

Switching to vehicles powered by electricity from renewables could save lives

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Driving vehicles that use electricity from renewable energy instead of gasoline could reduce the resulting deaths due to air pollution by 70 percent. This finding comes from a new life cycle analysis of conventional and alternative vehicles and their air pollution-related public health impacts, published Monday, Dec. 15, 2014, in the *Proceedings of the National Academy of Sciences*.

The study also shows that switching to vehicles powered by electricity made using natural gas yields large health benefits. Conversely, vehicles running on corn ethanol or vehicles powered by coal-based or "grid average" electricity are worse for health; switching from gasoline to those fuels would increase the number of resulting deaths due to [air pollution](#) by 80 percent or more.

"These findings demonstrate the importance of clean electricity, such as from natural gas or renewables, in substantially reducing the negative health impacts of transportation," said Chris Tessum, co-author on the study and a researcher in the Department of Civil, Environmental, and Geo- Engineering in the University of Minnesota's College of Science and Engineering.

The University of Minnesota team estimated how concentrations of two important pollutants—particulate matter and ground-level ozone—change as a result of using various options for powering vehicles. Air pollution is the largest environmental health hazard in the U.S., in total killing more than 100,000 people per year. Air pollution increases rates of heart attack, stroke, and respiratory disease.

The authors looked at liquid biofuels, diesel, compressed [natural gas](#), and electricity from a range of conventional and renewable sources. Their analysis included not only the pollution from vehicles, but also emissions generated during production of the fuels or electricity that power them. With ethanol, for example, air pollution is released from tractors on farms, from soils after fertilizers are applied, and to supply the energy for fermenting and distilling corn into ethanol.

"Our work highlights the importance of looking at the full [life cycle](#) of energy production and use, not just at what comes out of tailpipes," said Bioproducts and Biosystems Engineering Assistant Professor Jason Hill, co-author of the study. "We greatly underestimate transportation's impacts on air quality if we ignore the upstream emissions from producing fuels or [electricity](#)."

The researchers also point out that whereas recent studies on life cycle environmental impacts of transportation have focused mainly on greenhouse gas emissions, it is also important to consider air pollution and health. Their study provides a unique look at where life cycle

emissions occur, how they move in the environment, and where people breathe that pollution. Their results provide unprecedented detail on the air quality-related health impacts of transportation fuel production and use.

"Air pollution has enormous health impacts, including increasing death rates across the U.S.," said Civil, Environmental and Geo- Engineering Associate Professor Julian Marshall, co-author on this study. "This study provides valuable new information on how some transportation options would improve or worsen those health impacts."

More information: Life cycle air quality impacts of conventional and alternative light-duty transportation in the United States, Christopher W. Tessum, *PNAS*, [DOI: 10.1073/pnas.1406853111](https://doi.org/10.1073/pnas.1406853111)

Provided by University of Minnesota

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