Qeios

Peer Review

Review of: "Electric Vehicle Fleet Penetration and Air Pollution Mortality in Europe"

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Summary for Authors

The manuscript presents an important and timely analysis of electric-vehicle (EV) fleet penetration and air-pollution mortality across Europe, but its current framing, interpretation, and analytical approach overstate what the evidence can support. While the correlation identified is statistically significant, it cannot be interpreted as causal, and several of the paper's claims go beyond what the data and methods substantiate. At the same time, there is already a substantial and rapidly growing body of literature establishing the two key components of the causal pathway (1) EV penetration improves air quality and (2) improved air quality reduces mortality; but this study does not integrate that literature nor demonstrate the full causal chain itself.

To strengthen the manuscript, major revisions are needed in five areas: causal interpretation, methodological rigor, factual accuracy, pollutant scope, and contextualisation within existing research. Several key statements are either outdated, unsupported, or incomplete, and the discussion requires deeper engagement with known confounders, regional differences, and pollutant types. The following points summarise the recommended changes.

Key Points for Revision

- Correlation ≠ causation: The observed association ($r = -0.465$) does not demonstrate that EV penetration reduces mortality. Causal claims must be removed or reframed as associative.

Causal chain already partly established elsewhere (you should include references):

- EV adoption → improved air quality is supported by multiple studies.

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- Improved air quality → reduced mortality is also well established.
- This paper does not show EV adoption → reduced mortality and should acknowledge this explicitly.

Recommendation for stronger methodology:

- Potentially you could use longitudinal fixed-effects regression (panel econometrics) rather than simple cross-sectional correlation if the authors wish to make stronger causal inferences.
- Confounding factors missing: Eastern European mortality levels may be driven by coal heating, industrial emissions, agricultural burning, or governance differences, not just low EV adoption.

Several statements are overstated or incorrect:

- "These findings prove…" → must be removed; they do not prove causation.
- Policy statements ("EV replacement must proceed as fast as possible…") are not supported by the study's evidence.

Outdated EU policy claim:

- The EU no longer requires 100% zero tailpipe CO_2 for new cars by 2035. As of December 2025, the target is 90% tailpipe CO_2 reduction, with e-fuels permitted.

Missing acknowledgment of EV non-exhaust $PM_{2.5}$:

- EVs produce non-exhaust particulate pollution (tyres, brakes, road dust). This must be acknowledged when discussing $PM_{2.5}$.

Insufficient literature context:

- Important studies on EVs and air quality/mortality are missing ().
- The study must be placed within this broader evidence base.

https://pubs.rsc.org/en/content/articlehtml/2025/em/d5em00559k

https://doi.org/10.1016/j.scitotenv.2023.169577

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Lack of pollutant-mix discussion:

- The paper focuses solely on $PM_{2.5}$, but NOx, PM_{10}, ozone, and other pollutants play major roles. $PM_{2.5}$ should be described as a proxy, not the full pollution envelope.

Figure interpretation insufficient:

Figure 1 is not linear; this needs discussion.

- The claim that moderate correlation is “due to fleet turnover lag” is unproven; many other confounders exist.

Several descriptive claims require references:

- For example, statements about wood-stove heating in Italy need citations or supporting data.

Governance matters:

- EV penetration may act as a marker of environmental governance, not a causal mechanism by itself; this should be acknowledged.

Fleet data estimates:

- Where fleet penetration values were estimated, authors should use ACEA Vehicles on European Roads fleet-stock data instead of constructing their own estimates.

Causality caveat:

- The study should note explicitly that current EV penetration is still low in many countries, limiting the ability to estimate causal effects due to insufficient variation.

Policy implications:

- Nordic success is linked to multi-sector environmental policy, urban form, heating choices, industrial emissions controls, and governance, not just EV adoption. Examples should be provided.

Declarations

Potential competing interests: No potential competing interests to declare.