

## Exposure and dose response functions - PM and Endotoxins

### *Particulate Matter*

*PM exposure response functions* for respiratory and cardiovascular hospital admissions have been obtained from a literature review (Le Tertre et al., 2002; Medina et al., 2005; Dominici et al., 2005). Although PM10 relative risks are available for all ages, PM2.5 relative risks are only available for elderly (>65 years old). Moreover, a distinction between different health effects related to PM2.5 has been made (e.g. COPD and respiratory tract infection hospital admissions). The following exposure response functions have been selected as the most appropriate for the Greek case study.

**Table 1. PM exposure response functions for respiratory and cardiovascular hospital admissions.**

| Pollutants | Population                  | Health Indicator                                 | ICD9             | Relative Risk (95% CI) | 95% C.I.      | Unit                 |
|------------|-----------------------------|--|------------------|------------------------|---------------|----------------------|
| PM10       | All ages                    | Cardiovascular hospital admissions               | 390-429          | 1.011 <sup>1</sup>     | 1.004-1.019   | 10 µg/m <sup>3</sup> |
| PM10       | All ages                    | Respiratory hospital admissions                  | 460-519          | 1.003 <sup>2</sup>     | 0.9985-1.0075 | 10 µg/m <sup>3</sup> |
| PM2.5      | Elderly (> 65 years of age) | Peripheral vascular diseases hospital admissions | 440-448          | 1.0086 <sup>3</sup>    | 0.9994-1.0179 | 10 µg/m <sup>3</sup> |
| PM2.5      | Elderly (> 65 years of age) | Ischemic heart diseases hospital admissions      | 410-414, 429     | 1.0044 <sup>3</sup>    | 1.0002-1.0086 | 10 µg/m <sup>3</sup> |
| PM2.5      | Elderly (> 65 years of age) | Dysrhythmias hospital admissions                 | 426-427          | 1.0057 <sup>3</sup>    | 0.9999-1.0115 | 10 µg/m <sup>3</sup> |
| PM2.5      | Elderly (> 65 years of age) | COPD hospital admissions                         | 490-492          | 1.0091 <sup>3</sup>    | 1.0018-1.0164 | 10 µg/m <sup>3</sup> |
| PM2.5      | Elderly (> 65 years of age) | Respiratory tract infection hospital admissions  | 464-466, 480-487 | 1.0092 <sup>3</sup>    | 1.0041-1.0143 | 10 µg/m <sup>3</sup> |

<sup>1</sup>Le Tertre A., Medina S., Samoli E., et al. 2002 Short term effects of particulate air pollution on cardiovascular diseases in eight European cities, *J Epidemiol Community Health*. 56, pp 773-779.

<sup>2</sup>Medina S., Boldo E., Saklad M., Niciu E.M., Krzyzanowsky M., Frank F., Cambra K., Mucke H.G., Zorrilla B., Atkinson R., Le Tertre A., Forsberg B., and the contributing members of the Apehis group. 2005 APHEIS Health Impact Assessment of Air Pollution and Communications Strategy. Third year report, 2002–2003. Saint-Maurice: Institut de Veille Sanitaire. pp 232

<sup>3</sup>Dominici F., McDermott A., Daniels M., Zeger S.L. and Samet J.M. 2005 Revised analyses of the National Morbidity, Mortality, and Air Pollution Study: mortality among residents of 90 cities, *J Toxicol Environ Health*. 68, pp 1071–1092.

## Endotoxins

Emissions from animal husbandry include a variety of biological, microbial and inorganic particulates. Exposure to bioaerosols (endotoxins, bacteria, fungi, parasites, pollen etc) can have adverse health effects. However, according to several studies, exposure to endotoxins may have also protective effect to humans and especially to children (Braun-Fahrlander et al., 2002; Downs et al., 2001; von Ehrenstein et al., 2000; Rennie et al., 2008). A strong inverse relationship has been found between endotoxins and sensitization to common allergens, atopic diseases in adult farmers and school-age children (Portengen et al., 2005; Braun-Fahrlander et al., 2002).

**Table 2. Endotoxins exposure response functions for asthma, wheeze, hay fever, and atopic sensitization (Braun-Fahrlander et al., 2002).**

| HEALTH OUTCOME                             | TOTAL SAMPLE (N=812) |             |                |                               | CHILDREN FROM NONFARMING HOUSEHOLDS (N=493) |             |                |             |
|--|----------------------|-------------|----------------|-------------------------------|---|-------------|----------------|-------------|
|  | ENDOTOXIN LEVEL      |             | ENDOTOXIN LOAD |                               | ENDOTOXIN LEVEL                             |             | ENDOTOXIN LOAD |             |
|  |                      |             |                | Adjusted odds ratio (95% CI)* |   |             |                |             |
| Hay fever                                  | 0.58                 | (0.39–0.85) | 0.53           | (0.35–0.81)                   | 0.79  | (0.52–1.19) | 0.56           | (0.33–0.95) |
| Sneezing and itchy eyes during previous yr | 0.61                 | (0.43–0.86) | 0.5            | (0.34–0.72)                   | 0.7   | (0.47–1.05) | 0.46           | (0.28–0.76) |
| Atopic sensitization                       | 0.78                 | (0.60–1.01) | 0.76           | (0.58–0.98)                   | 0.8   | (0.59–1.08) | 0.73           | (0.51–1.04) |
| Atopic asthma                              | 0.73                 | (0.44–1.19) | 0.48           | (0.28–0.81)                   | 0.68  | (0.39–1.19) | 0.52           | (0.25–1.07) |
| Nonatopic asthma                           | 1.25                 | (0.62–2.51) | 1.13           | (0.57–2.26)                   | 1.29  | (0.62–2.68) | 1              | (0.46–2.21) |
| Atopic wheeze                              | 0.89                 | (0.57–1.39) | 0.62           | (0.39–0.99)                   | 0.79  | (0.46–1.33) | 0.64           | (0.33–1.25) |
| Nonatopic wheeze                           | 0.97                 | (0.58–1.61) | 1.14           | (0.68–1.90)                   | 1.36  | (0.86–2.14) | 1.82           | (1.04–3.18) |

**Table 3. Endotoxins exposure response functions of endotoxins for hay fever and asthma (von Ehrenstein et al., 2000).**

| Health outcome   | Farming  |             |              |             | Part-time farming activity |             |              |             | Full-time farming activity |             |              |             |
|--|----------|-------------|--------------|-------------|----------------------------|-------------|--------------|-------------|----------------------------|-------------|--------------|-------------|
|  | (N=1181) |             |              |             | (N=731)                    |             |              |             | (N=450)                    |             |              |             |
|  | Crude OR |             | Adjusted* OR |             | Crude OR                   |             | Adjusted* OR |             | Crude OR                   |             | Adjusted* OR |             |
|  |          | (95% CI)    |              | (95% CI)    |                            | (95% CI)    |              | (95% CI)    |                            | (95% CI)    |              | (95% CI)    |
| Doctor's diagnosis of hay fever <sup>2</sup>                 | 0.35     | (0.23-0.55) | 0.52         | (0.28-0.99) | 0.41                       | (0.24-0.69) | 0.63         | (0.31-1.29) | 0.26                       | (0.12-0.59) | 0.31         | (0.10-1.03) |
| Runny nose and itchy eyes in the past 12 months <sup>3</sup> | 0.53     | (0.37-0.75) | 0.89         | (0.54-1.47) | 0.58                       | (0.38-0.89) | 0.98         | (0.56-1.74) | 0.45                       | (0.24-0.82) | 0.7          | (0.31-1.58) |
| Doctor's diagnosis of asthma <sup>2</sup>                    | 0.51     | (0.37-0.71) | 0.65         | (0.39-1.09) | 0.56                       | (0.37-0.83) | 0.8          | (0.45-1.40) | 0.45                       | (0.26-0.78) | 0.38         | (0.15-0.97) |
| Wheeze in the past 12 months <sup>3</sup>                    | 0.67     | (0.52-0.87) | 0.55         | (0.36-0.86) | 0.65                       | (0.47-0.91) | 0.49         | (0.27-0.86) | 0.71                       | (0.47-1.06) | 0.66         | (0.36-1.23) |
| Doctor's diagnosis of eczema <sup>2</sup>                    | 0.87     | (0.73-1.04) | 1.09         | (0.82-1.44) | 0.9                        | (0.72-1.12) | 1.09         | (0.78-1.52) | 0.82                       | (0.62-1.09) | 1.09         | (0.72-1.65) |
| Itchy rash in the past 12 months <sup>3</sup>                | 0.83     | (0.64-1.07) | 1.04         | (0.7-1.54)  | 0.78                       | (0.56-1.09) | 0.97         | (0.61-1.56) | 0.9                        | (0.61-1.33) | 1.13         | (0.64-2.00) |

## References

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