Author's response to reviews

Title: Racial and ethnic differences in primary, unscheduled cesarean deliveries among low-risk primiparous women at an academic medical center: a retrospective cohort study

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Author's response to reviews: see over
Dear BMC Pregnancy and Childbirth Editors,

RE: MS: 1451713754970387

Title: Racial and ethnic differences in primary, unscheduled cesarean deliveries among low-risk primiparous women at an academic medical center: a retrospective cohort study

Authors: Joyce K Edmonds, Revital Yehezkel, Xun Liao and Tiffany A Moore Simas

Please find attached a revised version of the manuscript and a point-by-point response to the reviewers’ comments (below). The revised manuscript conforms to the journal style and has been uploaded to the central website. The authors would like to thank Reviewers for careful review of our manuscript and providing us with their comments and suggestion to improve the quality of the manuscript.

We are pleased that the reviewers agree that the manuscript will be a valuable contribution to the literature in this area. We look forward to seeing our manuscript in your journal.

Review 1

Comment: Methods first paragraph should state “Only nulliparous women WHO LABORED OR ATTEMPTED LABOR at term (37-41 weeks) with singleton ...were included.”

Response: The authors agree. We added the suggested language to the first paragraph of the method section.

Comment: Should be a statement as to whether patients were predominantly public, all public, or a mix of public and private.

Response: A statement was added to describe the patient population as a mix of public and private pay.

Comment: In the second paragraph of the Results, two sentences report adjusted odds ratios as equating to specific higher “rates” of primary CS. These two sentences are incorrect. The logistic regression model produces an odds ratio (OR), not a rate ratio (RR). The OR is only a good approximation for the RR when the outcome is rare, or at least uncommon, say <10% event rate. The CS rate is 17% so the OR cannot be used to approximate the RR. An aOR=1.49 means the odds of CS are 49% higher but this is not the same as a CS rate 49% higher. The two sentences that make the specific claims about higher rates should be removed.

Response: Thank you for this important clarification. The two sentences that make specific claims about higher rates were removed from the results section.

Comment: It would increase the interest of the paper if the authors could add whether there was any trend in the CS rate in their low risk study population over the six
years. This could be done by a simple chi square test for trend in the proportion who got a CS each year. If there was a trend it might also be worthwhile doing a trend test on one or more of the indication categories.

**Response:** The authors agree that it would be interesting, however, we believe it would be out of the scope of the paper. We did not identify a priori what a meaningful trend would be and the significance of such a trend. We are not sure what conclusions we would be able to draw from such data. This would be an interesting follow-up.

**Comment:** A reader who just looks at the tables will see “CD” and think that it includes all caesarean sections. The authors could consider changing this to “ICD” (intrapartum caesarean delivery) in Tables 1 and 2, to keep it clear in readers’ minds.

**Response:** Tables 1 and 2 were revised to include ICD versus CD as suggested by the reviewer.

**Review 2**

**Comment:** Women were included in this study if they underwent spontaneous labour or induction of labour (IOL). IOL has repeatedly been shown to increase the risk of CD (the authors have also listed failed IOL as one of the indications for CD in the first stage– Methods: end of paragraph 3). Can the authors please explain the rationale behind not including IOL as an a priori confounding variable in the first multinomial analysis? Without including this confounder, some of the association between ethnicity and CD may be explained by higher rates of IOL in some races. This would be consistent with aspects of the discussion that suggest that variations in clinical decision making for Black and Asian women may contribute to their higher rates of CD for fetal distress.

**Response:** Thank you for your thoughtful comments and questions. Induction of labor is associated with an increased risk of cesarean but no evidence suggests an association with race/ethnicity and therefore we did not include in our analysis. We agree that this is a potential limitation in our analysis and have included this in our discussion. The Ehrenthal, et al, (2010) article you cited showed that even after adjusting for induction there was still significant differences in the odds of cesarean delivery by race [Black race vs Other AOR 1.41 95% CI 1.22-1.64). This is an important area of inquiry and should be further investigated.

“Third, women were included in the study if they experienced spontaneous labor or underwent induction of labor. Studies have shown that induction of labor increases the risk of caesarean delivery [33, 34]. However, in controlling for maternal age [35] and BMI [36], we reduced the likelihood of a confounding effect as these variables are associated with induction of labor. Further, a recent study found that significant associations between CD and race persisted after adjustment for induction in nulliparous women at term. [37]. Therefore, we believe that our associations would remain. Finally, a minor limitation is the
use of self-reported pre-pregnancy weight, which is reported to be underestimated compared to weight measured at the first prenatal visit [38].”

**Comment:** The second multinomial analysis of indication for CD adjusts for neonate size alone. Again, can the authors please indicate why IOL is not included as a confounding variable? IOL is associated with both an increase in risk of ‘failure to progress’ and fetal distress (through hyperstimulation as well as non-reassuring fetal heart rate changes – evidenced also by increased neonatal complications). This comment also applies to the final binary logistic regression model represented in Table 4.

**Response:** We are unable to determine from our existing dataset and IRB approved analysis plan the degree to which IOL is associated with the cesarean section indication categories. Specifically we are unable to determine the contribution of IOL to indicators of failure to progress and fetal distress. With regard to failed induction, (an indication in the first stage category) only 24 women or .5% of our sample had a failed induction. The authors agree that this is an important area of study that should be further investigated.

**Comment:** It is well demonstrated in Table 1 that rates of obesity differ by ethnicity. Obesity is associated with an increased risk of failed IOL, as well as CD in the first, but not the second stage of labour. BMI was not included in the second multinomial analysis as a confounder of indication for CD by ethnicity – can the authors please explain this rationale? This comment also applies to the final binary logistic regression model represented in Table 4.

**Response:** Thank you for your comment. We agree that BMI should have been included and for related reasons maternal age. We repeated the analysis and included both BMI and maternal age. The results section and Tables 3 and 4 reflect the revised results. The associations (magnitude and direction) essentially remained unchanged.

**Comment:** Do the authors wish to comment on the low overall rate of CS of 16.7% compared to public health targets in low risk primiparous women of 23.9% (Background: paragraph 1)?

**Response:** Yes, thank you. Despite an overall low rate of CD, variation or disparities by race/ethnicity persist. Furthermore, the national population is different from the hospital population used in our study.

**Comment:** Although there is moderate agreement between self-reported and measured weight, women have been shown to be more likely to underestimate weight. Some reports have suggested that in pregnancy, self-reported prepregnancy weight is also underestimated. I suggest this be included as a minor limitation. Craig BM, Adams AK. Accuracy of Body Mass Index Categories Based on

**Response:** Thank you, we agree. This was added as minor limitation.