANS THEIR INCOMES ARE LOW, OTHER THINGS BEING HELD CONSTANT. SO THE LAST PART OF SENTENCE CAN BE DELETED, AS DONE ABOVE).

Response: This has been revised as suggested on page 12.

Discussion, page 12

Woman’s occupation was associated with impoverishment and catastrophic expenditure due to OOP payments but a previous study could not identify a direct association between occupation and impoverishment and catastrophic expenditure. The significant association between woman’s occupation, impoverishment and catastrophic expenditure found in our study, could be explained by woman’s low levels of employment.

19). Change last sentence to: “Women with few household members, or with a large number of ANC visits, or who had been attended by specialists or had used private services were more likely than other women to face impoverishment or catastrophic expenditures”.

Response: Revised as suggested in conclusion on page 14.

Conclusions, page 14

High OOP payments for utilization of ANC and delivery care in the Yangon region of Myanmar resulted in one-tenth of the women becoming impoverished and one-fourth suffering a catastrophic

expenditure. Women with few household members, or with a large number of ANC visits, or who had been attended by specialists or had used private services were more likely than other women to face impoverishment or catastrophic expenditures.

20). Acknowledgements

Change to: "This study was a part of the doctoral thesis of the first author in Epidemiology at Prince of Songkla University. We would like to thank the Ministry of Health and Sports and Regional Department of Yangon for their permission and support during the data collection phase of this work".

Response: Revised as suggested in acknowledgements, page 14.

Acknowledgements, page 15

This study was a part of a doctoral thesis in Epidemiology of the first author at Prince of Songkla University in Thailand. We would like to thank the Ministry of Health and Sports and Regional Department of Yangon for their permission and support during the data collection phase of this work.

21). Figure 1. Pen's parade of pre- and post-payment income of overall antenatal and delivery care. (THIS FIGURE IS MISSING; IT SHOULD BE INCLUDED IN THE PROPER PLACE IN THE PAPER AND BE WELL LABELED AND INTERPRETED).

Response: Thank you for your suggestion; however, we were told to send this figure as a separate file according the guidelines of the BMJ-Open journal. The interpretation of the figure is in the Results section in the response no. 15 above.