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### Title

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# The Effects of Ride-Hailing Services on Greenhouse Gas Emissions

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## Issue

Ride-hailing services, which allow consumers to order and pay for rides through smartphone applications, have grown to a substantial proportion of the transportation market. Today, an estimated 15% of adults across the United States and 21% living in major U.S. cities have used ride-hailing services.

The growth of ride-hailing services has raised questions about their overall effects on the transportation system. While they clearly offer a new form of mobility, there is concern they may increase congestion and air pollutant emissions. A limited number of studies have attempted to quantify changes associated with the increased use of ride hailing services.

UC Davis researchers examined how ride-hailing affects the total amount of driving (measured in vehicle miles traveled, VMT) as well as greenhouse gas (GHG) emissions. The researchers developed a framework of categories for analyzing the multiple aspects of transportation that may be affected by ride-hailing. These categories are: automobile ownership; number of vehicle trips generated; choice of mode of travel; empty (passenger-less) travel between drop-off and pick-up points, known as “network travel”; and destination choice and land use. (All except the last are shown in the middle section of Figure 1.)

Thirteen studies were analyzed using this new framework: 8 used surveys of riders or recorded data on rider and driver activity; and 5 used simulated (“modeled”) travel in and around cities by automated taxis. By compiling multiple studies in the framework, stronger and more certain conclusions could be reached.

## Key Research Findings

**Overall, ride-hailing appears to have increased vehicle miles traveled and GHG emissions.** Some of this increased travel came from trips that would not

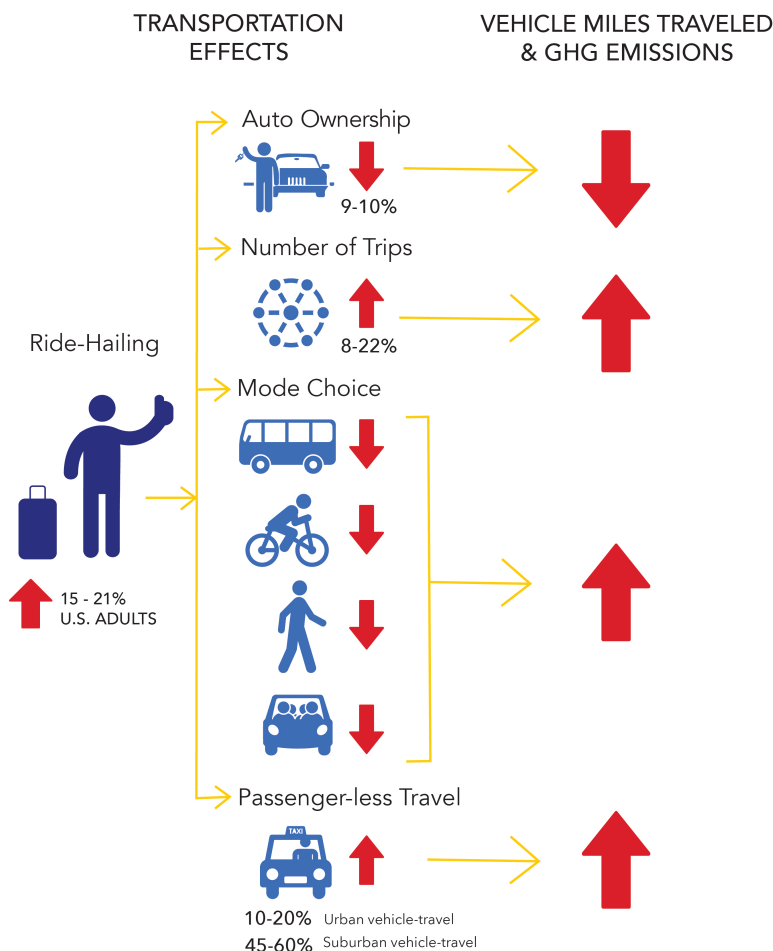


Figure 1. The effects of increased ride-hailing on multiple aspects of transportation and the impact on VMT and GHG emissions.

otherwise have been taken, some from network travel, and some from people substituting ride-hailing for trips they would have made by walking, bicycling, or taking public transit.

**Ride-hailing was associated with reduced auto ownership.** Two studies using surveys found that 9–10% of respondents gave up a vehicle after using ride-hailing services. However, more research is needed to test whether the use of ride-hailing is actually the cause of giving up a vehicle.

**Ride-hailing led people to take more trips.** Four studies that used surveys found that 8–22% of trips would not have been made if no ride-hailing service were available. This and other research suggest that the reasons for using ride-hailing include avoidance of drinking and driving and lack of automobile ownership.

**Ride-hailing users reduced their use of other modes, including transit.** Survey studies found that if ride-hailing were not available, riders would otherwise have used transit, carpools, walking, or bicycle riding. This indicates that ride-hailing services are associated with a reduction in travel by these other modes. Existing survey studies suggest that ride-hailing is used more as a substitute for transit than as a complement to it (e.g., as a means of “first and last mile” travel to and from transit stops). However, more research is needed to carefully measure the effects of ride-hailing on transit ridership.

**Ride-hailing increased network (i.e., empty) vehicle travel.** Ride-hailing drivers spend part of their time driving without passengers, as they wait for a request or drive to pick someone up. High-density urban areas typically show less of this empty vehicle travel than suburban areas, where vehicles must go farther to pick up new passengers. This “network vehicle travel” accounts for a 10–20% increase in vehicle travel in urban areas and a 45–60% increase in suburban areas.

**Research is needed to determine the effects of ride-hailing on destination choice and land use.** Although no studies have yet evaluated these effects, a substantial body of existing research on land use and travel demand shows that inexpensive, fast, and convenient travel options tend to contribute to urban sprawl and transportation-intensive land use

decisions. Further research is necessary to determine whether this pattern holds in the case of ride-hailing.

**Research is limited and results may not apply to the larger population.** Reliable answers to questions on the impact of ride-hailing are limited, due to the relative newness of ride-hailing as a phenomenon, lack of publicly available data, and low response rates on some surveys.

## Policy Implications

This study found that ride-hailing leads to increased VMT and GHG emissions, through increased trip generation, empty travel to pick up passengers, and riders switching from other modes of travel. There is agreement across studies in this general conclusion. Given these findings, the adverse impacts of ride-hailing on VMT and GHG emissions might be reduced by policies that are likely to:

- increase the use of travel modes with lower emissions than ride-hailing (e.g., through carpool incentives and congestion pricing)
- promote the use of ride-hailing for the first or last mile of travel to transit, but not as a substitute for transit (e.g., by fare subsidies or methods of smoothly integrating ride-hailing with transit)
- promote the use of zero-emission vehicles by drivers who work for ride-hailing companies
- promote pooling (giving rides to multiple passengers at once) within ride-hailing services
- minimize empty “network” travel, especially where it adds significantly to VMT, as in suburban areas (e.g., through distance pricing or limiting ride-hailing services in these areas)

## Further Reading

This policy brief is drawn from “The Effects of Ride-Hailing Services on Travel and Associated Greenhouse Gas Emissions,” a white paper from the NCST and the 3 Revolutions Policy Initiative, prepared by Caroline Rodier of the University of California, Davis, with support from the California Department of Transportation. To download the white paper, visit: <https://ncst.ucdavis.edu/white-paper/effects-of-ride-hailing-services-on-travel-and-associated-ghg-emissions/>

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