

OBSTETRICS & GYNECOLOGY



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- Comments from the reviewers and editors (email to author requesting revisions)
- Response from the author (cover letter submitted with revised manuscript)*
- Email correspondence between the editorial office and the authors*

**The corresponding author has opted to make this information publicly available.*

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Questions about these materials may be directed to the *Obstetrics & Gynecology* editorial office:
obgyn@greenjournal.org.

Date: Apr 18, 2019
To: "Elizabeth Wall-Wieler" [REDACTED]
From: "The Green Journal" em@greenjournal.org
Subject: Your Submission ONG-19-460

RE: Manuscript Number ONG-19-460

Severe Maternal Morbidity among Stillbirth and Live Birth Deliveries in California

Dear Dr. Wall-Wieler:

Your manuscript has been reviewed by the Editorial Board and by special expert referees. Although it is judged not acceptable for publication in Obstetrics & Gynecology in its present form, we would be willing to give further consideration to a revised version.

If you wish to consider revising your manuscript, you will first need to study carefully the enclosed reports submitted by the referees and editors. Each point raised requires a response, by either revising your manuscript or making a clear and convincing argument as to why no revision is needed. To facilitate our review, we prefer that the cover letter include the comments made by the reviewers and the editor followed by your response. The revised manuscript should indicate the position of all changes made. We suggest that you use the "track changes" feature in your word processing software to do so (rather than strikethrough or underline formatting).

Your paper will be maintained in active status for 21 days from the date of this letter. If we have not heard from you by May 09, 2019, we will assume you wish to withdraw the manuscript from further consideration.

REVIEWER COMMENTS:

Reviewer #1: To assess the prevalence and risk of severe maternal morbidity among delivery hospitalization for stillbirth versus live birth deliveries using data from the Office of Statewide Health Planning and Development in California, a population-based cross-sectional study of 6,450,308 deliveries between 1999 and 2011. The prevalence of severe maternal morbidity is substantially higher among stillbirth deliveries than live birth deliveries. With nearly 1 in 17 women hospitalized for stillbirth delivery experiencing severe morbidity

1. Why did the authors study this epoch of 12 years and not a more recent contemporary epoch
2. The incidence of stillbirth is not increasing nor are the causes changing. as far as I know? Is this really a factor in the increasing SMM nationwide? Please discuss because the Introduction is about increasing SMM nationwide, Alternatively perhaps this is an under represented cause that needs to be managed differently! and we need to decrease the SMM caused by stillbirth by changes in clinical practice guidelines
3. Discussion: Lines 189-193 It is well known to most practicing obstetricians that third trimester stillbirths caused by abruption (placental causes) are True Obstetric Emergencies because of DIC, hemorrhage, hypertensive crisis, neurologic complications and on and on. So not new information. How would you translate this information about SMM and stillbirth into clinical practice: I think you can be more forceful in your call for guidelines and standardization for evaluation for these women. Perhaps a toolkit or bundle for all third trimester stillbirths (or >20 weeks) could be developed? Most importantly, you don't necessarily know the cause at first glance and their initial provider might be a mid-level and not recognize the seriousness of the situation
4. Table 3 "cord anomalies" being 18%. A common documented reason "the cord is wrapped around the neck" has long been a default but no one is certain how real it is. Also non specified cause of death is 27%. Total (non-specified and cord) of 45% as cause listed for fetal death- is amazingly high in modern medicine (nothing to do about this but recognize the unknown)
5. Conclusion: What percent of overall SMM do you think can be attributed to stillbirth? Given the incidence most providers only see a few over the span of their career. So its unusual enough that no one sees a high volume but often enough that most doctors will see a few and need to be prepared- Guidelines could also be broadened to include Emergency Physicians/ Family/midlevels etc A Public Health Campaign

Reviewer #2: Introduction

My immediate reaction from reading the introduction is that the study's findings will be intuitive; i.e. that women with

stillbirth will experience more hemorrhage-related complications which is something that clinicians are already aware of and prepared for.

Additionally, stillbirth in many cases will be associated with and/or the result of, hypertensive diseases of pregnancy, resulting in predictably high complication rates.

In addition to the results being predictable, given that this is a population level analysis it will be impossible to determine whether complications from the stillbirth led to maternal complications or vice versa.

Methods

The methods section is generally well written and clear. However, I am unclear about the following:

1. Line 115-118 for the sensitivity analysis evaluating mode of delivery what was done? Were individual models repeated for vaginal and cesarean delivery? Was mode of delivery included as a variable in the adjusted analyses? The authors aren't clear.
2. Line 119-122 for the sensitivity analysis evaluating initial patient clustering, why not just account for it in the initial models?
3. Was subtype of preeclampsia accounted for? Severe vs mild vs superimposed?

Results

4. The rate of preexisting diabetes (2.1%) is very high. I would check the coding for this.

Discussion

5. "Second, given the recent calls to action to reduce the national rate of severe maternal morbidity, care guidelines and quality improvement initiatives may need to account for the increased morbidity risk associated with stillbirth. Until guidelines are updated, maternal care providers may need to consider closely monitoring all women hospitalized for stillbirth delivery for early signs of major organ dysfunction or failure."

6. I don't really think that these clinical inferences are supported by the findings. Specifically, underlying etiologies of stillbirth such as placental abruption and hypertensive diseases of pregnancy in many cases lead to both maternal morbidity and the stillbirth. It's not clear, particularly from this analysis, on what basis guidelines or recommendations for women with hemorrhage or preeclampsia need to be modified. Again, I would be careful given that this is cross sectional data and we don't know to what degree a condition causes the still birth and maternal outcome, to what degree stillbirth modifies risk for maternal morbidity in the setting of a major complication (severe preeclampsia, abruption, etc.), or to what degree stillbirth can lead to complications absent another cause. I realize that the authors address this to some degree in the study limitations, but I would recommend hedging a bit more earlier on in the discussion.

Reviewer #3: Well written paper on maternal mortality in the US. Though not a must, just a suggestion- it would be worth adding one statement on the relative importance of mat mortality in the US, as compared to other established market economies/developed countries. OECD or some other country data must be available. This way the readers can gauge the gravity of the situation, though US health care system is not comparable to others.

1. The discussion could be cut down by 20% without losing the take home message in this paper. Also, as this paper is not proving anything new and not a controversial topic, reference numbers can be cut down to under 25.
2. Page 7, line 136. Results: "Table 1, presents.....". This statement would be redundant as the table has a complete title. As such, you would not lose anything if you do not have this statement. Rather, if you would like to emphasize the findings in Table, just put the reference to the table in brackets after the first statement, as you have done later in the section. "(Table .1)" This way readers understand that this is the summary of what we find in the table.
3. Page 8, line 141-144. "...the prevalence of severe mat..mortality among was 578.1...". A word is missing after 'among'. Also, the data "101.1" is not seen in table, while 578.1 is seen. Usually, overall data could be seen in the Table for "All" or total etc as the first row, or last row. As such, may be you can help the reader with a note ("not shown in table"). Please help the reader.
4. All Tables. Please align the numbers to make easy visual comparison of numbers. Whole numbers can be right adjusted to achieve this, affording the reader eyeball comparison of 3 digit numbers vs single digit number. For example, in Table 2, SMM prevalence for All is 578 (a 3 digit number), and if the numbers were aligned to the Right, the reader could easily visualize the value for Eclampsia as a smaller (a 2 digit) number. Given your prevalence values are large enough, you may be able to round the numbers and delete the decimals to help de-crowd the table.

STATISTICAL EDITOR'S COMMENTS:

1. Table 1: Should statistically compare the maternal characteristics
2. Table 2: Should cite the counts for stillbirths and live births of the various SMM indicators. The counts for adverse events, from eclampsia to the least prevalent, have too few adverse events to justify aRR using 7 or 10 covariates, as described in this Table and its footnotes.
3. Table 3: The SMM prevalence per 10,000 deliveries among the stillbirth cohort (third column) is calculated by using as input the counts from the columns 1 and 2. In most cases, the numerators are < 99, so there is no justification for citing the prevalence per 10,000 to 3 significant figures. These should be rounded to an appropriate level of precision, eg, rounding to nearest 10 per 10,000 for both point estimate and CI boundaries. These causes and SMM prevalences are aggregated for all GAs. In view of Fig 2, does the ranking of cause of fetal death vary with GA < 30 wks vs later?
4. Fig 2: Need more descriptive legend. What do the error bars represent? lines 170-172: Were the differences in SMM prevalence vs GA statistically indistinguishable before 30 weeks and statistically different afterwards?

EDITORIAL OFFICE COMMENTS:

1. The Editors of *Obstetrics & Gynecology* are seeking to increase transparency around its peer-review process, in line with efforts to do so in international biomedical peer review publishing. If your article is accepted, we will be posting this revision letter as supplemental digital content to the published article online. Additionally, unless you choose to opt out, we will also be including your point-by-point response to the revision letter, as well as subsequent author queries. If you opt out of including your response, only the revision letter will be posted. Please reply to this letter with one of two responses:

1. OPT-IN: Yes, please publish my response letter and subsequent email correspondence related to author queries.
2. OPT-OUT: No, please do not publish my response letter and subsequent email correspondence related to author queries.

2. As of December 17, 2018, *Obstetrics & Gynecology* has implemented an "electronic Copyright Transfer Agreement" (eCTA) and will no longer be collecting author agreement forms. When you are ready to revise your manuscript, you will be prompted in Editorial Manager (EM) to click on "Revise Submission." Doing so will launch the resubmission process, and you will be walked through the various questions that comprise the eCTA. Each of your coauthors will receive an email from the system requesting that they review and electronically sign the eCTA.

Any author agreement forms previously submitted will be superseded by the eCTA. During the resubmission process, you are welcome to remove these PDFs from EM. However, if you prefer, we can remove them for you after submission.

3. Standard obstetric and gynecology data definitions have been developed through the reVITALize initiative, which was convened by the American College of Obstetricians and Gynecologists and the members of the Women's Health Registry Alliance. *Obstetrics & Gynecology* has adopted the use of the reVITALize definitions. Please access the obstetric and gynecology data definitions at <https://www.acog.org/About-ACOG/ACOG-Departments/Patient-Safety-and-Quality-Improvement/reVITALize>. If use of the reVITALize definitions is problematic, please discuss this in your point-by-point response to this letter.

4. Because of space limitations, it is important that your revised manuscript adhere to the following length restrictions by manuscript type: Original Research reports should not exceed 22 typed, double-spaced pages (5,500 words). Stated page limits include all numbered pages in a manuscript (i.e., title page, précis, abstract, text, references, tables, boxes, figure legends, and print appendixes) but exclude references.

5. Specific rules govern the use of acknowledgments in the journal. Please note the following guidelines:

- * All financial support of the study must be acknowledged.
- * Any and all manuscript preparation assistance, including but not limited to topic development, data collection, analysis, writing, or editorial assistance, must be disclosed in the acknowledgments. Such acknowledgments must identify the entities that provided and paid for this assistance, whether directly or indirectly.
- * All persons who contributed to the work reported in the manuscript, but not sufficiently to be authors, must be acknowledged. Written permission must be obtained from all individuals named in the acknowledgments, as readers may infer their endorsement of the data and conclusions. Please note that your response in the journal's electronic author form verifies that permission has been obtained from all named persons.
- * If all or part of the paper was presented at the Annual Clinical and Scientific Meeting of the American College of Obstetricians and Gynecologists or at any other organizational meeting, that presentation should be noted (include the exact dates and location of the meeting).

6. The most common deficiency in revised manuscripts involves the abstract. Be sure there are no inconsistencies between the Abstract and the manuscript, and that the Abstract has a clear conclusion statement based on the results found in the

paper. Make sure that the abstract does not contain information that does not appear in the body text. If you submit a revision, please check the abstract carefully.

In addition, the abstract length should follow journal guidelines. The word limits for different article types are as follows: Original Research articles, 300 words. Please provide a word count.

7. Only standard abbreviations and acronyms are allowed. A selected list is available online at <http://edmgr.ovid.com/ong/accounts/abbreviations.pdf>. Abbreviations and acronyms cannot be used in the title or précis. Abbreviations and acronyms must be spelled out the first time they are used in the abstract and again in the body of the manuscript.

8. The journal does not use the virgule symbol (/) in sentences with words. Please rephrase your text to avoid using "and/or," or similar constructions throughout the text. You may retain this symbol if you are using it to express data or a measurement.

9. Please review the journal's Table Checklist to make sure that your tables conform to journal style. The Table Checklist is available online here: http://edmgr.ovid.com/ong/accounts/table_checklist.pdf.

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Please note that if your article is accepted, you will receive an email from the editorial office asking you to choose a publication route (traditional or open access). Please keep an eye out for that future email and be sure to respond to it promptly.

If you choose to revise your manuscript, please submit your revision via Editorial Manager for Obstetrics & Gynecology at <http://ong.editorialmanager.com>. It is essential that your cover letter list point-by-point the changes made in response to each criticism. Also, please save and submit your manuscript in a word processing format such as Microsoft Word.

If you submit a revision, we will assume that it has been developed in consultation with your co-authors and that each author has given approval to the final form of the revision.

Again, your paper will be maintained in active status for 21 days from the date of this letter. If we have not heard from you by May 09, 2019, we will assume you wish to withdraw the manuscript from further consideration.

Sincerely,

The Editors of Obstetrics & Gynecology

2017 IMPACT FACTOR: 4.982

2017 IMPACT FACTOR RANKING: 5th out of 82 ob/gyn journals

In compliance with data protection regulations, you may request that we remove your personal registration details at any time. (Use the following URL: <https://www.editorialmanager.com/ong/login.asp?a=r>) Please contact the publication office if you have any questions.



May 7, 2019

Nancy C. Chescheir, MD
Editor-in-Chief
Obstetrics & Gynecology

RE: Severe Maternal Morbidity among Stillbirth and Live Birth Deliveries in California

Dear Editor-in-Chief,

Thank you for considering our revised manuscript “Severe Maternal Morbidity among Stillbirth and Live Birth Deliveries in California”. We have carefully considered the constructive suggestions and comments from the reviewers and statistical editor. These have been addressed as outlined below.

REVIEWER #1 COMMENTS

To assess the prevalence and risk of severe maternal morbidity among delivery hospitalization for stillbirth versus live birth deliveries using data from the Office of Statewide Health Planning and Development in California, a population-based cross-sectional study of 6,450,308 deliveries between 1999 and 2011. The prevalence of severe maternal morbidity is substantially higher among stillbirth deliveries than live birth deliveries. With nearly 1 in 17 women hospitalized for stillbirth delivery experiencing severe morbidity

Comment 1

Why did the authors study this epoch of 12 years and not a more recent contemporary epoch

Response to Comment 1

Linked data, including information on stillbirths, are currently only available from OSHPD for the period between 1997 and 2011. Although we do not expect that there were extensive changes in practice comparing the study period vs the ensuing 8 years, we added text to the limitations section to highlight these potential concerns (lines 259-261):

“Although care practices for women with stillbirths are unlikely to have dramatically changed in subsequent years, our results may not be generalizable outside of this time-period and location.”

Comment 2

The incidence of stillbirth is not increasing nor are the causes changing. as far as I know? Is this really a factor in the increasing SMM nationwide? Please discuss because the Introduction is about increasing SMM nationwide, Alternatively perhaps this is an under represented cause that needs to be managed differently! and we need to decrease the SMM caused by stillbirth by changes in clinical practice guidelines

Response to Comment 2

We thank the reviewer for this excellent suggestion. The following text was added to the second paragraph of the Introduction to clarify this (lines 60-64):



“The prevalence of stillbirth in the United States has remained steady at approximately 6 per 1,000 births;⁵ however, more than 15% of maternal deaths within 42 days of delivery in well-resourced countries occur in women who experience a stillbirth delivery.⁶⁻⁸ In contrast, scarce data exists examining the prevalence of severe maternal morbidity among women with stillbirth deliveries.”

We agree that SMM events associated with stillbirth may be underrepresented among all SMM events and that these women need differential care compared to those who have livebirths. In the discussion, we have modified text to highlight the need for clinical practice guidelines specific to women who have stillbirths (see our reply to Reviewer 1, Comment 3).

Comment 3

Discussion: Lines 189-193 It is well known to most practicing obstetricians that third trimester stillbirths caused by abruption (placental causes) are True Obstetric Emergencies because of DIC, hemorrhage, hypertensive crisis, neurologic complications and on and on. So not new information. How would you translate this information about SMM and stillbirth into clinical practice: I think you can be more forceful in your call for guidelines and standardization for evaluation for these women. Perhaps a toolkit or bundle for all third trimester stillbirths (or >20 weeks) could be developed? Most importantly, you don't necessarily know the cause at first glance and their initial provider might be a mid-level and not recognize the seriousness of the situation

Response to Comment 3

We thank the reviewer for their thoughtful comment. Although we acknowledge our results may be ‘well-known’ or ‘intuitive’ to some readers, there is scarce published data on rates of SMM among women who experience stillbirths. As highlighted in our introduction, data on SMM prevalence at a population-level have not been previously reported. Therefore, we believe that our study provides important information for providers who may not be aware of these potential risks and concerns. Additionally, this information will solidify any concerns of obstetricians which are based on their clinical experience. Given current concern about the rising national rate of SMM and the limited data on maternal outcomes of women with stillbirths, we believe our findings are timely and of clinical and public health importance. In light of aforementioned concerns, we agree with the reviewer about ‘being more forceful’ in a call for guidelines and standardization of evaluation and care. Based on the reviewer’s suggestions, we have strengthened our discussion to specify what approaches are needed to draw attention to the maternal morbidity associated with stillbirth (lines 200-210):

“Second, given the recent calls to action to reduce the national rate of severe maternal morbidity,^{4,28} new public health initiatives and practice guidelines are needed to highlight and address the morbidity risk associated with stillbirth. For example, bundles of care and toolkits would be valuable in standardizing how providers evaluate and monitor women who experience stillbirth delivery, with appropriate guidance on managing acute morbidities such as hemorrhage and acute hypertension. Given the low frequency of stillbirth and the possibility that women with stillbirth may not be considered as high-acuity by obstetric and non-obstetric providers, these guidelines should be applicable for all sites where these women receive care including: labor and delivery units, emergency departments, acute care facilities, and family medicine practices. These guidelines may be most valuable for mid-level providers with limited clinical experience in managing women with stillbirths.”

Comment 4

Table 3 "cord anomalies" being 18%. A common documented reason "the cord is wrapped around the neck" has long been a default but no one is certain how real it is. Also non specified cause of death is 27%.



Total (non-specified and cord) of 45% as cause listed for fetal death- is amazingly high in modern medicine (nothing to do about this but recognize the unknown).

Response to Comment 4

We accept that our analyses of cause of fetal deaths are limited for the reasons highlighted by the reviewer. We also acknowledge that we are unable to disentangle the relations between cause of fetal death from other factors that contribute towards severe maternal morbidity. We have modified text in our discussion that addresses both these concerns death' (lines 248-253):

“Second, the analyses of severe maternal morbidity by cause of fetal death was limited because fetal death records suffer from missing data, do not differentiate intrapartum fetal deaths from antepartum stillbirths, and 27% stillbirths had ‘unspecified’ cause of death. Further research is needed to understand how the relations between stillbirth and severe maternal morbidity are modified or explained by identifiable causes of fetal death.”

Comment 5

Conclusion: What percent of overall SMM do you think can be attributed to stillbirth? Given the incidence most providers only see a few over the span of their career. So its unusual enough that no one sees a high volume but often enough that most doctors will see a few and need to be prepared- Guidelines could also be broadened to include Emergency Physicians/ Family/midlevels etc. A Public Health Campaign

Response to Comment 5

We agree with the reviewer’s comment. See response to Reviewer 1, Comment 3.

REVIEWER #2 COMMENTS

Comment 1

Introduction. My immediate reaction from reading the introduction is that the study's findings will be intuitive; i.e. that women with stillbirth will experience more hemorrhage-related complications which is something that clinicians are already aware of and prepared for.

Additionally, stillbirth in many cases will be associated with and/or the result of, hypertensive diseases of pregnancy, resulting in predictably high complication rates.

In addition to the results being predictable, given that this is a population level analysis it will be impossible to determine whether complications from the stillbirth led to maternal complications or vice versa.

Response to Comment 1

We thank the reviewer for this comment. See our response to Reviewer 1, Comment 3.

Comment 2

Line 115-118 for the sensitivity analysis evaluating mode of delivery what was done? Were individual models repeated for vaginal and cesarean delivery? Was mode of delivery included as a variable in the adjusted analyses? The authors aren't clear.

Response to Comment 2

For this sensitivity analysis, mode of delivery was included as a variable in the adjusted analyses. The following was added to the methods (lines 119-121):

“The first examined whether mode of delivery affected the relationship between fetal outcome and severe maternal morbidity *by including mode of delivery (vaginal or caesarean) as a covariate in the adjusted model.*”



Comment 3

Line 119-122 for the sensitivity analysis evaluating initial patient clustering, why not just account for it in the initial models?

Response to Comment 3

Given the size of our analytic sample, an analysis that accounts for clustering for individual patients required computer memory beyond the capacity of our data servers. As an alternative approach, we performed sensitivity analysis of the sub-cohort including only one delivery per woman as an alternative approach to assess whether clustering may have biased our risk estimates.

Comment 4

Was subtype of preeclampsia accounted for? Severe vs mild vs superimposed?

Response to Comment 4

In Supplemental Table S3 we list the ICD-9 codes used to define pre-eclampsia, which include 642.4 (Mild or unspecified pre-eclampsia), 642.5 (Severe pre-eclampsia), and 642.7 (Pre-eclampsia or eclampsia superimposed on pre-existing hypertension).

Comment 5

Results. The rate of preexisting diabetes (2.1%) is very high. I would check the coding for this.

Response to Comment 5

Thank you for highlighting this concern. Two adjustments were made. First, upon checking our codes, we realized we had incorrectly identified ICD-9-CM code 648.0 as pre-existing diabetes when it should have been identified as gestational diabetes. We have modified this erratum in Supplemental Table S3. Second, we had initially used information from the birth certificate to supplement ICD diagnosis codes to identify medical conditions. After review, we realized that the definition of diabetes changes to the birth certificate in 2006 (pre-2006 birth certificates did not differentiate pre-existing and gestational diabetes). To remain consistent across medical conditions, we defined all conditions using only ICD-9 codes for this revision (listed in Supplemental Table S3). These changes resulted in 0.71% of pregnancies having pre-existing diabetes. We revised the Methods to reflect this modification (lines 116-118):

“Medical conditions were defined using ICD-9-CM diagnosis codes in the delivery hospitalization (Supplemental Table S3 lists specific ICD-9-CM codes).^{13-15”}

This change resulted in slight changes to our adjusted relative risk estimates – adjusted relative risk of SMM went from aRR = 4.69 (4.45-4.94) to aRR = 4.77 (4.53-5.02).

Comment 6

"Second, given the recent calls to action to reduce the national rate of severe maternal morbidity, care guidelines and quality improvement initiatives may need to account for the increased morbidity risk associated with stillbirth. Until guidelines are updated, maternal care providers may need to consider closely monitoring all women hospitalized for stillbirth delivery for early signs of major organ dysfunction or failure."

I don't really think that these clinical inferences are supported by the findings. Specifically, underlying etiologies of stillbirth such as placental abruption and hypertensive diseases of pregnancy in many cases lead to both maternal morbidity and the stillbirth. It's not clear, particularly from this analysis, on what basis guidelines or recommendations for women with hemorrhage or preeclampsia need to be modified. Again, I would be careful given that this is cross sectional data and we don't know to what degree a



condition causes the still birth and maternal outcome, to what degree stillbirth modifies risk for maternal morbidity in the setting of a major complication (severe preeclampsia, abruption, etc.), or to what degree stillbirth can lead to complications absent another cause. I realize that the authors address this to some degree in the study limitations, but I would recommend hedging a bit more earlier on in the discussion.

Response to Comment 6

We thank the reviewer for these comments. The primary aim of our study was to describe the frequency of SMM among women who have stillbirths and compare these frequencies with women who have livebirths. Our analyses of SMM rates according to fetal cause of death was exploratory. Although identifying causal pathways for SMM among women with stillbirths is of biological and clinical importance, this is beyond our scope of work. Based on the reviewer's comments, we have modified text in our discussion to highlight the exploratory nature of our analysis and indicated that future studies are needed 'to understand how the relations between stillbirth and severe maternal morbidity are modified or explained by identifiable causes of fetal death' (lines 248-253):

"Second, the analyses of severe maternal morbidity by cause of fetal death was limited because fetal death records suffer from missing data, do not differentiate intrapartum fetal deaths from antepartum stillbirths, and 27% stillbirths had 'unspecified' cause of death. Further research is needed to understand how the relations between stillbirth and severe maternal morbidity are modified or explained by identifiable causes of fetal death."

However, the findings of our analyses were consistent in our secondary analysis and sensitivity analyses. Given that we observed a high rate of SMM among stillbirths and the substantially higher risk of SMM among women with stillbirths vs livebirths among a very large population of US women, we believe that these results justify a call for action for closer evaluation and monitoring for women hospitalized for stillbirth delivery (see Reviewer 1, Comment 3 and our reply).

REVIEWER #3 COMMENTS

Comment 1

Well written paper on maternal mortality in the US. Though not a must, just a suggestion- it would be worth adding one statement on the relative importance of mat mortality in the US, as compared to other established market economies/developed countries. OECD or some other country data must be available. This way the readers can gauge the gravity of the situation, though US health care system is not comparable to others.

Response to Comment 1

We agree with the reviewer's suggestion. We have modified text in our introduction to highlight the fact that the US has a substantially higher maternal mortality rate than other well-developed countries (lines 53-54):

"Recent data indicates that the rate of maternal mortality is substantially higher than other well-resourced developed countries.¹"

Comment 2

The discussion could be cut down by 20% without losing the take home message in this paper. Also, as this paper is not proving anything new and not a controversial topic, reference numbers can be cut down to under 25.



Response to Comment 2

We have edited text in our discussion in some areas to shorten some sentences. In response to reviewers' comments, we have either modified or added text in the discussion. However, the overall word count for the manuscript is within the word limit. We defer to the Editor if a shorter discussion is needed. We are happy to shorten the discussion, as needed. We have not reduced our references as our total number, 32, is within the journal's guideline of not more than 60, and we feel that all are relevant to the discussion and potentially informative to the reader.

Comment 3

Page 7, line 136. Results: "Table 1, presents.....". This statement would be redundant as the table has a complete title. As such, you would not lose anything if you do not have this statement. Rather, if you would like to emphasize the findings in Table, just put the reference to the table in brackets after the first statement, as you have done later in the section. "(Table .1)" This way readers understand that this is the summary of what we find in the table.

Response to Comment 3

We thank the reviewer for their suggestion. We removed the first sentence from the results section and included (Table 1) after the sentence describing differences in characteristics.

Comment 4

Page 8, line 141-144. "...the prevalence of severe mat..mortality among was 578.1...". A word is missing after 'among'. Also, the data "101.1" is not seen in table, while 578.1 is seen. Usually, overall data could be seen in the Table for "All" or total etc as the first row, or last row. As such, may be you can help the reader with a note ("not shown in table"). Please help the reader.

Response to Comment 4

We added "(not shown in Table 2)" in the text describing prevalence of SMM.

Comment 5

All Tables. Please align the numbers to make easy visual comparison of numbers. Whole numbers can be right adjusted to achieve this, affording the reader eyeball comparison of 3 digit numbers vs single digit number. For example, in Table 2, SMM prevalence for All is 578 (a 3 digit number), and if the numbers were aligned to the Right, the reader could easily visualize the value for Eclampsia as a smaller (a 2 digit) number. Given your prevalence values are large enough, you may be able to round the numbers and delete the decimals to help de-crowd the table.

Response to Comment 5

The numbers in all Tables are now right-aligned. Table 2 now displays number of SMM cases and prevalence (per 10,000 deliveries) with no decimal places to de-crowd the table and provide information that is more relevant.

STATISTICAL EDITOR'S COMMENTS

Comment 1

Table 1: Should statistically compare the maternal characteristics

Response to Comment 1

χ^2 p-value are added to Table 1 to statistically compare maternal characteristics.



Comment 2

Table 2: Should cite the counts for stillbirths and live births of the various SMM indicators. The counts for adverse events, from eclampsia to the least prevalent, have too few adverse events to justify aRR using 7 or 10 covariates, as described in this Table and its footnotes.

Response to Comment 2

Table 2 now has SMM Cases (Prevalence per 10,000 Deliveries) presented for stillbirths and live births (instead of Prevalence (95% CI)).

We appreciate the comment and limitations of estimation within small sub-groups, but prefer to retain the consistency of the models across all sub-groups. Fortunately, only a few of the groups have <50 women, and the CI limits reflect imprecision of the estimates in all groups.

Comment 3

Table 3: The SMM prevalence per 10,000 deliveries among the stillbirth cohort (third column) is calculated by using as input the counts from the columns 1 and 2. In most cases, the numerators are < 99, so there is no justification for citing the prevalence per 10,000 to 3 significant figures. These should be rounded to an appropriate level of precision, eg, rounding to nearest 10 per 10,000 for both point estimate and CI boundaries. These causes and SMM prevalences are aggregated for all GAs. In view of Fig 2, does the ranking of cause of fetal death vary with GA < 30 wks vs later?

Response to Comment 3

We changed to prevalence per 100 pregnancies in Table 3.

Yes, the ranking of cause of fetal death vary by GA < 30 wks vs later (see Additional Table below). Because our analyses of SMM among stillbirths according to cause of fetal death and gestational age were exploratory, we prefer not to include this additional table in our paper or appendix. Also, the analyses of fetal death data needs cautious interpretation (see Reviewer 2, Comment 6, and our reply).

Additional Table. Cause of Fetal Death by Gestational Age (n = 25,997)

Cause of Fetal Death	Gestational Age < 30 Weeks (n = 11,670)		Gestational Age ≥ 30 Weeks (n = 14,327)	
	Number (%) of Stillbirths	Ranking	Number (%) of Stillbirths	Ranking
Obstetric complications	3,350 (28.71)	1	570 (3.98)	6
Not Otherwise Specified	2,585 (22.14)	2	4,511 (31.49)	1
Fetal major structural malformations and/or genetic abnormalities	1,313 (11.25)	3	1,383 (9.65)	4
Placental conditions	1,186 (10.16)	4	1,925 (13.44)	3
Umbilical cord anomalies	1,177 (10.09)	5	3,746 (26.15)	2
Other	938 (8.04)	6	902 (6.30)	5
Infections	429 (3.68)	7	232 (1.62)	9
Hypertensive disorders	342 (2.93)	8	367 (2.56)	8
Missing	204 (1.75)	9	229 (1.60)	10
Maternal medical conditions	146 (1.25)	10	462 (3.22)	7

Comment 4

Fig 2: Need more descriptive legend. What do the error bars represent?

Response to Comment 4

Figure 2 legend is now “Prevalence (Estimate and 95% Confidence Intervals) of Severe Maternal Morbidity per 10,000 deliveries, by Gestational Age: California, 1999-2011”

Comment 5

Lines 170-172: Were the differences in SMM prevalence vs GA statistically indistinguishable before 30 weeks and statistically different afterwards?

Response to Comment 5

In view of the editor's interest, we include a table with a stratified analysis for women who delivered <30 week vs. =>30 weeks (Table S7). In the methods, we added text to describe this stratified analyses (lines 135-138):

"Finally, we conducted an exploratory stratified analysis to examine whether the relative risk of severe maternal morbidity between stillbirth versus live birth deliveries differed by gestational age (before 30 weeks and at or after 30 weeks)."

Table S7 was added to as a supplementary table. In the results, we summarized the findings from this analysis (lines 177-183):

"We conducted an exploratory analysis in which we stratified women into two delivery cohorts: deliveries before 30 weeks' gestation and deliveries at or after 30 weeks' gestation (Supplementary Table S7). In the stratum who delivered at or after 30 weeks gestation, the risk of severe maternal morbidity was 5.36 (95% CI 5.02, 5.73) fold higher among women with stillbirth compared to women with live births. In contrast, the risk of severe maternal morbidity was not significantly different between women with stillbirths and live births for deliveries before 30 weeks gestation."

As indicated in (Comment 3; Statistical Editor), we wish to emphasize that our analyses of relations between stillbirth/livebirth and SMM that accounts for gestational age are very exploratory. These concerns were highlighted in our original discussion.

Table S7. Prevalence and Relative Risk of Severe Maternal Morbidity per 10,000 Delivery Hospitalization, Among Women with Stillbirth and Live Birth Deliveries, by Gestational Age: California 1999-2011 (n = 6,459,842)

Gestational Age	Number of Births	SMM Cases (Prevalence*)	Relative Risk (95% CI)	Adjusted† Relative Risk (95% CI)	Adjusted‡ Relative Risk (95% CI)
< 30 weeks					
Live Births	49,622	2870 (578)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Stillbirths	11,670	599 (513)	0.89 (0.81, 0.97)	0.88 (0.81, 0.97)	0.97 (0.88, 1.06)
≥ 30 weeks					
Live Births	6,384,223	60,949 (95)	1.00 (Ref)	1.00 (Ref)	1.00 (Ref)
Stillbirths	14,327	904 (631)	6.61 (6.20, 7.04)	5.71 (5.35, 6.10)	5.36 (5.02, 5.73)

*per 10,000 deliveries

If you should have any questions, please don't hesitate to contact us.

Sincerely,



Elizabeth Wall-Wieler, PhD (Corresponding Author)
Department of Pediatrics, Stanford University



RE: Manuscript Revisions: ONG-19-460R1

Elizabeth Wall-Wieler [REDACTED]

Thu 5/16/2019 4:32 PM

To: Daniel Mosier <dmosier@greenjournal.org>;

1 attachments (100 KB)

19-460R1 ms (5-16-19v2)_EW.docx;

Hello Daniel,

Thank you for sending me these changes. I have addressed each of your comments, and made a few additional minor changes (which I explained in comments). Let me know if you have any additional questions.

Best,
Elziabeth

Elizabeth Wall-Wieler, PhD
Postdoctoral Fellow
Division of Neonatal and Developmental Medicine
Department of Pediatrics
Stanford University School of Medicine

From: Daniel Mosier <dmosier@greenjournal.org>
Sent: Thursday, May 16, 2019 8:49 AM
To: Elizabeth Wall-Wieler [REDACTED]
Subject: Manuscript Revisions: ONG-19-460R1

Dear Dr. Wall-Wieler,

Thank you for submitting your revised manuscript. It has been reviewed by the editor, and there are a few issues that must be addressed before we can consider your manuscript further:

1. Please note the minor edits and deletions throughout. Please let us know if you disagree with any of these changes.
2. LINE 44: Please be sure this is stated in the body of your paper, tables, or figures. Statements and data that appear in the Abstract must also appear in the body text for consistency.
3. LINE 45: Please revise "and/or" to mean either "and" or "or." Be sure this is done throughout your paper.
4. LINE 170: Please revise "and/or" to mean either "and" or "or." Be sure this is done throughout your paper.
5. LINE 194: This needs to be supported by a literature search

When revising, use the attached version of the manuscript. Leave the track changes on, and do not use the "Accept all Changes"

Please let me know if you have any questions. Your prompt response to these queries will be appreciated; please respond no later than COB on **Monday, May 20th**.

Sincerely,
-Daniel Mosier

Daniel Mosier

Editorial Assistant

Obstetrics & Gynecology

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From: [REDACTED]
To: [Denise Shields](#)
Subject: RE: figures in your Green Journal manuscript (18-460R1)
Date: Wednesday, May 15, 2019 2:53:05 PM

Dear Denise,

Thank you so much for sending these. I have carefully reviewed both figures and do not see any errors.

Best,
Elizabeth

Elizabeth Wall-Wieler, PhD

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

From: Denise Shields <DShields@greenjournal.org>
Sent: Wednesday, May 15, 2019 11:03 AM
To: Elizabeth Wall-Wieler [REDACTED]
Subject: figures in your Green Journal manuscript (18-460R1)

Re: "Severe Maternal Morbidity Among Stillbirth and Live Birth Deliveries in California"

Dear Dr. Wall-Wieler,

The figures in your manuscript have been edited and are attached for your review. Please review the attachments CAREFULLY for any mistakes.

PLEASE NOTE: Any changes to the figures must be made now. Changes made at later stages are expensive and time-consuming and may result in the delay of your article's publication.

To avoid a delay, I would appreciate a reply no later than Friday, 5/17. Thank you for your help.

Best,
Denise

Denise Shields
Senior Manuscript Editor
Obstetrics & Gynecology
www.greenjournal.org

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