



# ECRHS II

## Correlations between Surrogates of Exposure to Ambient Air Pollution (PM<sub>2.5</sub> mass, Sulphur, NO<sub>2</sub>, black Smoke, Silicon) across 21 European Centres



### Introduction

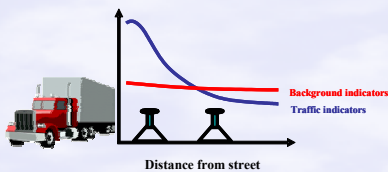
The European Community Respiratory Health Survey II (ECRHS II) is a cohort study aimed at assessing the **long-term effects** of air pollution.

In addition to **PM<sub>2.5</sub>**, the core indicator of air pollution exposure assessment in ECRHS II, **NO<sub>2</sub>**, **Black Smoke**, and **28 chemical elements** on PM<sub>2.5</sub> were measured.

**Correlations** between annual means of pollutants indicate to what degree their effects may be distinguishable in long-term health analyses.

However, different **spatial variability** of these indicators may affect their **comparability**. Of specific concern is the influence of the sampling location on measured levels of pollutants heterogeneously distributed in space, such as traffic emissions.

Pollution level



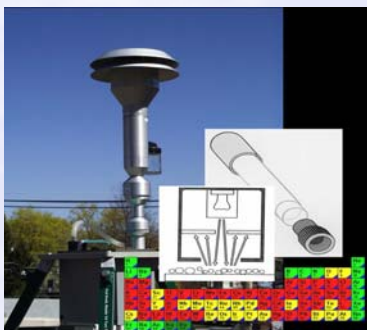
### Aims

Derive estimates of long term exposure which reflect ...

- **specific aspects of air pollution and**
- **representative levels for population**

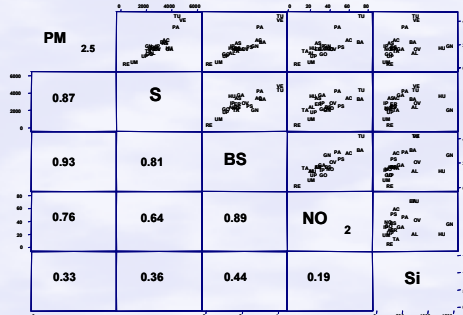
### Method

- Parallel exposure measures, same sites:
  - PM<sub>2.5</sub> (Basel Sampler/BGI, 7 days/month)
  - NO<sub>2</sub> (Palms Tubes, monthly only)
  - Reflection of PM<sub>2.5</sub> (Black smoke (BS))
  - Elements on PM<sub>2.5</sub> (ED-XRF)
    - Sulphur (s), Lead (Pb), 26 others
- Assumptions for indicators:
  - Background: PM<sub>2.5</sub> (urban), S (long range)
  - Traffic: NO<sub>2</sub>, BS (diesel), Pb (gasoline)
  - Crustal material: Si



### Results and Discussion

#### Correlations of PM<sub>2.5</sub>, S, NO<sub>2</sub>, BS, and Si annual means



AC=Antwerp city, AL=Albacete, AS=Antwerp south, BA=Barcelona, BS=Basel, ER=Erfurt, GA=Galdakao, GN=Grenoble, GO=Gothenburg, HU=Huelva, IP=Ipswich, NO=Norwich, OV=Oviedo, PA=Pavia, PS=Paris, RE=Reykjavik, TA=Tartu, TU=Turin, UM=Umea, UP=Uppsala, VE=Verona

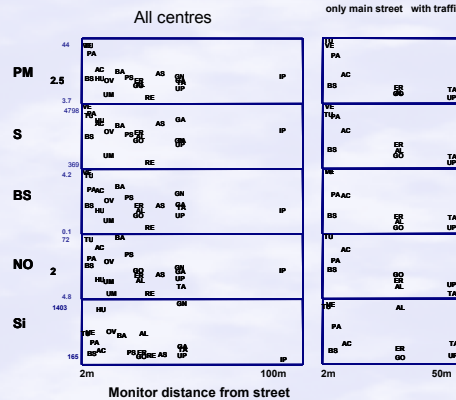
Pearson correlations between annual means of anthropogenic pollutants (PM<sub>2.5</sub>, S, BS and NO<sub>2</sub>) range from 0.64 to 0.93. PM<sub>2.5</sub>, S and BS correlated better with each other than with NO<sub>2</sub>. Their correlations with Silicon are significantly lower (0.19 < r < 0.44)\*.

Very high correlations between pollutants make it difficult to assign health effects to specific indicators or emission sources. Therefore, the health relevance of these pollutants should be investigated separately.

\* For epidemiological investigation of long-term effects of air pollution, annual means serve as exposure estimates.

#### Evaluation of influence of sampler locations

##### Sampler to street distance vs. pollutant levels

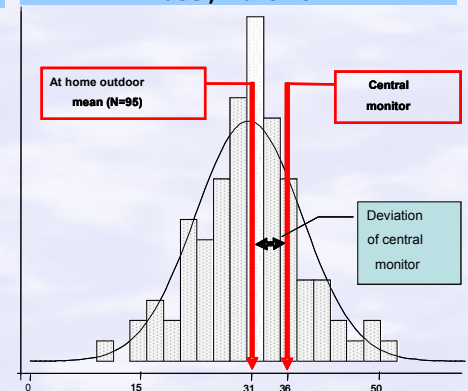


Over all centres pollutant levels are independent of the distance to the nearest street. But after the exclusion of centres where the street closest to the monitor is a "side street" or only has "low" traffic volume, a clear trend for higher levels at stations closer to a street is observable (right column).

The observed pattern may reflect true background levels as distance to street seems to be correlated with expected pollution levels and therefore acts as a confounder. E.g. all stations in North Italy are close to a street (PA, TU, VE) whereas stations in Sweden (GO, UP) and Estonia (TA) are further away.

We created several variables expected to depend on the proximity to traffic but being independent of absolute pollution levels, namely ratios between traffic and background indicators and weekdays vs. weekend ratios. So far we see no evidence for a major influence of local traffic. We will further investigate this using more detailed data on traffic, wind patterns and station characteristics.

##### Spatial distribution of NO<sub>2</sub> at home, outdoors, simultaneously, Basel, March 02



Spatially distributed NO<sub>2</sub> measurements at participants' homes will be used to calculate differences between central monitor values and the average of NO<sub>2</sub> at home levels. This will provide an estimate for the deviation of the central sampler from what can be considered a representative mean.

### Conclusions

- **Various potentially source specific indicators of exposure are available**
- **Comparability of indicators may be affected by several factors:**
  - **spatial variability**
  - **differences of sampling locations**
  - **methodological differences**
- **Exposure data will be evaluated on this matter before health effects analyses**

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