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### Title

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### Authors

Bunch, Davis S.

Chakraborty, Debapriya

Brownstone, David

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## Household Vehicle Choice in California: Behavior and Impacts

David S. Bunch and Debapriya Chakraborty, *University of California, Davis*  
David Brownstone, *University of California, Irvine*

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### Issue

How will households with multiple vehicle types choose what to drive, and how will those choices affect miles traveled? Researchers modeled vehicle choice in relation to travel needs and preferences to better understand possible outcomes. Results show that household demographics and the density and walkability of neighborhoods are important factors in vehicle choice and use.

To reduce greenhouse gas (GHG) emissions from the transportation sector, government programs and regulations are encouraging a transition from internal combustion engine vehicles (ICEVs) to battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), collectively referred to as plug-in electric vehicles (PEVs). California has targets of having 5 million PEVs and Fuel Cell Electric Vehicles on the road by 2030, and 100% of new vehicle sales being zero-emission by 2035.

An increasing diversity of vehicle types, paired with a growing demand for PEVs, has major implications for vehicle miles traveled (VMT), air pollution, and emissions. To better understand what is likely to happen, researchers predict household vehicle preference and VMT by vehicle body and fuel type. Having estimates for these factors makes it possible to project future VMT changes and vehicle emissions. This is particularly important because, in past studies, there have been major discrepancies in the estimates of miles traveled by BEVs. This makes their likely contribution to emission reductions unclear. These conflicting studies did not consider vehicle choice and VMT in an integrated framework. This research closes this knowledge gap.

### Key Research Findings

- **PEVs have a lower satiation effect than similar ICEVs.** In multi-vehicle households, drivers put more miles on PEVs than on ICEVs with similar body types. Households may still have a higher baseline preference for ICEVs for all body types, other than small cars. However, when households have both PEVs and ICEVs, they tend to put more miles on the former.
- **Larger vehicles are preferred in households with more residents or children.** Larger vehicles include vans and SUVs with higher passenger and truck capacity, likely needed by households with more residents and children for their travel needs.
- **Household demographics relate to interest in smaller PEVs.** Smaller PEVs like the Leaf, Bolt, Prius-Plug-in, and Volt are often used for commuting. They are preferred in households with a college education, rooftop solar ownership, and/or more employed workers
- **The population density and walkability of a neighborhood have significant impacts on vehicle choice and VMT.** If policies encourage mixed-use development and increase neighborhood density, they can reduce ICEV ownership and usage and help to electrify the transportation sector.

## Conclusions

A rising share of PEVs is expected in the vehicle fleet in response to GHG emission reduction targets and PEV adoption goals in California set by Senate Bill (SB) 32, ongoing policy efforts targeting auto manufacturers, and market adoption trends. Understanding factors that influence vehicle choice and the driving behavior of PEV drivers will help to refine the emissions impact assessment of these alternative fuel technology vehicles. The model developed through this research can help in this process. It can predict changes in vehicle preference and VMT as EVs penetrate the market, and the results can inform California travel demand models and emission prediction models. The results presented here underscore the impact of land-use and transportation policies on household vehicle choice and usage. Vehicle usage can, in turn, impact travel demand, emissions, and air quality across the state.

## More Information

This policy brief is drawn from “Role of Vehicle Technology on Use: Joint analysis of the choice of Plug-in Electric Vehicle ownership and miles traveled,” a report from the National Center for Sustainable Transportation, authored by David S. Bunch and Debapriya Chakraborty of the University of California, Davis, and David Brownstone of the University of California, Irvine. The full report can be found on the NCST website at <https://ncst.ucdavis.edu/project/role-vehicle-technology-use-joint-analysis-choice-plug-electric-vehicle-ownership-and-miles>.

For more information about the findings presented in this brief, contact David S. Bunch at [dsbunch@ucdavis.edu](mailto:dsbunch@ucdavis.edu).

The National Center for Sustainable Transportation is a consortium of leading universities committed to advancing an environmentally sustainable transportation system through cutting-edge research, direct policy engagement, and education of our future leaders. Consortium members include the University of California, Davis; California State University, Long Beach; Georgia Institute of Technology; Texas Southern University; the University of California, Riverside; the University of Southern California; and the University of Vermont.

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