



## Comments on Air Pollutant Exposures and COVID-19 Severity and Mortality: Some Concerns on Methodology

To the Editor:

We read with great interest the epidemiological study by Chen and colleagues investigated the association between ambient pollutant exposures and coronavirus disease (COVID-19) severity and mortality in California during the first wave of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic (1). They concluded that even short-term exposure to air pollution may have an effect on the COVID-19 outcomes. We thank the authors for conducting this retrospective study by collecting information from electronic medical records of a large integrated healthcare system to provide a timely and potentially practical recommendation. We would like to share ideas on this article.

First, the authors have taken many measurable confounders into analysis, and both groups had similar baseline characteristic, such as age, sex, smoking history, body mass index, and Charlson comorbidity score. However, we are concerned about the presence of residual confounding factors associated with the outcomes of the COVID-19 infection, such as that the severity of comorbidities in both groups were not controlled for. For example, patients with chronic lung disease with impaired lung function, as well as patients with cancer who have active anticancer treatment and those with autoimmune diseases receiving immunosuppressants are expected to play important roles for adverse disease outcomes (2, 3).

Second, the interaction between exposure to air pollution and the outcome of patients with COVID-19 infection may vary depending on the age of the subjects (4), and some studies have mentioned a substantial increase in the risk of death related to COVID-19 as air pollution increases, especially in the elderly (5). It would be interesting to readers if this study could be further analyzed to see whether the same trend is observed.

Third, as for the definition of mortality, the authors set the definition of mortality within 60 days after COVID-19 diagnosis. We wonder if COVID-19 infection is the primary diagnosis of death? Or did the authors include deceased cases as long as one of the diagnoses of mortality on the

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claims-based data was COVID-19? Because air pollution has been mentioned to be associated with cause-specific cardiovascular disease mortality, there may be mediating confounders (6).

In conclusion, we thank the authors for providing this fine ecological study that fills a gap not provided by contemporary studies. However, considering the marginal differences in risk effects due to ambient air pollution, even small biases can have a significant impact on the study results, and we believe the results will be more robust if the above issues are further addressed. ■

**Author disclosures** are available with the text of this letter at [www.atsjournals.org](http://www.atsjournals.org).

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