Living near 2008 California wildfires during pregnancy and changes in birthweight and preterm birth

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INTRODUCTION

- The 2008 California Wildfires burned the highest number of acres ever recorded during that time. Wildfires emit air pollution for a duration and higher level of particulate matter leads to poorer health outcomes for humans and the surrounding environment, and especially for vulnerable populations such as pregnant mothers. The study analyzes whether women who lived near the areas affected by wildfires is associated with birth weight changes in a child.
- Wildfires release pollutants such as particulate matter, carbon monoxide, ozone, nitrogen oxides, and sulfur dioxides.
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OBJECTIVE

The study analyzes whether women who lived near the areas affected by wildfires is associated with birthweight changes in child and preterm birth.

METHODS AND MATERIALS

- The 2008 California Fires were identified from the California Department of Forestry & Fire Protection database. ArcGIS Pro was used to calculate the distance between each fire and all 1,749 zip codes in California.
- California Department of Public Health’s Linked Birth Cohort Data were linked to the fire zip codes by mother’s zip code at the time of birth. Exposure was defined as living within 15 miles distance from a wildfire during any period of pregnancy. Multivariable regression models were used to determine the association between birthweight and fire exposure during pregnancy.

RESULTS

- Being exposed to natural fire during Trimester 1 of the pregnancy period was associated with 2.1 times (P value 0.000) increase in birth weight.
- Trimester 2 was associated with 22 grams (P value 0.000) increase in birth weight.
- Trimester 3 was associated with 8.2 grams (P value 0.017) reduction in birth weight.

Table 1. Association between Wildfire and Birth weight (g) adjusting for confounders

<table>
<thead>
<tr>
<th>Birthweight</th>
<th>Beta</th>
<th>P</th>
<th>LCI</th>
<th>UCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tri 1</td>
<td>-90.61</td>
<td>&lt;0.001</td>
<td>-110.37</td>
<td>-70.85</td>
</tr>
<tr>
<td>Tri 2</td>
<td>-22.97</td>
<td>&lt;0.001</td>
<td>-33.35</td>
<td>-12.58</td>
</tr>
<tr>
<td>Tri 3</td>
<td>8.17</td>
<td>0.02</td>
<td>1.49</td>
<td>14.86</td>
</tr>
</tbody>
</table>

Table 2. Association between Wildfire Preterm Birth adjusting for confounders

<table>
<thead>
<tr>
<th>Preterm</th>
<th>OR</th>
<th>P</th>
<th>LCI</th>
<th>UCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tri 1</td>
<td>2.10</td>
<td>&lt;0.001</td>
<td>1.87</td>
<td>2.37</td>
</tr>
<tr>
<td>Tri 2</td>
<td>1.11</td>
<td>0.01</td>
<td>1.02</td>
<td>1.20</td>
</tr>
<tr>
<td>Tri 3</td>
<td>0.83</td>
<td>&lt;0.001</td>
<td>0.78</td>
<td>0.88</td>
</tr>
</tbody>
</table>

* Both were adjusted for maternal pre-pregnancy BMI, WIC status, maternal age, delivery mode, and trimester specific prenatal smoke.

REFERENCES

- Holstius, D. M., Reid, C. E., Jesdale, B. M., & Morello-Frosch, R. (2012). Birth weight following pregnancy during the 2003 southern California wildfires. Environmental Health Perspectives. https://doi.org/10.1289/ehp.1104515

CONCLUSIONS

Mothers who were exposed to wildfire smoke during pregnancy was associated with changes in birthweight and preterm risk and impact was the greatest during the beginning of the pregnancy (first trimester). Third trimester exposure had different direction of association, further study is needed to investigate factors underlying the protective effect of wildfire.

IMPLICATIONS

Additional studies are needed in order to specify the relationship between wildfire smoke and preterm birth or low birthweight. This study underlined the importance of wildfire smoke exposure during the first and second trimester of pregnancy. This will allow future studies to focus on the specified trimesters to further investigate the cause of low birthweight and preterm birth.

Figure 3. The frequency of fires that occurred in each county.