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Aphekom

Improving Knowledge and Communication for Decision Making on Air Pollution and Health in Europe

# The assessment of the implementation of fuel related legislations and their impact on air quality and public health -The Aphekom Project

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## Background and Aims

The work presented here has been conducted as part the EU-funded Aphekom project that aims to improve knowledge and communication for decision making on air pollution and health in Europe.

A multicity analysis involving 20 cities across Europe was initiated assessing the impact of the implementation of the EU legislation (Council Directive 93/12/EEC and its amended version 1999/32/EC) designed to reduce the sulphur content of fuels (mainly diesel oil used by diesel vehicles, shipping and home heating) on air quality, mortality and associated monetary costs.

## Methods

Daily $SO_2$ air pollution and mortality data from 20 participating EU cities* was obtained and analysed. A descriptive analysis using time-series plots was conducted to assess changes in pollutant levels overtime. The association between mortality and daily variations in air pollution overtime was assessed using GAM in the R statistical software environment. City specific effect estimates were combined using meta-analysis and used in an HIA to predict attributable cases to level changes in $SO_2$ in each individual centre.

### *Air Quality analysis*

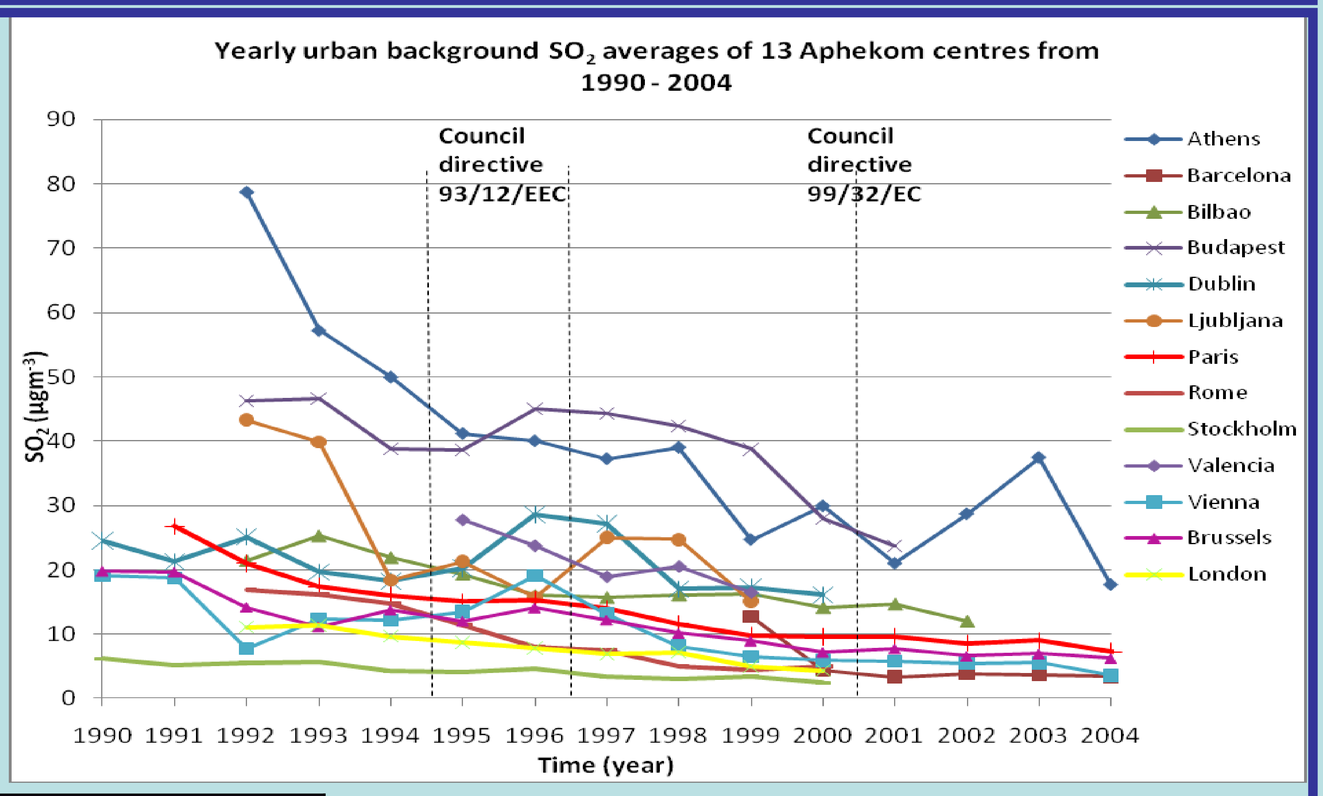
- General **downwards trend** in $SO_2$ levels overtime
- BUT **no obvious step change** found after implementation of Council Directives

→ **Gradual change** overtime (shown in graph)
→ Overall drop of about 66% in ambient $SO_2$ levels comparing pre-Directive period to time period after the year 2000

### *Health data analysis and monetary value*

- **Increase of 10 μgm$^{-3}$ in $SO_2$** found to be associated with an (pooled) **increase** of daily **all-cause (0.53%)**, **respiratory (0.49%)** and **cardiovascular (0.72%) mortality**

→ Intuitively one would expect that a decrease **in** daily $SO_2$ levels would result in a decrease in daily deaths.




**14 centres that implemented all three stages of the fuel legislations**

| Time period | All cause mortality | | | Respiratory mortality | | | Cardiovascular Mortality | | |
|---|---|---|---|---|---|---|---|---|---|
| | Premature deaths avoided per year† | 95 CI - | 95 CI + | Premature deaths avoided per year† | 95 CI - | 95 CI + | Premature deaths avoided per year† | 95 CI - | 95 CI + |
| ≥ 01.10.1994 to <01.10.1996 | 639 | 223 | 1056 | 47 | -15 | 109 | 361 | 107 | 618 |
| ≥ 01.10.1996 to <01.07.2000 | 1093 | 382 | 1808 | 83 | -27 | 195 | 610 | 180 | 1043 |
| ≥ 01.07.2000 | 1616 | 564 | 2676 | 127 | -41 | 298 | 889 | 262 | 1523 |
| **20 centres that implemented 1 common stage of the fuel legislations (Directive 1999/32/EC)** | | | | | | | | | |
| ≥ 01.07.2000* | 2212 | 772 | 3663 | 154 | -50 | 360 | 1312 | 386 | 2247 |

† compared to pre-Directive levels (= prior to October 1994)
*implementation date as laid down in the Directive, actual dates differ between the individual centres

- **No** evidence of **change of slope in the dose-response curve after implementation** of the legislations
  → observed effects seem only related to level changes overtime
- Summary of HIA results for 14 EU cities (implemented all 3 stages of Council Directives) and for 20 cities (implemented one common stage) in the Table
- Restricting the analysis to the 3rd implementation stage common to 20 EU cities:

  → **2212** (95% CI: 772; 3663) **premature deaths per annum were avoided from all causes** associated with decreases in $SO_2$ from year 2000 onwards compared to the pre-Directive period

  → The annual economic burden has been **valued at about €192 million** relying on preference-derived monetary values

## Discussion & Conclusion

- $SO_2$ levels have reduced significantly over time
- Within the context of the many changing factors determining temporal patterns we failed to identify clear step changes in measured $SO_2$ concentrations
- No change in the dose-response function → Important finding with significant relevance for policy makers AND demonstrating that there is no safe threshold level

**Overall the findings underscore the health and monetary benefits from drafting and implementing effective EU policies on air pollution!**

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## Contact & Project Information

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Aphekom tackles air pollution in Europe. WHO Newsletter No. 42, Dec. 2008, p. 14-15, Berlin, Germany.

Aphekom General Brochure
http://aphekom.org/c/document_library/get_file?uuid=5532fafa-921f-4ab1-9ed9-c0148f7da36a&groupId=10347

More on **www.aphekom.org**

*Athens, Barcelona, Bilbao, Bordeaux, Brussels, Budapest, Dublin, Le Havre, Lille, Ljubljana, London, Lyon, Marseille, Paris, Rome, Rouen, Stockholm, Strasbourg, Toulouse and Vienna