

# ***Interactive comment on “Assessment and economic valuation of air pollution impacts on human health over Europe and the United States as calculated by a multi-model ensemble in the frame work of AQMEII3” by Ulas Im et al.***

## **Anonymous Referee #4**

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### Summary comments

This manuscript is an ambitious effort to simulate air quality changes and estimate health impacts using an ensemble of models. The results clearly reflect a substantial effort on the part of the authors. I have three primary concerns: (1) the health impact assessment is insufficiently documented. In particular, the manuscript does not clearly describe the procedure for selecting and applying health endpoints to quantify or the source of the baseline incidence rates in the U.S. and Europe. (2) Reasonable people can disagree as to whether it's appropriate to quantify the economic value of years

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of life lost. However, the manuscript does not attempt to provide a rationale for this choice. (3) Finally, the authors should indicate whether each of the air quality and health impact models used have been peer reviewed and whether the source code is publicly available.

#### Detailed comments

Line 46: Is this correct? The outdoor air pollution portion of the Global Burden of Disease studies have applied a consistent modelling framework to predict ambient concentrations of common air pollutants, and quantify the number of premature deaths attributable to outdoor fine particles and ground-level ozone. Other studies, including Anenberg et al. (2010, 2014) quantify global ozone and PM-attributable deaths due to anthropogenic emissions. Line 50: Anthropogenic and non-anthropogenic? Line 53: Did you estimate impacts down to some background concentration, or to zero? Lines 52-65: Here and elsewhere it would be helpful to distinguish between the air quality modeling portion of the ensemble and the health impact estimation portion of the ensemble. Lines 66-77: Are these a sum of the PM<sub>2.5</sub> and ozone-related premature deaths? Line 85: What does "scale dependent challenge" mean in this context? Line 93: Suggest updating with most current GBD published value. Lines 104-109: These two statements are difficult to reconcile. Line 150: This isn't quite right. That paper estimated a total of between 130k and 350k PM & O<sub>3</sub> related deaths. Note also that this paper quantified impacts from anthropogenic emissions alone. Line 155: Suggest rephrasing for clarity. Lines 197-202: I had a hard time following these statements. In particular, I could not understand what exactly you did to minimize error and what redundancy you're referring to. Line 291: How does this ozone metric correspond to the exposure metrics specified in each epidemiological study? Line 292: Here (or elsewhere) it would be useful to provide the rationale for selecting these health endpoints. Citing back to WHO or US EPA documents or other systematic reviews would be helpful. Line 297: It's really difficult to understand why YOLL are being divided by 10.6. Why not simply quantify counts of excess cases in the EVA tool? Line 300: the

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selection of c-r functions greatly influences the health impact assessment, and so I'd recommend including this information directly in the manuscript rather than citing back to another paper. Likewise, what is the source of the baseline death and morbidity rates? At what spatial scale were these data available? Lines 303-321: I'd suggest providing a clearer rationale for valuing years of life lost rather than counts of excess death. Line 314: Please provide a citation to support this claim. Line 316: Did you consider adjusting the WTP to account for changes in income over time (i.e. income elasticity)? Line 320: Why adjust the WTP using a PPP when you can just apply a U.S. specific value? Line 394-402: Please report the currency year. Line 418: Did you consider reporting population-normalized results (e.g. deaths per 100k)? Line 434: Can you clarify what a health impact index is? Table 2: The nomenclature is a little misleading. In a health impact function, effect coefficients are exponentiated and multiplied against an air quality change and then against baseline incidence rate and the population exposed. However, the effect coefficient is written as "x cases/ugm3". This is not correct. Table 2: Several of the endpoints list multiple studies. Were these pooled in some way? Tables 3-4: Please include 95% confidence intervals

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