

Response to Comments from R2

This study evaluates the economics of reduced labor time associated with pollution induced health outcomes. The assessment framework is comprehensive and the manuscript is well organized. My major concern is the uncertainty of this assessment.

1. The PM_{2.5} concentration estimated by Geng et al. (2015) is based on satellite data. How are they compared with surface PM_{2.5} measurements?

Thank you for your question. We acknowledge that satellite AOD retrievals have regional biases compared with ground measurements and surface reflectance. To reduce such possible uncertainties, we employed the method from van Donkelaar et al (2010) to distinguish surface types using black-sky albedo and identify regional errors in AOD retrievals by extending biases calculated against ground measurements within a certain surface type. Specifically, we first identified four dominating surface types in China and used ground AOD measurements between 2006-12 to calculate monthly mean bias of satellite AOD and interpolated in each defined surface type. We excluded daily satellite AOD data with monthly bias larger than $\pm 20\%$, which were further averaged to obtain the estimates of final long-term retrieval.

Van Donkelaar, Aaron, et al. "Global estimates of ambient fine particulate matter concentrations from satellite-based aerosol optical depth: development and application." *Environmental health perspectives* 118.6 (2010): 847.

2. The IER curve is applied in this study, but which version? IER parameters experienced significant changes over the past years since proposed, how that will change the results in this study?

Thank you for your comments. We referenced the IER functions developed by Burnett et al (2014). His proposed IER model incorporates data from cohort studies of ambient air pollution, and second-hand and active tobacco smoke to describe the concentration–response relationship throughout the full distribution of ambient PM_{2.5} concentrations, especially including the high levels in China. Therefore, we perceive this approach is suitable for estimating air pollution health impacts at high levels, such as the case in China, in the absence of epidemiological studies of the effects of long-term exposure to PM_{2.5}. Given its applicability to a wide range of PM_{2.5} concentrations, the GBD also project employed these functions to estimate the global mortality due to ambient particulate and household air pollution in 2010 (Lim et al, 2012).

Burnett, Richard T., et al. "An integrated risk function for estimating the global burden of disease attributable to ambient fine particulate matter exposure." *Environmental health perspectives* 122.4 (2014): 397.

Lim, Stephen S., et al. "A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010." *The lancet* 380.9859 (2012): 2224-2260.

3. The industrial labor time loss is the most uncertain part here. 250 working days lost are assumed without any references. These numbers can have large impacts on the reported conclusions. It would be great if the authors could provide confidence intervals to address these uncertainty issues.

Thank you for your comments. For the pollution-induced mortality, the 250 working day loss was inferred based on the business days calculator in China, which can be found on <http://china.workingdays.org/EN>

For pollution-induced morbidity, each cardiovascular admission will result in 11.9 working days lost while each respiratory admission causes 8.4 working days lost. We obtained the statistics from National Bureau of Statistics of China (2016). Meanwhile, we referenced Xia et al (2016) to provide a range for labor time loss estimation of outpatient visits due to data unavailability, which ranges from 2 to 4 hours per outpatient visit. We assumed each outpatient visits clinic once during the year.

We acknowledge the uncertainties involved in the evaluation. However, given the current data constraints, we feel that such assumption tends to provide a relatively conservative estimate regarding the disease induced labour time loss and the resulting economic impacts. We also provide sensitivity analysis for alternative hospital admission and outpatient time, indicating an upper and lower boundary for our estimates.

4. Method part should be moved before results.

Thank you for your comments. We have moved the Method section before Results section.