

**COMMITTEE ON THE MEDICAL EFFECTS OF AIR POLLUTANTS**

**IS THERE A THRESHOLD FOR THE EFFECT OF OZONE ON HEALTH?  
INITIAL ASSESSMENT OF EFFECT ON MORTALITY AND  
RESPIRATORY HOSPITAL ADMISSIONS**

**Introduction**

1. After discussion of paper 2001/13 at the last meeting, the Committee agreed to consider whether the complete literature, including studies published since the COMEAP Quantification Report in 1998, still supported a positive association between ozone and all-cause mortality or respiratory hospital admissions. It was also agreed to look at the association between ozone and cause-specific mortality, COPD admissions, asthma admissions and pneumonia admissions. Other health outcomes would be considered at a later stage.
2. It was also agreed to consider whether the size or statistical significance of the coefficients varied according to the average concentration of ozone in a city.
3. This paper is a first step in examining these issues.

**[Overview of results**

*Some preliminary data extracted from the St George's database was presented. This is not currently publicly available as presentation of incomplete analysis would be confusing. The complete analysis will be publicly available as soon as COMEAP has come to some firm conclusions.]*

**Summary**

16. All-cause and cause-specific mortality and respiratory hospital admissions all show mainly positive associations but the lower confidence limits can be negative. The largest associations are for respiratory mortality. However, this view is tentative at present because the plots represent coefficients from only single pollutant models and with mixed lag times and averaging times.
17. The seasonal analysis for all-cause mortality did not show any obvious differences between summer and winter as might have been expected if there were a threshold.
18. No obvious trend of coefficients with mean or median ozone concentration was seen although there is a suggestion that the confidence intervals may be wider at

lower mean concentrations. However, the existence of a threshold, or non-linear dose-response, is only one possible explanation for this.

### **Next steps**

19. If the Committee agrees that there is sufficient indication of a positive association to proceed with the analysis, the following further steps can be proposed.

#### *Summary estimates*

20. Summary estimates could be derived for two purposes. One is as a means of illustrating differences between groups of studies. The second is to generate an overall dose-response function for an outcome to use for quantification. Heterogeneity will have to be considered before deriving these summary estimates.

21. Summary estimates could be considered in the following areas:

(i) Examination of multi-pollutant models to see if the positive associations remain after control for other pollutants. Consideration can then be given to whether single or multi-pollutant models or both should be used for deriving summary estimates and for further examination of the threshold issue. There are sufficient studies (28) using multi-pollutant models for all-cause mortality to examine this. **Does the Committee have any initial views on this?**

(ii) Separation of the results according to different averaging times (1 hour, 8 hours and 24 hours). A judgement can then be made as to the appropriate studies to include in a meta-analysis to derive a summary estimate. If necessary, more than one summary estimate could be derived e.g. for 8 hour and 1 hour averages.

(iii) Separation of the results according to different lags. **Does the Committee consider that a lag should be chosen *a priori* for determining the summary estimate or should this be decided after learning what the data indicates about different lags or by choosing the lag presented in the largest number of studies?**

(iv) Similar investigations could be made for the seasonal analysis although the number of studies in each category after subdivision for averaging time, for example, might become too small. It also needs to be checked that the winter ozone concentrations were indeed lower than the summer ozone concentrations as has been assumed in this paper.

#### *Dependence of coefficients on ozone concentration*

22. The data presented here can be subjected to an effect modification analysis to see whether the coefficients do vary with mean or median ozone concentrations. This would give more weight to studies with greater power. Judgements will need to be made about whether to use single or multi-pollutant models and what averaging times or lags to use when looking to see whether there is a threshold or non-linear dose-response. **The Committee is invited for its views on this.**

23. So far, only mean or median ozone concentrations in a city have been used to characterise the city. In looking for thresholds, it might be easier to characterise the city using the maximum or 95<sup>th</sup> percentile ozone concentration. All or the majority of the days will have ozone concentrations below the specified level, so the absence of a positive coefficient would suggest a threshold at or above that level. Looking at the maximum or 95<sup>th</sup> percentile ozone concentration would be possible although examination of the individual studies would be needed and the information may be lacking from several studies. **The Committee is invited to comment on the most appropriate measure of ozone concentration to use to characterise a city.**

#### **Other issues**

24. Other outcomes – asthma, pneumonia and COPD admissions, cardiovascular admissions and panel studies can be looked at similarly. The individual studies also need to be examined to see if there is any information on the shape of the dose-response function within the study. Some discussion is also needed about the biological plausibility of any of the provisional conclusions arising from examining the epidemiological literature. **The Committee is invited to make any other suggestions not so far mentioned that may aid consideration of the threshold issue.**

**Secretariat  
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