Title: Components of fine particulate matter and daily mortality in the Denver Aerosol Sources and Health (DASH) study

Version: Date: 25 February 2015

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Reviewer’s report:

BMC EnvironHealth n 7648425381578133_article

Title: Components of fine Particulate Matter and daily mortality in the Denver Aerosol Sources and Health (DASH) study.

The authors aimed to present additional evidence about the contribution that some specific components of fine particles make to daily mortality related to PM2.5. The metropolitan region of Denver, from 2003 to 2007, was the setting. Exposure was defined as daily levels of pollutants determined by means of continuous monitoring. Natural, CV, respiratory and cancer mortality was assessed using generalized additive models for PM2.5 and EC, OC, sulphates and nitrates were the components studied. Results showed larger RRs of natural and cancer mortality for EC and OC, but no effect on CV and respiratory mortality (apart from IHD mortality). The authors concluded that combustion products increased mortality more than secondary pollutants.

GENERAL COMMENTS

My general impression is that, though the authors contributed additional evidence about the effects of carbonaceous components on health, they neither characterized the exposure to carbonaceous components (representing their main interest) nor discussed the possible weaknesses of the health effects exhaustively enough to support their conclusions definitively.

I shall now enlarge on these comments, hoping the authors will take advantage of them in revising their manuscript.

MAJOR REVISIONS

1. About exposure

Although the authors appropriately highlight the important change in exposure assessment represented by the continuous monitoring of pollutants, the exposure assessment is nonetheless affected by some important limitations. The authors acknowledge their having used only one fixed monitor as a limitation of their study, but they do not discuss having failed to assess the content of PM2.5 in metals, which were identified in other studies (by Bell, Ostro, Peng, whom the authors list among their references) as bearing considerable responsibility for PM2.5 health damages and as a potential aid in identifying the sources of pollution. Moreover, the authors should explain why they did not analyse primary and secondary OC, the former coming predominantly from vehicle emissions [J
Expo Sci Environ Epidemiol. 2010; 20: 457-68], and the latter contributing almost 46% of measured particulate OC. This could help to disentangle primary from secondary pollution in terms of their responsibility for effects, as well as detecting the source of pollution and assessing particle-phase polycyclic aromatic hydrocarbons (p-PAHs). They should at least discuss to what extent the absence of these measurements may have affected their hurried conclusion about traffic responsibility. The authors should also discuss more exhaustively the correlation coefficients among the Denver pollutants; the particularly low one between PM 2.5 and NO2, and the very high one between PM2.5 and secondary aerosol (sulphates and nitrates) require comment, as does the negative linear correlation with temperature, which suggests a considerable contribution in winter.

2. About effects

There are no effects (rather than fewer large effects mentioned) for secondary aerosol on mortality (apart from IHDs). Discussion of the inconsistent evidence about the effects of PM2.5 on cardiovascular mortality, which the authors however do mention, should involve more comments about the differences (in populations, exposure assessment, statistical methods) between the studies with contrasting results. Discussion about the different findings for mortality and hospitalisations could be avoided, as it refers to not very well-documented sensitivity analysis, while the role of seasonality on the effects should be explored more fully in the Discussion section. The discussion of cancer mortality is occasionally cursory and unsatisfactory, e.g., the comment about the frailty of advanced cancer patients, which usually leads to a lower possibility of exposure, seems somewhat careless. I think the authors would do better to concentrate their discussion on an analysis of all cancers rather than just lung cancer, and on the specific roles of EC and OC in this association.

A few points are unclear:
1. Why do the authors underline the coexistence of 5 counties in the Denver region?
2. Why do they report the data about gases in the atmosphere when they do not assess their relationship with mortality?
3. The origin of mortality data should be the National Center for Health Statistics. Is it?

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

I declare that I have no competing interests