

Peer Review Report

Review Report on Time-trends in air pollution impact on health in Italy: an analysis from the Global Burden of Disease Study 1990–2019

Original Article, Int J Public Health

Reviewer: Aaron Cohen

Submitted on: 14 Apr 2023

Article DOI: 10.3389/ijph.2023.1605959

EVALUATION

Q 1 Please summarize the main findings of the study.

The authors analyze publicly available estimates of the burden of disease (DALYs) attributable to exposure to ambient PM_{2.5} and ozone in Italy from 1990–2019. The analyses focus on time trends in the attributable burden, dividing the 30-year span into intervals before and after the promulgation of EU air quality limits, and aim to identify the role of air quality improvement after accounting for changes in demography and epidemiologic factors to infer the health benefits of air quality regulation. They conclude that "...air quality regulations were effective in reducing the disease burden for PM_{2.5} (but not for ozone), despite population aging."

Q 2 Please highlight the limitations and strengths.

The data and estimates have been previously reported by the GBD 2019 Collaboration and others (references 7 and 20–24) and are accurately described and reported. However, the authors understate the limitations of their work and additional and much fuller critical discussion is needed.

The limitations of analyses of the demographic and especially the epidemiologic drivers of burden trends need to be more fully acknowledged.

The authors compare the proportional changes in attributable burden to the proportional changes in overall mortality rates before and after the promulgation of the EU regulations and conclude that reductions in air pollution "had a significant role in reducing the burden," that this was the result of the promulgation of the EU limits, and that new, more stringent limit values would have similar effects. I am inclined to agree, but here too fuller acknowledgement of the uncertainties and limitations of the analyses and implications for interpretation are needed.

Q 3 Please provide your detailed review report to the authors. The editors prefer to receive your review structured in major and minor comments. Please consider in your review the methods (statistical methods valid and correctly applied (e.g. sample size, choice of test), is the study replicable based on the method description?), results, data interpretation and references. If there are any objective errors, or if the conclusions are not supported, you should detail your concerns.

The authors analyze publicly available estimates of the burden of disease (DALYs) attributable to exposure to ambient PM_{2.5} and ozone in Italy from 1990–2019. The analyses focus on time trends in the attributable burden, dividing the 30-year span into intervals before and after the promulgation of EU air quality limits, and aim to identify the role of air quality improvement after accounting for changes in demography and epidemiologic factors to infer the health benefits of air quality regulation. They conclude that "...air quality regulations were effective in reducing the disease burden for PM_{2.5} (but not for ozone), despite population aging." The data and estimates have been previously reported by the GBD 2019 Collaboration and others (references 7 and 20–24) and are accurately described and reported. However, the authors understate the limitations of their work and additional and much fuller critical discussion is needed.

Major Comments

Lines 265–285: The limitations of analyses of the demographic and especially the epidemiologic drivers of burden trends need to be more fully acknowledged. The authors clearly appreciate the important role played by temporal changes in the underlying mortality rates, but they have not actually quantified that contribution. Ideally this should be done using risk-deleted mortality, i.e., mortality rates from which the contribution of air pollution has been removed as part of a comprehensive decomposition analysis (see ref.9 and GBD 2019 Diabetes and Air Pollution Collaborators. *Lancet Planet Health*. 2022 Jul;6(7):e586–e600. doi: 10.1016/S2542–5196(22)00122–X. PMID: 35809588; PMID: PMC9278144). The authors infer what the contribution of temporal changes in underlying rates may have been by comparing the proportional changes in attributable burden to the proportional changes in overall (not risk-deleted) mortality rates but need to acknowledge more fully the uncertainty that results from not having made a more direct quantitative analysis. This acknowledgement might well draw on the GBD 2019 Diabetes and Air Pollution Collaborators paper cited above which quantified the contribution of risk-deleted diabetes rates to the PM2.5 attributable burden.

The authors compare the proportional changes in attributable burden to the proportional changes in overall mortality rates before and after the promulgation of the EU regulations and conclude that reductions in air pollution “had a significant role in reducing the burden,” that this was the result of the promulgation of the EU limits, and that new, more stringent limit values would have similar effects. I am inclined to agree, but here too fuller acknowledgement of the uncertainties and limitations of the analyses and implications for interpretation are needed.

Three suggestions:

- There is a missing link between promulgation of EU limit values and reduced exposure. Provide examples of actions taken by the Italian government to reduce emission/air pollution exposure in response to the EU regulations.
- The authors should discuss their methods, findings, and interpretation in the context of other “accountability studies” specifically designed to quantify the effects of air quality regulation (see <https://www.healtheffects.org/publication/causal-inference-methods-estimating-long-term-health-effects-air-quality-regulations> ; Boogaard J et al. *Curr Environ Health Rep* 2017 Dec;4(4):514–522 doi: 10.1007/s40572–017–0161–0).
- Regarding changes in future burden to be expected with lower limit values it is important acknowledge that this will depend on trends in future demography and cause-specific mortality rates which the authors have not quantified. Others have and their example may be helpful (see <https://www.healtheffects.org/publication/burden-disease-attributable-coal-burning-and-other-air-pollution-sources-china>)

Minor comments

Line 64: Consider replacing “valid and reliable” with “comprehensive global,” for 204 countries and territories

Lines 234–235: Note the role of tobacco smoking.

Line 310–312: see also Burnett R and Cohen A. *Atmosphere* 2020, 11, 589; doi:10.3390/atmos11060589

Line 312–315: Perhaps expand a bit on the potential effect of dementia not being included. Alzheimers was the 5th leading cause of DALYs in Italy in 2019 and its contribution rose by 155% over 3 decades (ref.23; <https://vizhub.healthdata.org/gbd-compare/>) A recent analysis gives some sense of what the effect on estimates would be if dementia were to be included (Ru M, Brauer M, Lamarque JF, Shindell D. *Geohealth*. 2021 May 1;5(5):e2020GH000356. doi: 10.1029/2020GH000356. PMID: 34084981; PMID: PMC8143277.)

Line 328: I would say “limited evidence.”

PLEASE COMMENT

Q 4 Is the title appropriate, concise, attractive?

Yes

Q 5 Are the keywords appropriate?

Yes

Q 6 Is the English language of sufficient quality?

Yes

Q 7 Is the quality of the figures and tables satisfactory?

Yes.

Q 8 Does the reference list cover the relevant literature adequately and in an unbiased manner?)

Yes, for the most part. See suggestions in my comments to author

QUALITY ASSESSMENT

Q 9 Originality



Q 10 Rigor



Q 11 Significance to the field



Q 12 Interest to a general audience



Q 13 Quality of the writing



Q 14 Overall scientific quality of the study



REVISION LEVEL

Q 15 Please make a recommendation based on your comments:

Minor revisions.