



# The Rise of Private Vehicles: Investigating Factors for Mode Shift after COVID-19

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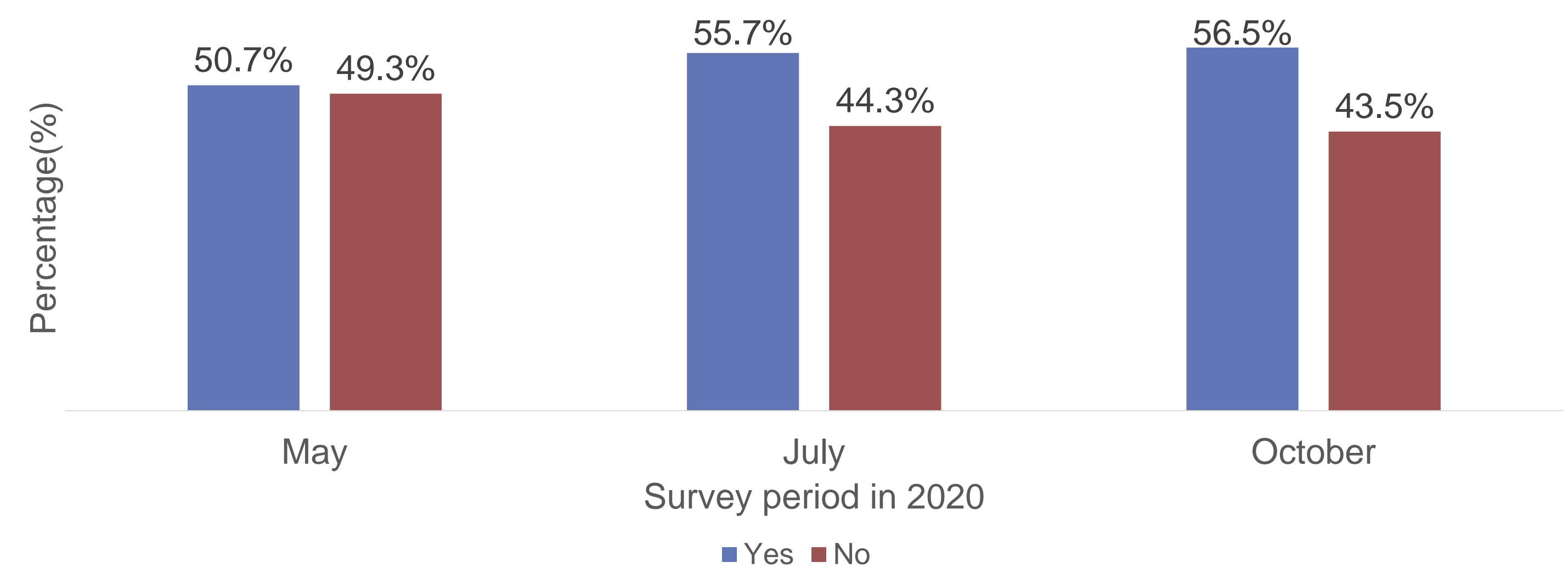
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## Background and Objective

- The spread of COVID-19 has caused many unexpected changes including social, economic and transportation.
- People have been fearful of using public transportation and ridesharing during the pandemic, which has led to increased switching to private vehicles.
- If a similar situation occurs in the future, identifying the factors that influence mode transitions will support better operations.

## Data acquisition

- This research utilized survey from NYC DOT mobility survey, that collected from May 4 to May 8 in 2020 and the data includes socio-demographics, travel patterns, attitudes toward travel policies.
- The percentage of travel mode shift getting increased during the pandemic in below figure.



## Methodology

- In this study, mixed logit model was chosen to develop the model to reflect heterogeneity across the respondents.
- The mode choice function for respondent  $n$  is presented by considering variations of parameters across different individuals and the probability computed as shown in equation below.

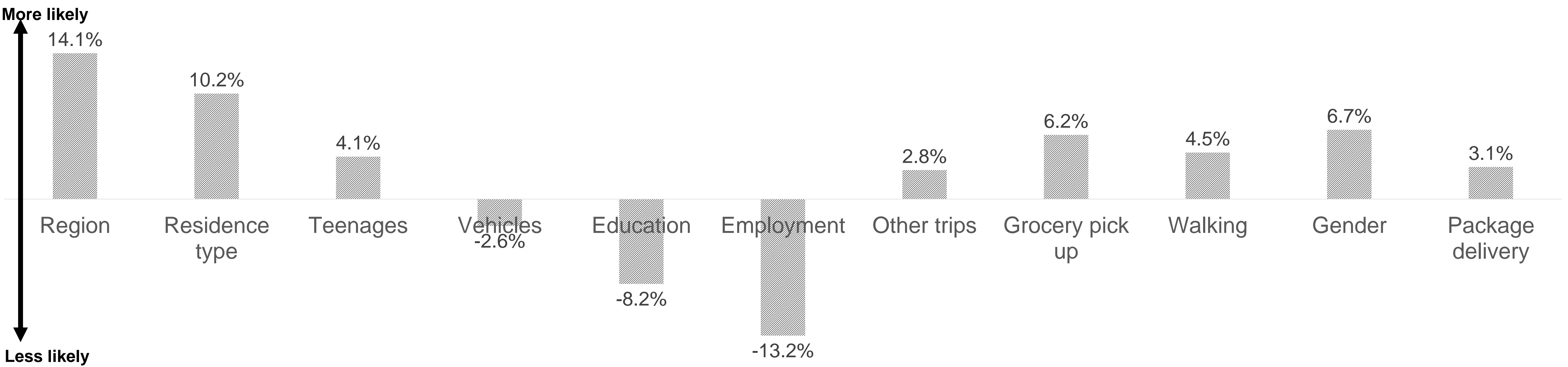
$$P_n(i) = \int \frac{\exp(\beta_i X_{i,n})}{\sum_I \exp(\beta_i X_{I,n})} f(\beta|\varphi) d\beta$$

- $P_n(i)$  is the probability of mode change,  $f(\beta|\varphi)$  is density function of  $\beta$ . The  $\beta$  allows individual specific variations of the impacts on mode shift probabilities, and the density function  $f(\beta|\varphi)$  is used to define  $\beta$ .

## Results

Variable	Random Parameter Model		
	$\beta$	t-value	Marginal effect
Constant	1.216	1.880	
Residence region indicator variable (1 if respondent lives in Manhattan, inner Queens, inner Brooklyn, or Southern Bronx, 0 otherwise)	2.967	3.710	0.141
Indicator variable for current residence type (1 if residence type is one of those: second home /family member's or partner's home; 0 otherwise)	2.002	2.520	0.102
Number of family members aged 13 to 17	1.539	2.540	0.041
Number of vehicles in household	-0.823	-2.440	-0.026
Indicator variable for the highest level of education completed (1 if the highest education level is equal to or above graduate school; 0 otherwise)	-1.887	-3.040	-0.082
Indicator variable for employment status before the Mid-March 2020 (1 if unemployed; 0 otherwise)	-1.919	-2.640	-0.132
Number of days of trips for other reasons: excluding purpose of work, food, exercise, shopping, and social in last 7 days	2.499	2.080	0.028
Indicator variable for attitudes towards grocery pick up at curbside or selected pick up location (1 if preferred; 0 otherwise)	1.078	2.040	0.062
Indicator variable for attitudes towards walking (1 if preferred; 0 otherwise)	0.955	2.000	0.045
Gender (1 if male; 0 female)	0.926 (3.116)	1.830	0.067
Number of days ordered/received deliveries in the last seven days: receive packages at home	0.411 (1.028)	2.160	0.031

- Positive parameter values indicate that respondents are more likely to shift mode to private.
- The below figure shows the increased (or decreased) likelihood of changing the travel mode to private



## Discussion and Conclusion

- Stakeholders need to be aware of regional differences in sensitivity to changes in private transport (higher population, higher income)
- Several variables such as attitude to walking, and grocery pick up, show the necessity of policies that discourage private vehicles.
- Combining with other types of data, such as social media, GPS, and smart card data, could provide more insights into changes in travel behaviour for future work.