DRISI
Caltrans Division of Research, Innovation and System Information

Research Notes

A National Study of Dockless Transportation: Land Use and Demographic Correlates of Trip Hotspots and Mode Shift

In this research, we will study dockless travel (scooters, e-bikes, dockless bicycles) at a fine level of geographic detail, linking dockless trip patterns to land use and infrastructure (e.g. bike lanes) to understand these short distance travel patterns.

Planning, Policy& Programming

MAY 2020

Project Title:
A National Study of Dockless Transportation: Land Use and Demographic Correlates of Trip

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WHAT IS THE NEED?

The rising prevalence of dockless bike-sharing and scooter-sharing services (dockless mobility) have posed many challenges for public agencies responsible for the planning and management of transportation. Part of the evolution of disruptive transportation technologies, these services abruptly entered the market for transportation services in 2017, at a time when frameworks for regulating and planning their use were limited. As these services have grown in popularity, government agencies need planning and regulatory frameworks for managing dockless mobility.

Regulating and planning for dockless mobility requires an understanding of where, when, and how it is used. Where do dockless trips tend to originate? Are there land use correlates of dockless trips – e.g. population or employment density or other factors? Are there peak travel times or days of the week for dockless mobility trips? How do sociodemographic and built environment variables explain dockless mobility use? To-date, there are few empirical studies that can help answer these questions. This research will develop the underlying empirical relationships to help answer these questions.

WHAT ARE WE DOING?

Our research will rely on ordinary least squares (OLS) regression to estimate dockless mobility trip generation (origins) and attractions (destinations) as a function of built environment and sociodemographic variables for the local area, as shown below.

Gen or Attit = f(LUit)

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Key independent variables include the number of jobs in an area and the density of those jobs, population density, and proxies for activity centers that might generate short dockless trips.

We have obtained dockless trip data, geocoded to census block groups, for Louisville and Minneapolis. California cities and agencies have not yet developed a similar protocol for releasing dockless data to the research community. We are developing regression models of dockless trip generations and attractions as a function of land use. Once the regressions are validated, we will use the regression results to predict the potential for dockless travel to replace short trips in metropolitan areas, including in large California metropolitan areas.

WHAT IS OUR GOAL?

Our goal is to generate empirical evidence about the built environment correlates of dockless mobility travel, and to use regression model results to predict the potential for dockless travel as a short-trip mode in large metropolitan areas in California and the U.S. These findings will help inform planning practices that relate to short-distance travel, including but not limited to first-last mile travel to/from transit stations.

WHAT IS THE BENEFIT?

Informed public policy formulation depends on supportive empirical research. To-date, empirical research about dockless mobility use is extremely limited. As a result, much regulatory and policy development relating to dockless mobility relies on assumptions about dockless mobility travel behavior. Our research will help bridge this knowledge gap by providing empirical findings about dockless travel that can better inform policy development. To our knowledge, this is the first research of its kind.

WHAT IS THE PROGRESS TO DATE?

We canvassed public data sources and found that three cities release dockless trip origin and destination data. We have the most recent data available, for the past year, for dockless travel in the cities of Louisville, Minneapolis, and Austin. (Note that dockless providers do not operate in Minneapolis in winter, causing a gap in the timespan of the data.) The Austin data is geocoded to the census tract level, while the data in Louisville and Minneapolis have been geocoded to census block groups. We also worked with the City of Los Angeles and with Lime, a private dockless company, but neither was able to release data for this study.

We have developed regression models that explain dockless trip generations, in census block groups and by day, as a function of land use characteristics. The models have been developed for Louisville and Minneapolis. We anticipate using the Austin data to conduct an "out of sample" test of the trip generation model's predictive power. We will then use the models to predict dockless travel based on land use characteristics in large metropolitan areas in the U.S.

IMAGES

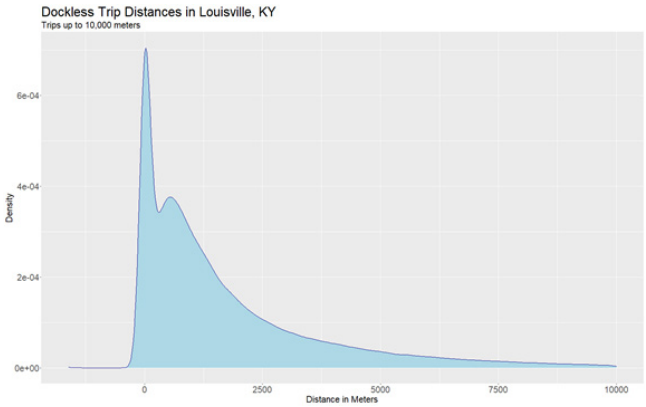

Image 1: Kernel density plot of dockless trip distances in Louisville.

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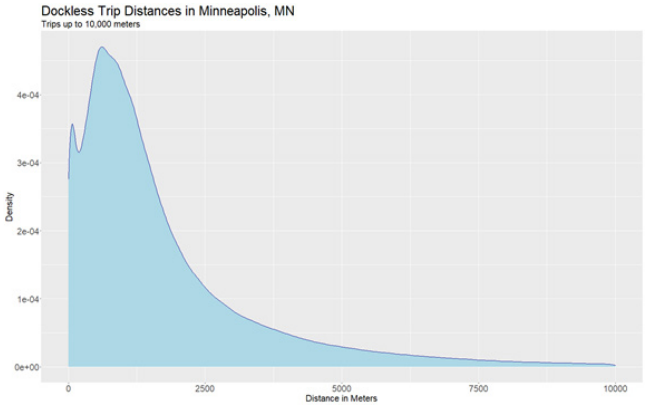
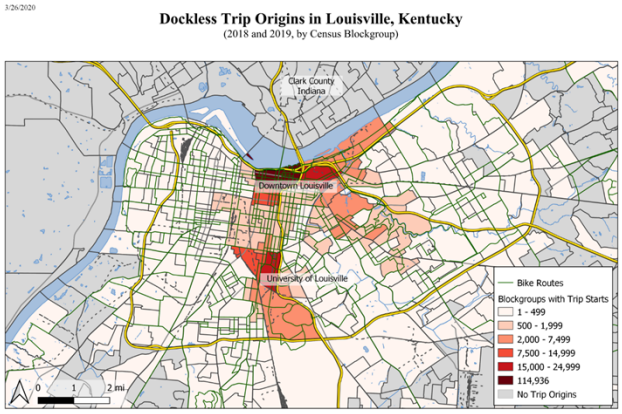
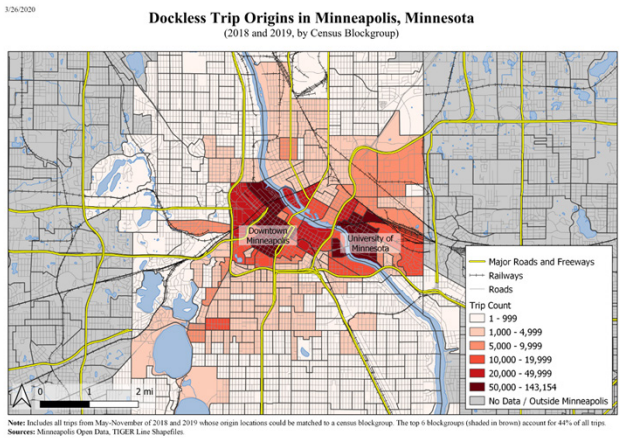
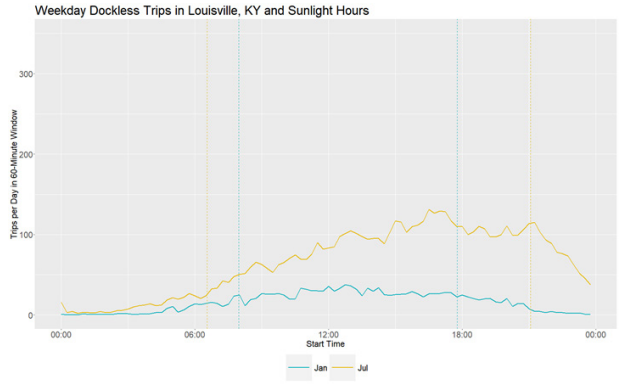


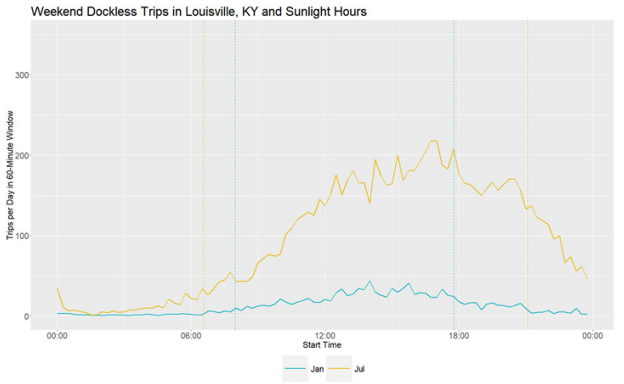
Image 2: Kernel density plot of dockless trip distances in Minneapolis.

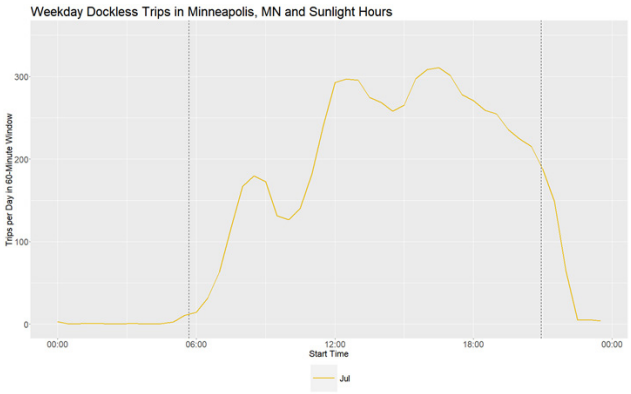




Images 3 & 4: Maps of dockless trip generations in both those cities







Images 5-7: Time graphs, over the course of a day, of monthly average of dockless trips in Louisville and Minneapolis with daylight hours indicated, in July and January for Louisville and July only for Minneapolis

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