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Interactive comment on "The effect of future ambient air pollution on human premature mortality to 2100 using output from the ACCMIP model ensemble" *by* Raquel A. Silva et al.

Anonymous Referee #2

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This manuscript uses the RCPs to project estimated air pollutant levels and health impacts globally for 10-year intervals between 2000 and 2100. It advances previous publications through the use of projected baseline mortality and population size along with projected air pollutant concentrations and therefore one can isolate the impacts of projected emissions from those of demographic changes in estimating future health impacts from air pollution. Further, the use of ensemble forecasts allows for the evaluation of the role of model variability in future estimates. Interestingly, while mortality impacts related to PM2.5 levels are projected to decrease under all scenarios, mortality from ozone exposure is projected to increase in all scenarios due to changes in population demographics, the absence of widespread decreases in ozone concentra-

tions, increases in methane and climate warming. There are two main analyses in the manuscript:1) the impact of concentration changes relative to those in the year 2000 which is focused on the effects of future emissions and the variability between the different models, and 2)the assessment of the overall burden of disease attributable to air pollution in future years relative to pre-industrial (1850) concentrations where the relative impacts of emissions, and population projections are compared (cases A and B).

General comments Overall the manuscript provides unique new information to assess both potential future health impacts under well-defined scenarios and the role of model variability, uncertainty in concentration-response functions, uncertainty in emissions and the role of demographic changes in the estimation of future impacts. While the absolute numbers from the simulations are interesting, arguably more important is the assessment of uncertainty and the relative roles of different factors (demographics, emissions) in future estimates. For this component of the manuscript, decreasing the emphasis on the absolute numbers while providing more relative comparisons would help the reader sort through all of the results. Further the manuscript would benefit from some clear take-home messages on the relative impacts of future emissions and demographic changes and on the largest contributors to overall uncertainty. This information is in the manuscript but is hard to find and needs to be brought forward (even if it means decreasing emphasis on the absolute numbers).

The estimates for 2000 are low compared with other similar estimates and the authors attribute this to the choice of counterfactual. Given that the counterfactual is a choice, it would seem useful to isolate the impact of the choice of counterfactuals if the absolute number is being emphasized – some simple sensitivity analyses in which, for example, the Global Burden of Disease counterfactuals were applied, would be useful.

Future ozone and PM2.5 attributable mortality is clearly driven by China and India; given this it might be useful to present (or at least comment on) the model variability in these regions as what appears to be overall agreement across most of the models

may be a result of smoothing due to other regions which have relatively minor impacts on future trends.

Specific comments Abstract should be more consistent in presenting uncertainty in estimates and should include some quantification of uncertainty. Abstract should also provide more emphasis on uncertainty and relative impacts of different sources for the burden of disease estimates

L89 -Lim et al should be updated with Forouzanfar et al., 2015

L102 - suggest that in future ozone concentrations will decrease with climate change; can this be reconciled with observations on global increases during recent periods? (Emissions vs warming?)

L239 How do IF projections compare with current numbers, i.e. from the Global Burden of Disease ($\sim$for 2010)?

L283 –Should mention in limitation/discussion that the absence of uncertainty in the IF projections may be as important as other sources of uncertainty and that this uncertainty would increase over time (i.e. 2100 vs 2030)

L299-310 –There would appear to be $\sim$20x variability estimates for the different RCP scenarios - this is very large and clearly makes the case that emissions DO matter - it seems that this point should also be brought out a bit more.

L404 what are the 1850 concentrations that are used as the counterfactual? These should eb provided in the text.

Apte JS et al., ES&T 2015 also estimates future mortality assuming only changes on population – it would be useful to cite this paper and make some rough comparisons

L472 "preature" typo

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