Reviewer's report

**Title:** The Impact of Long-Term PM2.5 Exposure on Specific Causes of Death: Exposure-Response Curves and Effect Modification among 53 million U.S. Medicare Beneficiaries

**Version:** 0 **Date:** 23 Aug 2019

**Reviewer:** Keita Ebisu

**Reviewer's report:**

This manuscript explored relationships between long-term exposure to fine particulate matter (PM2.5) and cause specific mortality. Taking advantage of large Medicare data (53 million record) and novel computation technique, they applied Cox hazard model to estimate the risk. They also conducted stratification by some characteristics such as race/ethnicity. They found associations between long-term PM2.5 exposure and mortality, and some of those associations were non-linear.

Overall, it is well written, but some results are not consistent with previous findings. More text is desirable why there are inconsistent findings. I am particularly interested in inconsistent findings with Di et al (2017). They found linear relationships even low PM2.5 ranges, while this study indicated some threshold-model for non-accidental mortality. Di et al. used meta-analysis approach, while this study analyzed in one large dataset. While this is already mentioned in the text, the potential explanations for heterogeneous results due to different approach should be discussed in more depth.

Second, the authors adjusted some SES variables, but they may not enough to represent individual SES characteristics. SES cannot be represented by a few variables, and SES-related residuals is something to worry about. The authors wrote "confounding by other personal-level characteristics is unlikely to explain our findings, given previous findings showing little change in mortality risks after adjustment for individual-level characteristics." This may be true for these studies conducted in urban places, but not necessarily true for studies including non-urban places, like this study.

I was a bit surprised for strong protective results for Hispanic. Are there any good explanation for these findings? Is this results driven by specific regions? Have you tried any region stratified model?
Some text in the method section better be revised, since some readers in this journal are not familiar with the computation explanation.

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