Previous studies mostly focused on the estimate of outdoor concentrations of traffic-related pollution. However, on average, people spend almost 90% of their time indoors. **We need to assess the effect of traffic emissions on indoor exposures.**

### Methodology

**Sampling:** 662 indoor PM2.5 samples collected at 426 homes in the Great Boston area.

**Monitoring supersite:** Week long indoor samples were collected using an HSPH Micro-environmental Automated Particle Sampler (APS).

**Analysis:** PM2.5 mass (gravimetric), BC (reflectometry) and 21 elements (X-ray fluorescence).

**Statistical analysis:** Linear mixed-effects model was developed to examine the relationship between indoor pollutant concentration $C_i$ and the distance to the nearest major road $d$.

$$C_i = \beta_0 + \gamma_0 + \beta_d \times \log(d) + \beta_{SO} \times (SI/IO) + \beta_{CO_2} \times (SI/IO) + \beta_{CO} \times \cos + \beta_\alpha \times \log(w) + \epsilon_i$$

SI and SO are the indoor and outdoor sulfur concentrations, respectively; CO is the Counway concentration; $\log(d)$ is the logarithm of the distance to the nearest major road; $CO_2 \times (SI/IO)$ reflects the amount of species i that penetrated indoors as a result of traffic emissions from the nearest major road; $CO_2 \times (SI/IO)$ reflects the amount of species i that penetrated indoors as a result of outdoor sources as represented by the Counway site; $\cos$ is the cos value of date; $w$ is the wind speed.

We consider the influence of A3 roads only if the nearest A1 or A2 (A12) road is more than 200m farther from the residence than the A3 road. Otherwise, we consider only the influence of the A12 road ($A1$ is a primary highway with limited access; $A2$ is a primary road with limited access; and $A3$ is a secondary and connecting road.)

### Results and Discussion

**Regression results:**

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Road</th>
<th>N</th>
<th>$\beta_0$ Estimated ± SD</th>
<th>$\beta_1$ Estimated ± SD</th>
<th>$\beta_2$ Estimated ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM2.5</td>
<td>A12</td>
<td>75</td>
<td>(3.70 ± 1.39) $\times 10^3$</td>
<td>(-1.16 ± 0.43) $\times 10^3$</td>
<td>0.92 ± 0.09</td>
</tr>
<tr>
<td>PM2.5</td>
<td>A3</td>
<td>366</td>
<td>(3.50 ± 0.69) $\times 10^3$</td>
<td>(-1.36 ± 0.18) $\times 10^3$</td>
<td>0.96 ± 0.03</td>
</tr>
<tr>
<td>BC</td>
<td>A12</td>
<td>69</td>
<td>-0.03 ± 0.23</td>
<td>0.8913</td>
<td>(-0.19 ± 0.07) $\times 10^3$</td>
</tr>
<tr>
<td>BC</td>
<td>A3</td>
<td>369</td>
<td>0.51 ± 0.09</td>
<td>&lt;0.001</td>
<td>(-0.07 ± 0.03) $\times 10^3$</td>
</tr>
</tbody>
</table>

The relationship between relative concentration decrease and road proximity: Relative concentration decrease: $R(\alpha) = C(\alpha) / C(1800)$

The influence of A3 roads on indoor pollutant concentration is more significant than A12 for PM2.5, BC and most of the species. The main reason is that most of the homes are much more closer to A3 roads than A12 roads.

### Conclusions

- The results show that traffic-related exposure decreases significantly with increase in road proximity, and more significantly with A3 than A12.
- There is a linear relationship between relative concentration decrease ($R(\alpha)$) and the logarithm of road proximity; road proximity may be considered as an appropriate traffic exposure metric in exposure and epidemiology studies.

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