Author’s response to reviews

Title: Acute effects of fine particulate matter (PM2.5) on hospital admissions for cardiovascular disease in Beijing, China: A time-series study

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Author’s response to reviews:

Dear Editor and Reviewers,

We appreciate the chance to revise our manuscript entitled "Acute effects of fine particulate matter (PM2.5) on hospital admissions for cardiovascular disease in Beijing, China: A time-series study" (ENHE-D-18-00355) for consideration for potential publication. We thank you very much for your consideration. First, we would like to thank the editors and reviewers for their thoughtful comments. In addressing their comments, we have produced a much-improved version of the manuscript. We have made a substantial effort to address all of the comments from the reviews. We presented a summary of the changes we made in the revision as follows.
To help readers to understand the study and to avoid confusion, the revised manuscript has been carefully reviewed and polished by a language service (American Journal Experts, certificate verification key: 22B7-9A45-4837-EC5E-64C5). Grammatical errors have also been corrected in the revised manuscript. We hope it will be better received by the reviewers and readers.

Reviewer #1

Main comments

1. Daily count of events: In the Figure 1, the authors reported the daily count of total hospital admissions for cardiovascular events and daily averages of pollutant concentrations. Regarding the daily count of outcome, there is a clear reduction of events in a specific moment (the resolution of the figure is not good enough to recognize the year) with a subsequent reduction of daily variability. The count returns normal during the very last period suggesting a clear bias during the previous years. Maybe some hospitals did not participate to the daily counts for that period? However, this is a critical issue that need to be resolved or explained in details.

Response: We appreciate the reviewer’s concern regarding Figure 1, which shows the daily counts of events. We have corrected the figure resolution in the revision.

Regarding the daily outcome, the reduction of daily counts in the stated period in the plot, from the beginning of 2016 to 2017, may be related for the following reasons:

1) In 2016, the Chinese government approved the Healthy China 2030 plan (jiànkāng zhōngguó 2030), emphasizing the strategic role of health in China’s development and outlining the major principles to achieve this, including health priority, science and technology innovation, scientific development, and balanced medical resource allocation(1). The prevention and treatment of CVDs have become vital to achieve success with this plan. Recommendations have been formulated and relayed to Chinese governmental authorities working with the media (both television and radio) and the power of the internet and social media (e.g., WeChat, Weibo) have been leveraged to promote healthy lifestyles around the nation. These efforts may have resulted in a constant change on the societal level of the prevalence of risk factors associated with CVD, changes in the health-care system and improved prevention of CVD-related outcomes during the reduction period.

2) In addition, another important factor for the reduction during this period may be related to the air pollution level (PM2.5). For instance, according to the Ministry of Ecology and Environment of the People’s Republic of China, the PM2.5 concentration declined by 6.5% in 2017 compared to 2016(2). This reduction may result in a reduction in the burden of cardiovascular admission during the study period.
3) However, further investigations may be needed to assess the effects of increments in the later period, advanced diagnosis skills, increases in health seeking behaviors, and the quality of reporting based on the International Classification of Diseases (ICD) codes may be associated with the effect of increment in the late period. Chengxing et al. hypothesized that the steadily rising incidence and prevalence of CVD in China is likely to continue, particularly for coronary artery disease, stroke, heart failure, and age-related degenerative valve disease(3). According to their perspective, numerous factors contribute to the epidemic of CVD in China. Rapid aging of the population, improved survival from other illnesses, progressive urbanization, increased caloric consumption, decreased physical activity, mental stress, and air pollution all play important roles.

2. Discussion: The Discussion is scarce and need to be implemented. Especially for the comparison with other similar studies, where the authors limited to a few sentence. Please improve this section to allow the readers to better understand what this paper gives to the literature.

Response: We appreciate the reviewers’ thoughtful suggestions about the Discussion section. We have improved part of the discussion (see Discussion).

3. Analyses for period: The authors could improve the statistical analyses with some supplemental approaches. For example, the authors could apply an analysis by year to evaluate some possible temporal trends in the health effects.

Response: We appreciate the reviewer’s thoughtful suggestion regarding improving the statistical analysis. From various time-series literature, Bell MI et al. concluded that the effect estimates for particulate matter and mortality are unlikely to be biased to a large degree by inadequate control for temporal trends(4). However, proper adjustment of confounding is still a concern. In the long run, techniques that remove unexplained temporal trends include stratification and model variables, and newer approaches use harmonics and later smoothing. For example, Scheartz J et al. analyzed mortality in Steubenville, Ohio, by using random effects for the yearly fluctuation of mortality, and analyzed mortality in Birmingham, Alabama(5) by using harmonics (trigonometric filtering) to remove long-term patterns of seasons and months(6). In another key study, the regression model used by Fairley et al. to examine mortality in Santa Clara Country, California, included a separate third-order polynomial for each year. The study found that the regression appears consistent in the sense that the estimated exposure coefficients for each year are not significantly different from each other, and most of the coefficients were insignificant(7).

Therefore, to improve the statistical analysis of this study, we performed an analysis by

1). Calculating percentage change for each year to evaluate possible temporal trends in health effects. This analysis is included in the revision as Additional Table 1 (Line 175, page 8)
2). We also calculated the percentage change per 10 μg/m³ increase in PM2.5 at lag0-1 on CVD hospital admissions using different degrees of freedom (df) for time trends (3-10), temperature (6-10) and relative humidity (6-10). This sensitivity analysis is included as an additional file and is included in the revision (Line 174, Page 8).

3) We also extended (including all lag) the lag structure for all the subgroup analyses and corrected Figures 3 & 4, which is now Figure 4 in the revision (Line 167, p 8).

4. Table 1: Please remove the "WHO Target" column as it is informative only for O3, PM10 and PM2.5.

Response: We have removed the “WHO Target” column from Table 1.

Response: Done

References


