Grant Deliverables and Reporting Requirements for UTC Grants

UTC Project Information	
Project Title	Estimating Activity and Health Impacts of First and Last Mile Transit Access Programs for Work and Shopping Trips Using Shared Mobility Services in a Metropolitan Area
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Total Project Cost	$148,846
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Start and End Dates	Start date: 11/30/2016 End date: 11/30/2018
Brief Description of Research Project	The advent of shared mobility providers (e.g., Lyft, Uber) has generated opportunities for the potential collaboration between transit agencies and these providers to explore the feasibility and benefits of complementary services. This project will explore the potential service integration by developing and modeling a first and last mile transit access shared mobility service. In doing so, the team will develop a hybrid model that combines the San Francisco Bay Area activity based travel demand model (MTC-ABM) with approximate routing and facility locations sub-routines to simulate the service. At the demonstrative level, the model will concentrate on access to subway systems for work and shopping related trips. The outcomes will be evaluated in terms of activity (VMT, congestion), and health impacts associated to the environmental emissions generated by the vehicles in the system. The process method is three-fold: 1) the team will analyze the mode and destination choice models embedded in the MTC-ABM to identify the mode choice decisions and changes to various factors and variables. Using these results, the team will evaluate the network and behavioral factors that shed some light into the

	variables that that can produce a significant shift to other modes (i.e., shared mobility services); 2) develop approximation models considering districting and routing to simulate the movements of individuals from origins to pick-up locations and from drop-offs to destinations. The sub-routines models will provide updated parameters of approximate costs, and travel/transfer times that could be fed back into the MTC-ABM framework. And, 3) use the activity simulated results to estimate the health impacts of implementing such a complementary service. The model could be expanded to evaluate different scenarios such as the use of zero or near zero emission vehicles as part of the shared mobility service; and benefits from autonomous and connected vehicles. Considering shopping trips during the estimation of potential demand for the service will contribute to on-going research conducted by the authors to estimate the impacts of shopping versus residential deliveries. We will use the Integrated Transport and Health Impacts Model (ITHIM) model developed by the California Department of Public Health to estimate health effects.
Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here	The researchers implemented the framework for the first mile transit access program to the San Francisco Bay Area. The authors developed a number of scenarios to test different assumptions about the impacts of the program on travel behavior. The scenarios considered changes in perceived accessibility to transit (i.e., BART) based on access time and costs. The implementation provided different results for the feasibility of the program. Overall, the program (at least with limitation of the behavioral models in MTC-ABM) does not achieve significant shifts from drive alone modes to transit or active. There are other aspects that affect the ridesharing+transit program: • Users locations (e.g., distance/access to BART); • Origin-destination pairs (e.g., outside of BART service area); • Trip purpose (e.g., work vs. shopping); and, • Travelers' preferences and characteristics (e.g., income and other socio-demographic variables affecting travel choices).
Impacts/Benefits of Implementation (actual, not anticipated)	The framework allows evaluating the activity and health impacts from a transit access program using ridesharing. The optimization and later agent-based simulations are important considerations in the simulation-optimization framework as they show how feasible or realistic the initial assumptions of the scenarios modeled in the MTC-ABM are.

	One of the evaluated scenarios, assuming a 25% reduction in access time to BART for work trips during the AM periods generated the following impacts and benefits: • 8% increase in AM work trips (72,404) • 5,792 new Drive-BART trips (1,077 switched from SOV) • Estimation of approximate average of 17 min walk time, 20 min drive time, and 7 min wait time per passenger • 5 to 20 min combined walk and wait time for 60% of the travelers, and more than 20 minutes, up to an hour of delay, for a large portion of others. • 99% of trips with significant travel time increase that contributed to increases in general cost for 74% of trips • Trip cost (excluding the time cost) reduced for around 68% of trips (total value of $5,000) • Total VMT deceased dramatically; however, 45% of the rideshare vehicle mileage is empty. • Major share of passenger travel time spent on ride share mode followed by transit and walk. • Larger general cost change for higher income group, while the others are almost within same range. • Increases in travel delay by almost all the trips is a serious operational issue. Overall, the program is not able to generate a significant shift from drive alone to the mode, thus generating small changes in the system. When evaluating the health impacts in the system, the results are very small. However, when estimating the impacts to those individuals that switch from drive alone to BART, results in health benefits between 2% and 11% for different diseases and injuries.
Web Links • Reports • Project website	http://ctech.cee.cornell.edu/final-project-reports/