The Impact of Covid-19 on Travel

Data Science Major Capstone
Marisa Papagelis | Wellesley College

Motivation

I found it both relevant and of interest to look into the potential effects Covid-19 had on travel trends, and how these trends differ based on sociodemographic factors.

Research Question

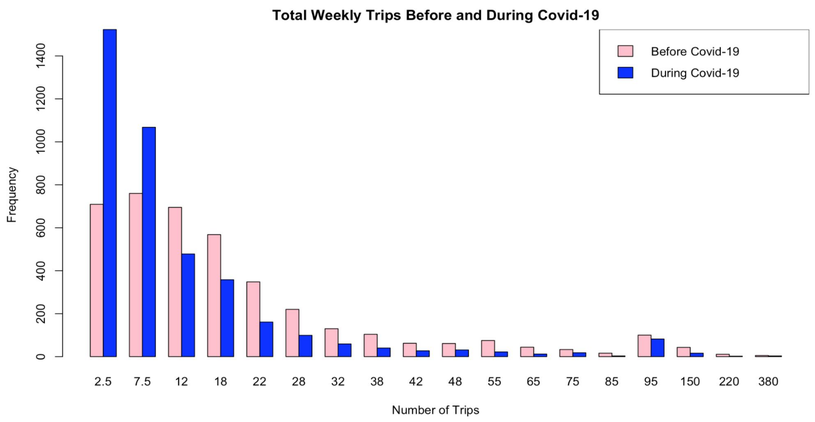
How has Covid-19 impacted weekly travel trends within Chicago, Washington DC, Dallas, and Seattle?

Data

The data was collected by researchers at MIT Sloan as a survey sent to 4000 randomly selected participants in 4 major U.S. cities. The survey was sent out twice, once before and once during Covid-19 to the same cohort of participants. For the purposes of this capstone, the participants in the four cities were aggregated because the travel trends did not appear to vary between cities. The question of interest in the survey was:

In the past week, how many trips did you make using each of the following transportation modes?

Of 3993 respondents, 2593 (64.9%) traveled *less*, 884 (22.1%) traveled *the same*, and 488 (12.2%) traveled *more* during Covid-19 than they had before.

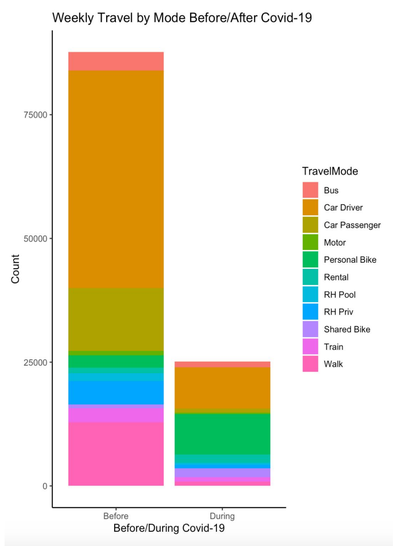


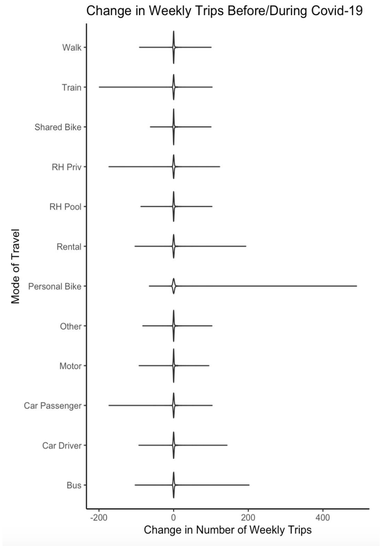
Average Change in Trips by Travel Mode

Mode	*Before*	*During*	*% Change*
Train	2829	867	-0.6935
Bus	3697	1180	-0.6808
Car Driver	43956	8346	-0.8101
Car Passenger	12691	838	-0.9340
Rental Car	1096	1675	0.5283
RH Private	4672	668	-0.8570
RH Pool	1621	438	-0.7298
Shared Bike	808	1802	1.2302
Personal Bike	2477	8196	2.3088
Walk	12854	890	-0.9308
Motor	952	237	-0.7511

% Change = (During - Before) / Before

While overall transportation usage did decline, the three modes of transportation that increased were Rental Cars, Shared Bike, and Personal Bike.





Model Selection

Which sociodemographic factors contribute to best predicting the change in number of trips before and during Covid-19?

Response Variable: The difference in number of trips before - during Covid-19 for each individual

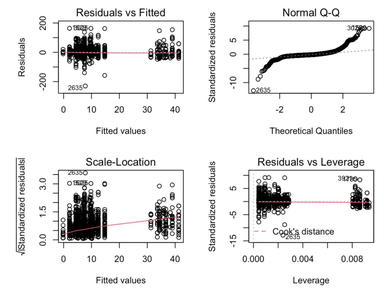
Predictor Variables of Interest: 30 sociodemographic predictors including Age (continuous) and dummy variables (1/0) indicating race, education, city, etc.

Automatic Selection, Stepwise Regression

Measure	*AIC Criterion*	*BIC Criterion*
# of predictors	11	4
5-fold CV score	117.7790	105.6435

Model Diagnostics

The BIC model was chosen due to it's smaller CV score, and thus a better predictive performance. After removing 11 influential observations, the BIC model satisfies the constant variance and normality assumptions.



Final Model

$$\widehat{ModeTravel\_Difference} = 7.7909 + 2.3168HHCars - 3.0320EssWkr + 26.5359PTsuperuser - 4.94PTnonuser$$

Conclusion

Overall, Covid-19 decreased weekly travel trends. Change in weekly travel trends can best be predicted by number of household cars (HHCars), essential worker status (EssWkr), and public transportation usage (PTsuperuser = > 10 weekly trips, PTnonuser = 0 weekly trips).