



Effect of adoption of electric vehicles on public health and air pollution in China: a modelling study

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Abstract

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Background Adoption of electric vehicles has the potential to reduce air pollutant and greenhouse gas emissions, hence China has implemented policies incentivising use of electric vehicles. However, much is unknown about the potential air quality and public health benefits of electric vehicles, including optimal vehicle type prioritisation and the vehicles' ability to reduce acute health impacts due to extreme air quality events. We aimed to assess the potential climate and acute public health benefits of use of electric vehicles during an extreme winter air pollution event.

Methods In this modelling study, we used the Weather Research Forecast and Community Multiscale Air Quality Modeling System air quality model to simulate the interplay between weather and atmospheric chemistry. We used this model to examine potential co-benefits of electric vehicle adoption during an extreme pollution episode in China. We simulated heavy-duty and light-duty electric vehicle adoption scenarios, in which 40% of the population adopted a heavy-duty or light-duty passenger electric vehicle, re-mapped battery power needs to energy generation facilities, and characterised differences in public health outcomes using China-specific concentration-response functions.

Findings We found that widespread adoption of heavy-duty electric vehicles would reduce nitric oxide and fine particulate matter resulting in 562 (95% CI 410–723) fewer premature acute deaths than the non-electrified baseline scenario. However, widespread adoption of heavy-duty electric vehicles does not reduce carbon dioxide emissions without the addition of emission-free electricity generation. By contrast, widespread adoption of light-duty electric vehicles robustly reduces greenhouse gas emissions, but results in lesser air quality improvements and fewer premature deaths avoided (145 [95% CI 38–333]) than the heavy-duty scenario. Economic effects of human health endpoints and carbon dioxide reductions for adoption of light-duty electric vehicles are nearly double those of a heavy-duty electric vehicle scenario (US\$155 million vs \$87 million).

Interpretation Amelioration of severe winter pollution events through adoption of electric vehicles could provide a moderate public health benefit, but continued emission reductions in the power generation sector will have greater human health and economic benefits in China.

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Contributors

JLS and DEH conceived and executed the study. DRP, DCW, XL, HZ, HG, and PLK provided guidance, data, and helped to analyse the results.

Declaration of interests

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