Author's response to reviews

Title: Exposure to cooking fuels and birth weight in Lanzhou, China: a birth cohort study

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Title: “Exposure to cooking fuels and birth weight in Lanzhou, China: a birth cohort study”

Dear Editor,

Thank you for sending us the comments and suggestions from your reviewers. We appreciate these thoughtful comments and suggestions and feel that our corresponding revisions have significantly improved our manuscript. We hope that these revisions and explanations will now make it possible for the manuscript to be published in your journal. The descriptions and explanations of the changes made are listed below. If you have any further suggestions, please let us know. I can be reached by phone at 203-785-6210; by fax at 203-737-6023, and by e-mail at yawei.zhang@yale.edu.

Thank you and best wishes.

Sincerely yours,

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Reviewer 1: Lisa Thompson

1. Remove from abstract, since not statistically significant and misleading: A slightly increased risk of SGA was observed for coal (OR = 1.27, 95% CI: 0.90, 1.80) and electromagnetic stoves (OR = 1.27, 95% CI: 0.93, 1.74) users compared to gas users.

Done as suggested. Please see the third paragraph of abstract.

2. In general, was there simultaneous use of multiple stoves?

There was a relatively small proportion of multiple stoves users. A total of 168 participants used multiple stoves, which accounted for approximately 1.7% of our study population. We clarified this point in lines 212-6.

3. What % of study participants with EM stoves used other stoves simultaneously? Are those that use EM cookers of similar SES compared to those that use gas stoves? One would think that since they don’t emit air pollutants, EM cookers would be most protective. EM cookers have emerged as important “replacement stoves” so this analysis is timely. However, if households were stove stacking, or using indoor heaters with EM stoves (info not collected in
the study), this could be the reason that EM stoves did not show an effect.

A total of 140 participants with EM stoves also used other stoves, which accounted for approximately 22.3% of women who used EM stoves. EM stove users were less educated and had a slightly lower family income as compared to those who used gas stoves. Please see lines 216-18 and Table 2 on page 22 for a more details.

4. In line 302, authors suggest that EM stoves are associated with SGA when they are not. The Roberts study on EM fields is old, and EM fields have been generally refuted as cause of adverse pregnancy and fetal growth. It would be risky, maybe even irresponsible, to suggest that EM may lead to adverse outcomes when data don’t show that.

Done as suggested. Please see lines 346-7 for more details.

5. Line 166: How good is record-keeping/maternal recall around LMP in China? Did authors do a sensitivity analysis of LMP with date of delivery based on ultrasound dates to confirm accurate LMP? Did they extract this info from the charts?

Information on LMP was extracted from medical records. All self-reported LMP dates were verified by ultrasound examinations during antenatal care in the hospital. Since the records only kept the final verified dates, we were unable to conduct sensitivity analysis. We clarified this point in lines 171-3.

6. Line 172-174: What % of infants in study were between 22-28 weeks for which you applied the US national reference standard?

A total of 17 infants were born less than 28 weeks, accounting for approximately 0.2% of our study population. We clarified this point in line 179.

7. Results: How preterm were these infants? Give PT in weeks: mean, SD, range, or % early preterm versus late preterm.

910 (9.2%) infants were preterm births, with a mean gestational age of 33.8 (SD=2.3) weeks. Among the preterm births, 776 were moderate to late preterm births (gestational age 32-36 weeks) and 134 were very preterm births (gestational age <32 weeks). We have included a detailed description of preterm in lines 243-6.

8. Results: Discuss C/S by preterm delivery. (Are we talking C/S of infants at 36 weeks? 36½ weeks? Very different than a 22 week PT infant)

Further stratified analyses were performed by moderate to late preterm and very preterm. The observed associations were similar among moderate to late preterm births as compared to total preterm births. However, no association was observed among very preterm birth, probably due to the small sample size. Please see lines 249-52 and Table 5 on page 26 for more details.

9. Discussion: Discuss very high rate of cesarean section in this study and how
this might lead to PTB.

Literature reported a rapid rise of cesarean sections in China in the past decades. The current national rate is nearly 40%, irrespective of geographic location or socioeconomic status. In our study population, the cesarean section rate was approximately 37.9%, which is comparable to the national rate. In addition, the cesarean was not strongly correlated to PTB (correlation coefficient=0.08). Please see lines 320-5 for a more detailed description.

10. Line 295-7: State general characteristics about households in China, but can you state % with chimney, % cooking in separate room in THIS study?

We did not collect information on using chimneys and whether cooking in a separate room in this study. An early study reported that approximately 92% of Chinese households had smoke removed by a hood or chimney, and 90% of Chinese households cooked in a separate room or a separate building. Since the majority of our study population came from an urban area, the percentages in our study population should be higher than those reported in the previous study. Please see lines 338-42 for a more detailed description.

11. Information about ventilation in table 1.

Done as suggested. Please see Table 1 on page 21.

12. Line 198: add were more likely TO BE either younger.

Done as suggested. Please see line 205.

13. Line 307-8: “Few studies”, but none cited (if there are studies, please cite them)?

To our knowledge, no previous study examined the association between electromagnetic stoves and LBW and SGA. We clarified this point in lines 351-2.

Reviewer 2: Mukesh Dherani

1. What is the catchment area of the population? How generalizable are the results for the Gansu Province?

The study population was recruited from the largest maternity and child care hospital in Lanzhou, the capital city of Gansu Province. The majority of study population came from Lanzhou City. Approximately 20% of the remaining study population came from other cities and towns in Gansu Province. Although the study was hospital-based, which might impact generalizability, the LBW rate (6.2%) in our study population was comparable to the LBW rate (5.0%) in the whole Gansu Province. We have amended lines 360-5 to include a more detailed description.

2. Did the pregnant women come to the hospital from whole province or just the catchment area?
The majority of the pregnant women who came to the hospital were from Lanzhou City. Approximately 20% of the pregnant women came from other towns in Gansu Province.

3. It is not clear if the study design was retrospective cohort or prospective cohort.

This study used data from a birth cohort study. We have retrospectively collected antenatal exposure information and are prospectively following up after delivery. For the present study, the exposure data was collected retrospectively. We amended line 137 to include a more detailed description.

4. What are the reasons that 26.6% of women who did not participate in the study? Do we know their baseline characteristics to compare with those who participated?

The main reason for non-participation was not interested in the study. The distributions of selected characteristics were similar between the participants and non-participants. We clarified this point in lines 139-45.

5. What are the proportions of women who were excluded by each category? Are those women with missing birth weight similar to those who participated in the study?

The number of women excluded by each category was listed in lines 145-7. Participants with missing birth weight had a similar distribution of demographic characteristics, maternal complications, and birth outcomes as compared to those included in the final analyses.

6. Sample size calculations were not mentioned. How did the researchers reach this number given very little use of biomass fuel?

This study was analyzed data from the Lanzhou Birth Cohort Study that was designed to investigate an array of environmental and lifestyle factors, genetic and epigenetic changes in relation to adverse pregnancy outcomes. Therefore, the sample size was not calculated based on the current investigation.

7. Table 1 describes results for 9231 newborns with information on birth weight and 8521 with information on SGA. Methods section suggested final analysis was based on 9895 pregnant women. Please describe the reasons for this discrepancy.

Macrosomia (n=664) was excluded from LBW analyses and LGA (n=1374) was excluded from SGA analyses. Since some macrosomia were not LGA birth and vice versa, the overall sample size was 9895.

8. Table 1 is not distribution of characteristics it is actually a univariate analysis (presumably done retrospectively). You would rather like to assess the distribution by fuel type.

Done as suggested. Please see lines 212-25 and Table 2 on pages 22-23 for
more details.

9. I am not sure if stratified analysis in table 4 is meaningful given the small numbers.

Although the sample size was relatively small in the stratified analyses, we found a slightly stronger association between coal and electromagnetic stove usage and risk of LBW and a significantly greater risk of LBW associated with using biomass as cooking fuel among preterm births. Further studies are needed to confirm these findings. We clarified this point in lines 317-8.

10. Please describe the impact of relatively less prevalence of biomass use/or high gas use on the results.

We acknowledge that the unbalanced design may create problems in estimation. We experimented sampling from gas users and creating a more balanced design. We observed similar results as in the previous model. In addition, with all samples, we have examined the covariate design matrix but have not observed serious singularity. Thus, we do not expect the unbalanced design to cause any serious problem in our estimation.

11. You need to discuss the importance of measuring of household air pollution given huge variations in exposure and also the availability of technology.

Done as suggested. Please see lines 381-3.