**BACKGROUND AND OBJECTIVES**

Several epidemiological studies have reported conflicting results on the effect of traffic-related pollutants on markers of inflammation. In a Bayesian framework, we examined the effect of traffic pollution on inflammation using structural equation models (SEMs) and assessed effect modification by participant characteristics.

**HYPOTHESIS**

We hypothesize that short-term exposure to traffic pollution is associated with increased inflammation.

**METHODS**

**Study Population: Normative Aging Study (NAS)**
- 749 NAS participants with every 3-5 year clinic visits.

**Health Measurements:** CRP, sICAM-1 and sVCAM-1
- Each clinic visit: includes extensive physical examination, lab tests, blood collection, self-administered questionnaire, CRP, sICAM-1, sVCAM-1.
- Plasma CRP measured by immunoturbidimetric assay.
- Serum sICAM-1 and sVCAM-1 measured by ELISA assay.
- Each clinic visit: includes extensive physical examination, lab tests, blood collection, self-administered questionnaire, CRP, sICAM-1, sVCAM-1.
- Temperature from Logan airport averages pre-visit.

**Exposure Periods**
- 1-, 2-, 3-, 7-, 14-, and 30-day moving averages pre-visit.

**Statistical Analysis**
- Bayesian SEMs that account for repeated measures
- Linear mixed models with random subject-specific intercepts in Bayesian and Frequentist approaches.
- SEM estimates scaled to a specific traffic-related pollutant (BC) and inflammation marker (sVCAM-1).

**Regression Models**

**Bayesian SEM**

\[
\text{Traffic}_{it} = \beta_0 + \beta_1 \text{BC}_{it} + \beta_2 \text{NO}_{it} + \beta_3 \text{NO}_2_{it} + \beta_4 \text{NO}_{it} + \beta_5 \text{Residual}^{\text{Atemp}}_{it} + \beta_6 \text{Residual}^{2\text{Atemp}}_{it} + \phi_i + \epsilon_{it}
\]

\[
\text{Inflammation}_{it} = \gamma_0 \text{Traffic}_{it} + \gamma_2 X_{1it} + \gamma_3 X_{2it} + \gamma_4 X_{3it} + \gamma_5 \text{Residual}^{\text{Atemp}}_{it} + \gamma_6 \text{Residual}^{2\text{Atemp}}_{it} + \phi_i + \epsilon_{it}
\]

**Bayesian Linear Mixed Model**

\[
\text{sVCAM-1}_{it} = \beta_0 + \beta_1 \text{BC}_{it} + \beta_2 X_{1it} + \beta_3 X_{2it} + \beta_4 \text{Residual}^{\text{Atemp}}_{it} + \beta_5 \text{Residual}^{2\text{Atemp}}_{it} + \phi_i + \epsilon_{it}
\]

**RESULTS**

**Study Population**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Study Population (N = 749), NAS 2000–2009</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years</td>
<td>74.9 ± 6.7</td>
<td>65.4</td>
</tr>
<tr>
<td>Body Mass Index, kg/m²</td>
<td>28.1 ± 4.2</td>
<td>26.5</td>
</tr>
<tr>
<td>Mean Arterial Pressure, mmHg</td>
<td>90.1 ± 11.0</td>
<td>70.4</td>
</tr>
<tr>
<td>Cholesterol, mg/dL</td>
<td>185.6 ± 38.5</td>
<td>19.6</td>
</tr>
<tr>
<td>Glucose Fasting, mg/dL</td>
<td>105.9 ± 22.4</td>
<td>18.6</td>
</tr>
<tr>
<td>Cumulative Cigarette Packyears, yrs</td>
<td>20.3 ± 24.4</td>
<td>47.2</td>
</tr>
</tbody>
</table>

**CONCLUSIONS**

- This study showed positive associations between traffic pollution (BC, CO, NO₂, and NO) exposure and inflammation (CRP, sICAM-1 and sVCAM-1).
- BSEMs are a suitable, alternative method to examine effect of traffic pollution exposure on multiple health effect outcomes in repeated measures and longitudinal studies.
- The Bayesian approach allowed us to incorporate the mixed effect model structure within the SEM framework.
- This study provides further evidence that traffic pollutants via the inflammation pathway may play a critical role in cardiopulmonary toxicity.

**ACKNOWLEDGMENTS**

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