Equity Analysis with Replica Synthetic Population

Ngoc Nhu Hoang[1], Xiyuan Ren[2], Joseph Chow[2]

1. New York University Abu Dhabi   2. New York University Tandon School of Engineering

Background

The lack of consistent travel data, especially for underserved and rural communities where travel demands are under-presented, poses a standing challenge in statewide transportation planning. Replica, a data company, has developed a consistent, nationwide synthetic population dataset by combining census, travel survey, and mobile phone data which can be used to develop behavioral models that can account for individuals in underserved communities. Utilization of the data can potentially enable analyses of equity impacts of new mobility scenarios. This study aims to check the quality of Replica's dataset as well as conduct descriptive analysis prior to the next modeling part in developing a statewide behavioral-response decision-support tool to measure impacts on equity for different changes of transportation systems.

Methodology & Process

1. Data quality validation

- Checking the quality of the synthetic population dataset by checking its consistency with census data and travel survey data at the aggregated level.
- Extracting a range of statistics and insights from the dataset e.g. distribution of population across different counties and census tracts, daily movements of the population in terms of vehicles and purposes of the trips, etc.

2. Region comparison

- Focusing on differences of mobility patterns (distribution, frequency, nature of trips) among major cities in New York State (New York City, Syracuse,

Buffalo, Rochester), between weekdays and weekends, between in-county trips and out-of-county trips.

Figure 1: Distributions of trip origins and destinations in New York City
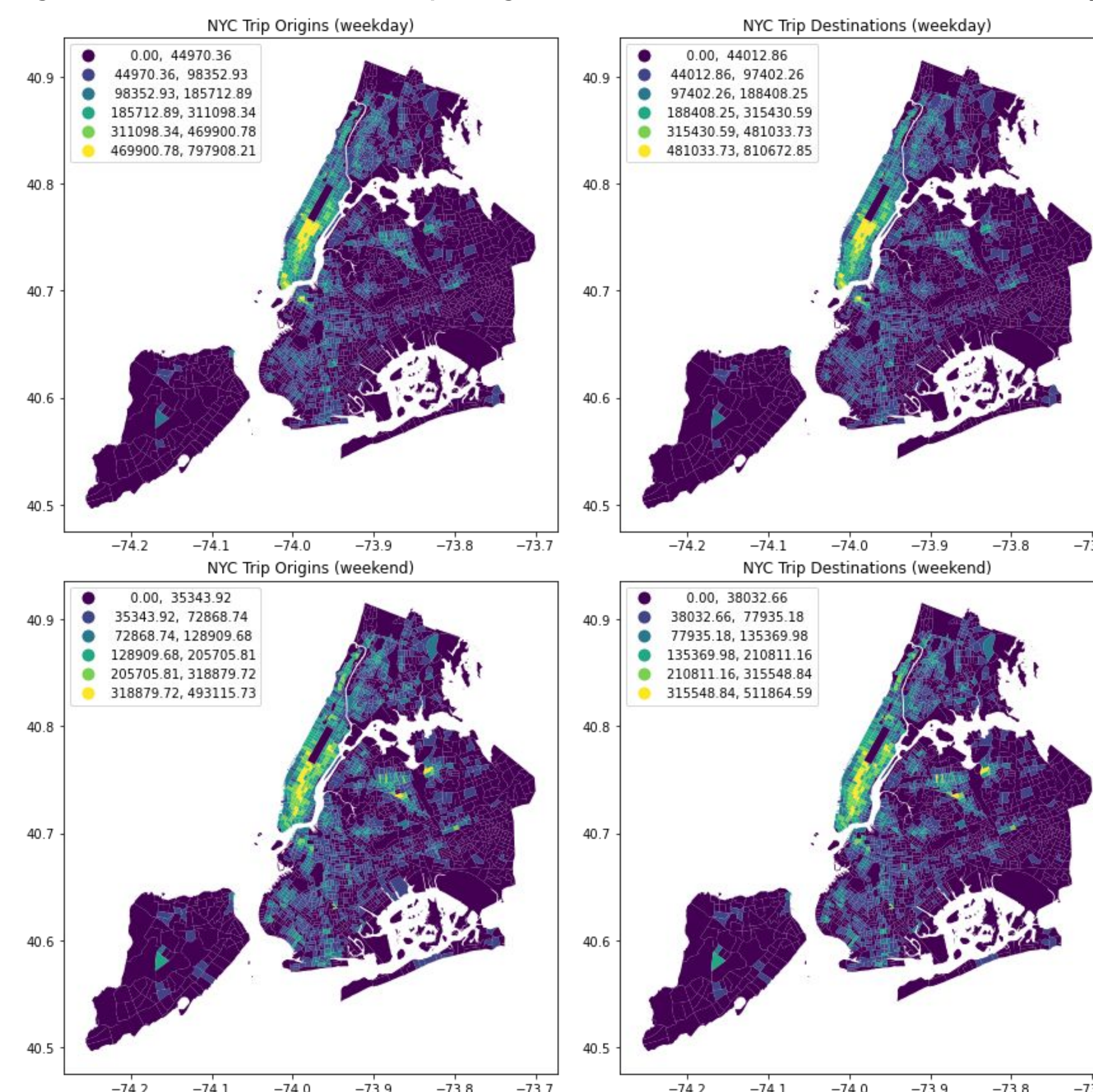
3. Socioeconomic factors examination

- Looking into different socioeconomic factors and studying their relationship with mobility patterns on an individual level.
- Using synthetic population dataset in combination with real statistics to recreate statewide maps of disadvantaged areas and rural areas to study unique mobility patterns in rural, less densely populated areas.

Figure 2: Original (left) and recreated (right) maps of NYS disadvantaged areas, original map by NYS Energy Research and Development Authority
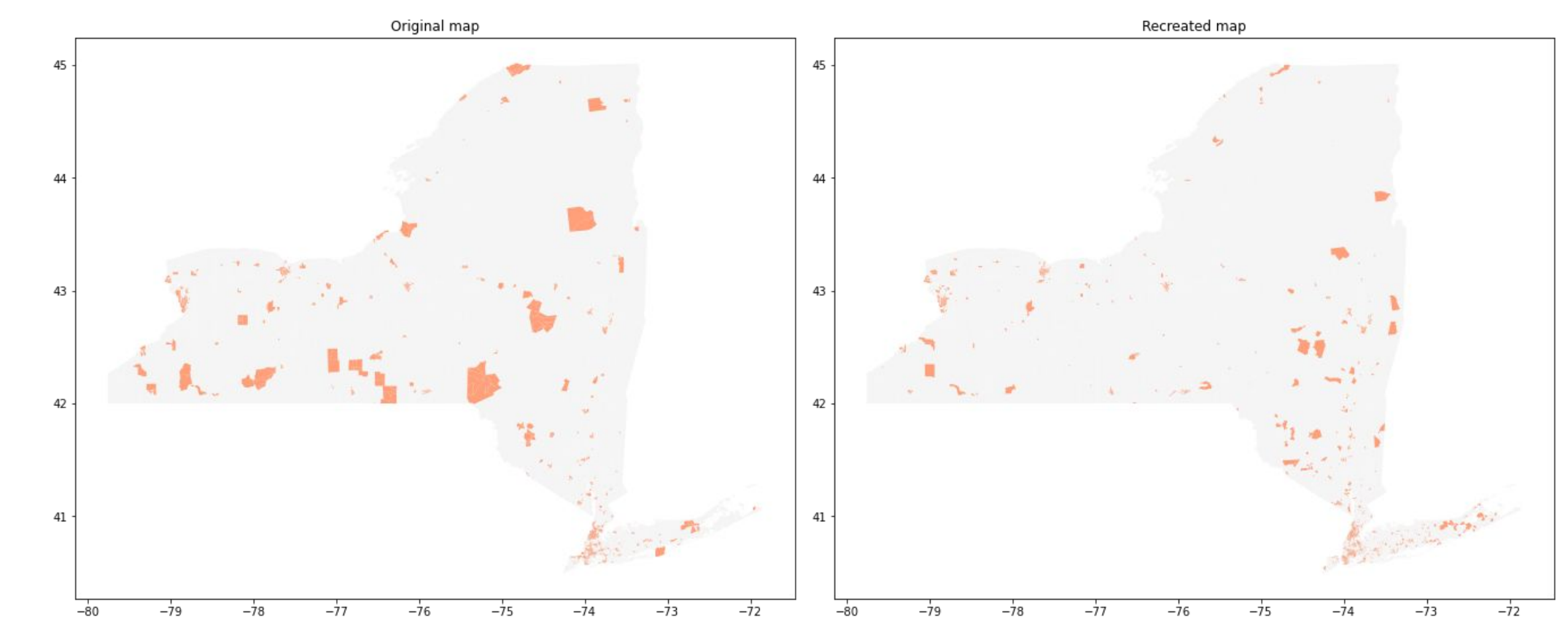
Results & Future works

- This project has allowed us to obtain deeper understanding and findings into the synthetic population dataset, its quality, consistency, and applicability in our future research into equity analysis using large-scale population and transportation data.
- Deliverables include multiple graphs, maps, and interactive dashboards illustrating findings from the project on data quality and insights from data explorations.
- The findings will serve to provide important supports for the bigger ongoing project "New York Statewide Behavioral Equity Impact Decision Support Tool" aiming to build a tool for measuring impacts on equity for systems design changes, especially in underserved communities in New York State.

Acknowledgement