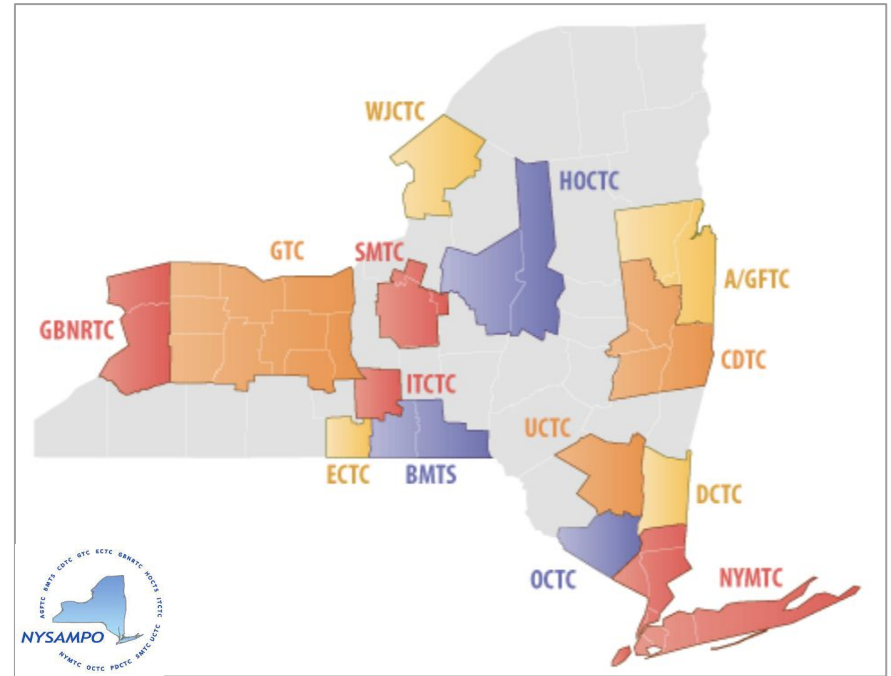


Integrating Replica Data into MPO Workflows

2023 NYSAMPO Conference
May 9, 2023

Today's Session: What to Expect

- Replica Background & Overview
- Sample Illustrative Use Cases
- Leveraging Replica Data & New York's Regional Models
- Additional Opportunities to Integrate Replica Data into MPO Workflows
- Q&A

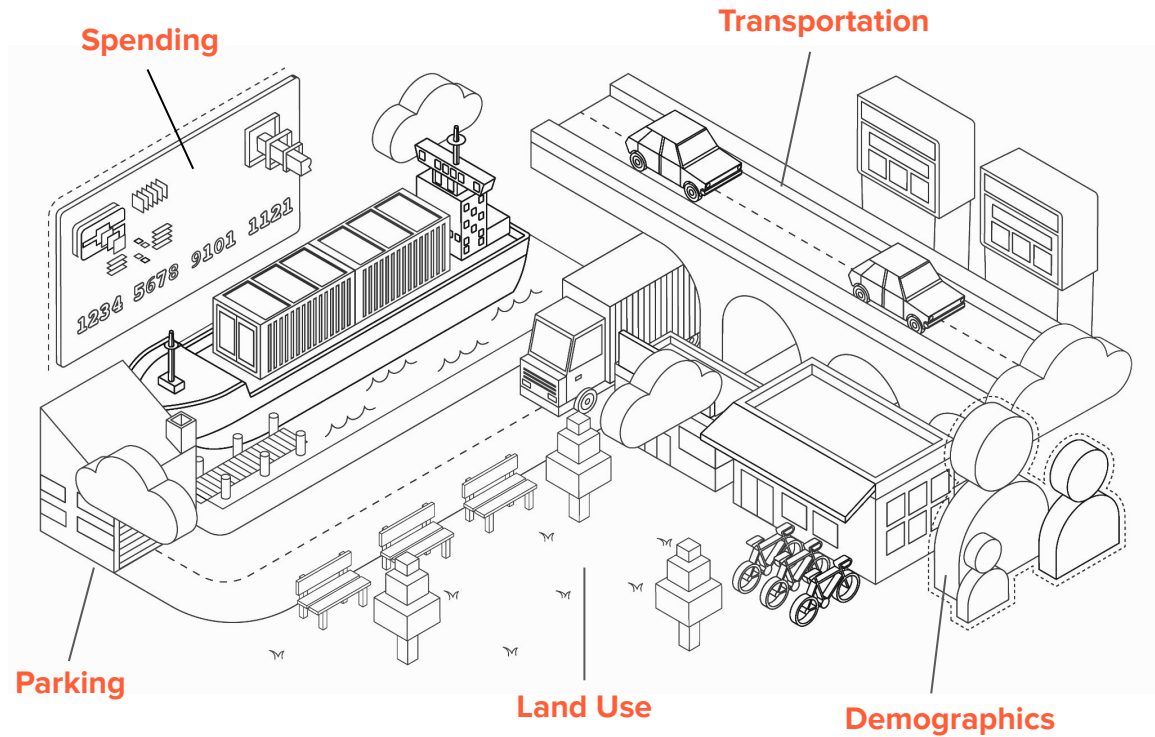


Replica Background & Overview



Our Mission

Organize the world's information about the **built environment** to make it **accessible**, **valuable**, and **actionable**.



What Makes Replica Different?



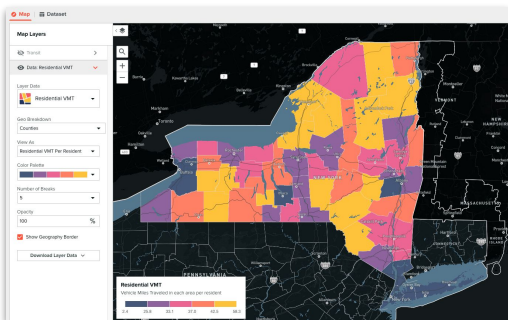
Depth and Breadth

- **Depth: Mobility & demographic data**
 - Trips: O/D pairs, start time, mode split, purpose, distance, duration, transit routes, and more
 - Trip takers: household income, race and ethnicity, age, employment status, private auto availability, working from home, and more
- **Breadth of data**
 - Land use, including parcel-level
 - Economic activity
 - Additional datasets:
 - Annual Average Daily Traffic (AADT)
 - Turning Movement Counts (TMC)
 - Parking



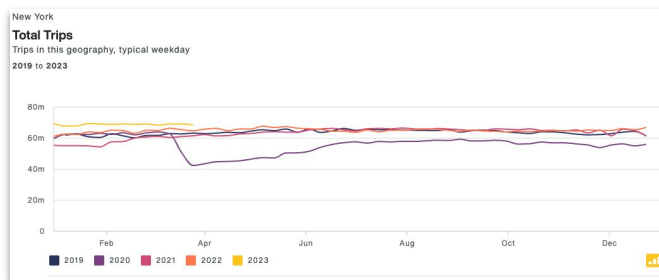
Places

High-fidelity activity-based travel models, representing specific regions during specific seasons, with **data outputs down to the network link level**.



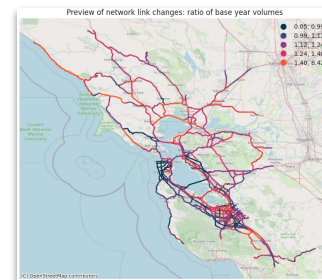
Trends

Nationwide activity-based model, with **near-real time data** at the census-tract level covering mobility, consumer spend, and land use.



Scenario

Forecast future conditions based on potential changes to population/employment (available now), land use, and transportation infrastructure.



How it Works

Raw Data Layer

We leverage a diverse set of third-party source data to create our models.

This composite approach is both a risk-mitigation strategy and aligned with our objective to show a holistic view of the built environment.



**Mobile
Location
Data**



**Consumer
& Resident Data**



**Built
Environment**



**Economic
Activity**



**Ground
Truth Data**

How it Works

The Pipeline

Replica generates its data by running computationally intensive, **large-scale simulations**.

These simulations allow us to deliver **granular data outputs** that match behavior in aggregate, but **don't compromise the privacy** (or surface the actual movements) of any one individual.

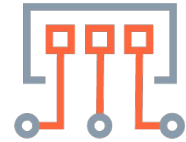
1

Create a **synthetic population** matching the characteristics of a given region



2

Train a number of **behavior models** specific to that region



3

Run **simulations** of those models applied to the synthetic population to create a “replica” of transportation and economic patterns



4

Calibrate the outputs of the model against observed “ground-truth” to improve quality



Sample Illustrative Use Cases



Use Case: Internal & External Trip Flows

Case Study: Onondaga County, NY

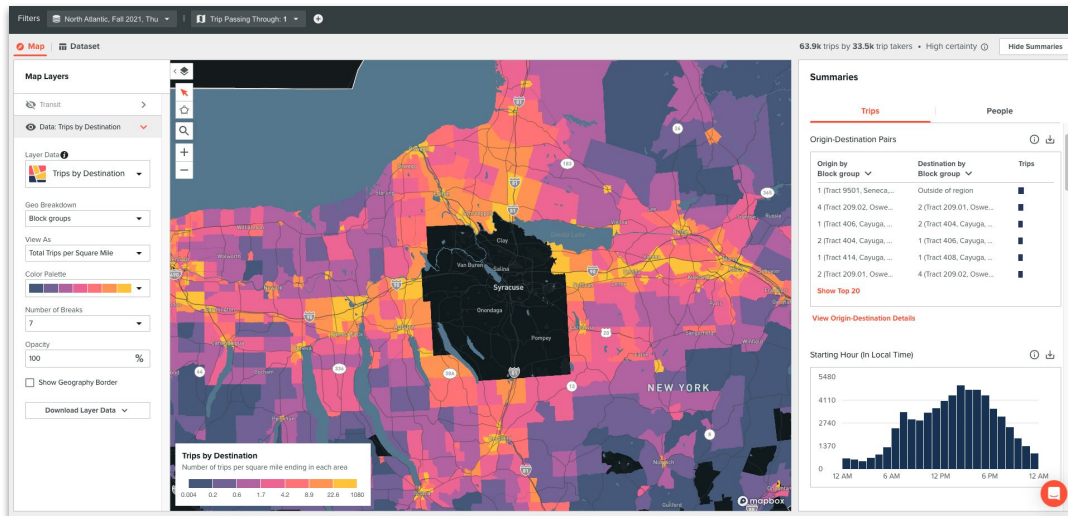
Challenge: Quickly/easily obtaining trip origin and destination data, accompanied by trip taker characteristics.

Solution: Leverage the trip origin filter, trip destination filter, and trip passing through filter in Replica Places.

- On a typical weekday in Fall 2021, how many trips fit the following parameters for Onondaga County:
 - Internal/Internal (II)
 - Internal/External (IE)
 - External/Internal (EI)
 - External/External (EE)

Insight:

- Understand travel patterns to/from/through Onondaga County to inform a wide range of analyses (e.g., VMT and emissions estimates).
- Apply additional filters to query the data by trip mode, purpose, distance, duration, etc.



Use Case: Opportunities for Mode Shift to Active Transportation

Case Study: Nassau County, NY

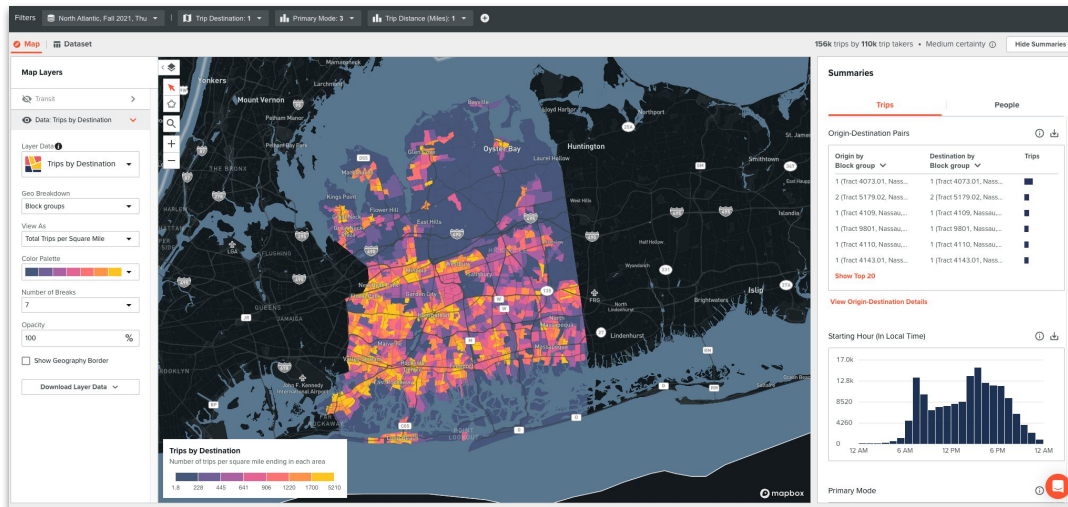
Challenge: Identifying short-distance auto trips.

Solution: Leverage the primary mode filter and trip distance filter in Replica Places.

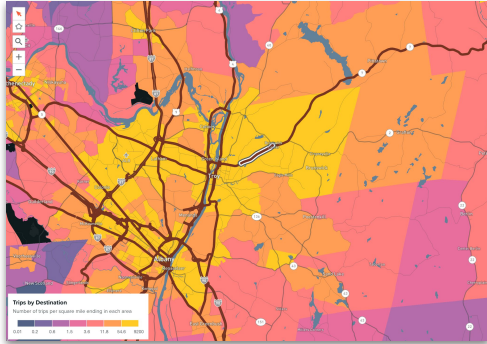
- Where are there concentrations of trip origins/destinations for auto trips of less than 1/2 mile in distance?
- What roadways are used for these trips?

Insight:

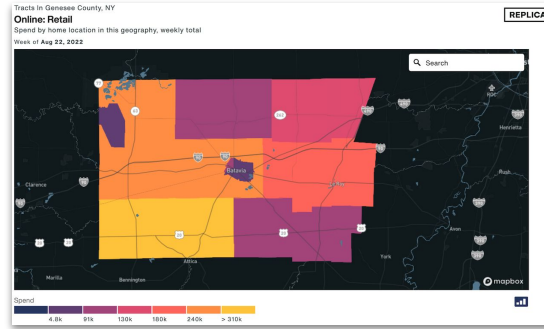
- Inform planning and capital projects to encourage walking and biking trips.
- Identify potential opportunities to mitigate traffic congestion through mode shift.



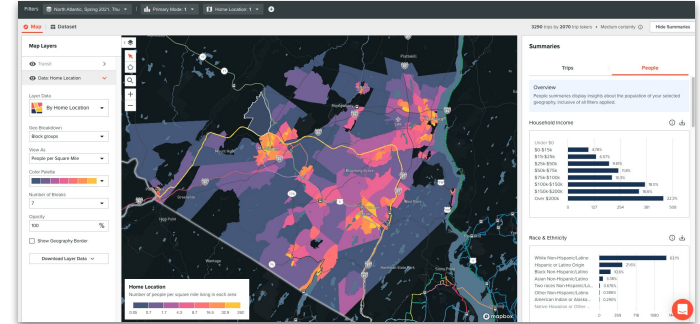
Additional Illustrative Use Cases (Inspired by MPO UPWPs)



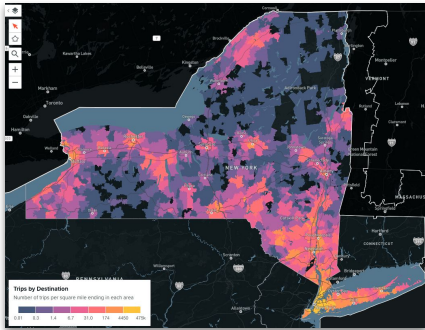
Use Case: Corridor Study
Case Study: Town of Brunswick
Hoosick Road Corridor Study (CDTC)



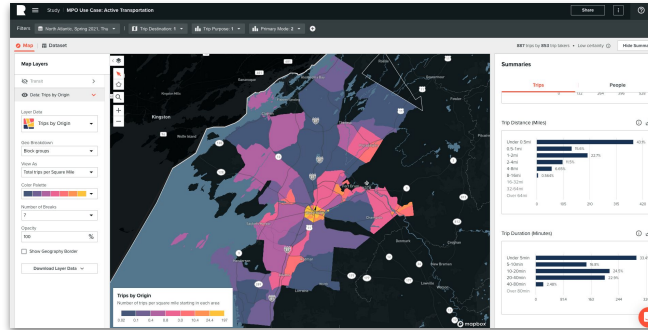
Use Case: Freight Plan
Case Study: Genesee-Finger Lakes (GTC)



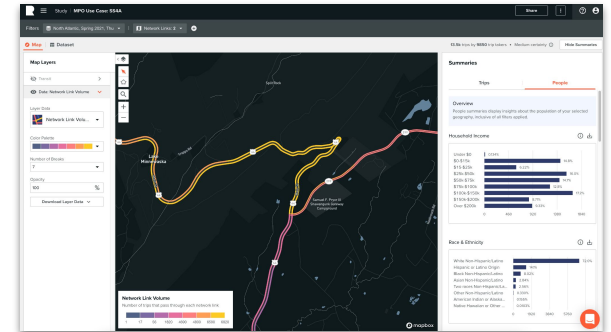
Use Case: Transit Planning
Case Study: Countywide Transit Feasibility Study (OCTC)



Use Case: Equity & EV Charging Stations
Case Study: NEVI Formula Program



Use Case: Active Transportation
Case Study: Bike/Ped Linkages (WJCTC)



Use Case: Safe Streets for All
Case Study: Ulster County
Location-Specific Road Safety Analyses (UCTC)



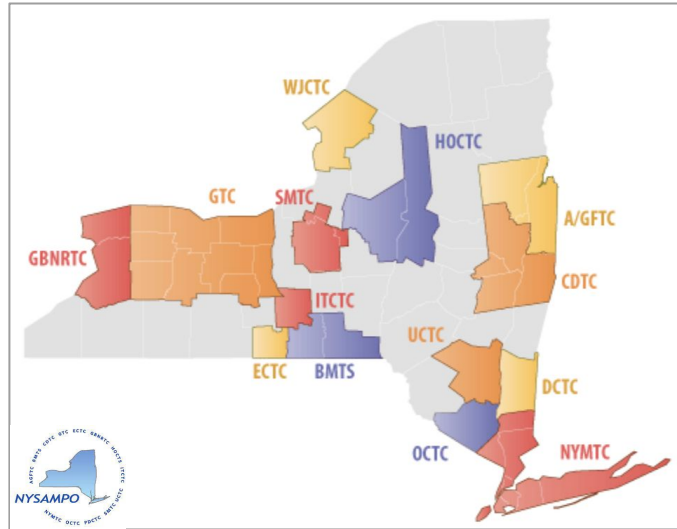
Leveraging Replica Data & New York's Regional Models



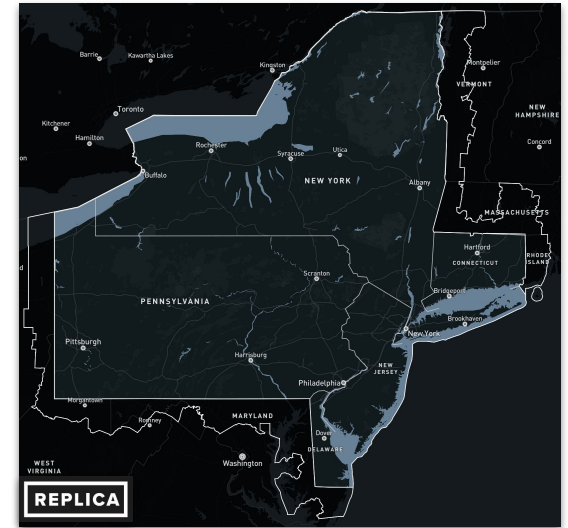


Setting the Stage: Geographic Context

- There are 14 MPOs in New York, encompassing geographies that range from one to 10 counties.
- Most MPOs have their own travel demand models, which vary in geographic coverage and capabilities (i.e., activity-based model vs. traditional four-step model).
- Replica's North Atlantic Megaregion includes an activity-based model covering NY, NJ, CT, PA, DE.
- Opportunities to use Replica data:
 - **Inform the calibration and validation** of the base year for updates to regional models
 - **Expand the geographic coverage** of regional models



NYS MPOs



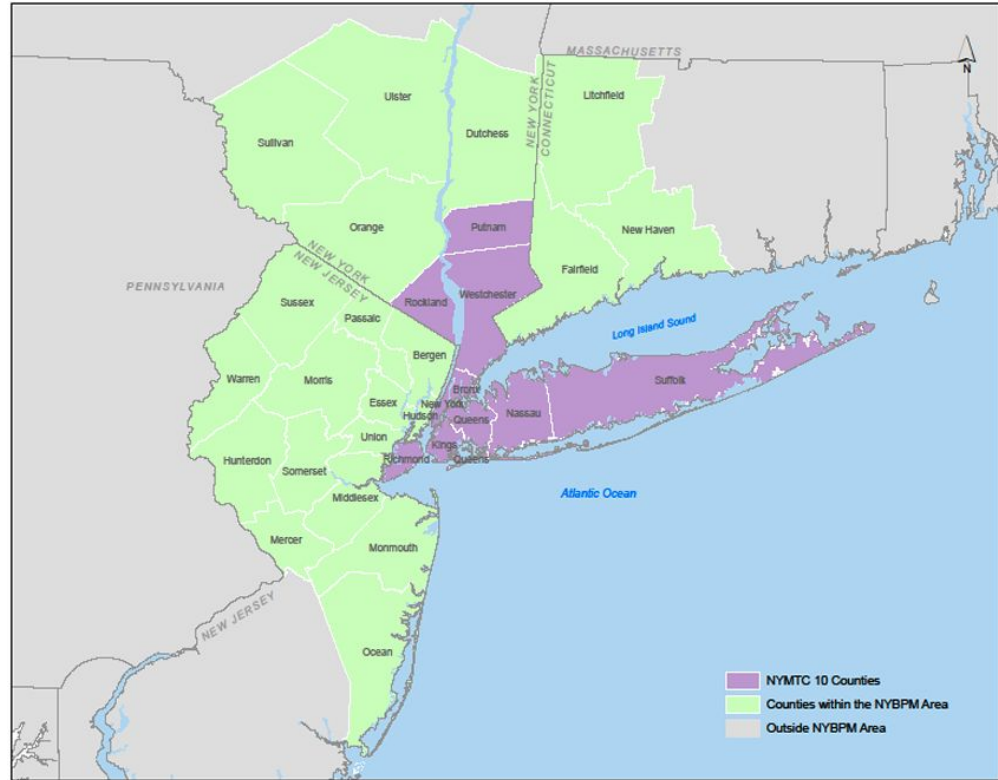
Replica North Atlantic Megaregion



Augmenting Regional Activity-Based Model Coverage with Replica Data

Example: NYMTC

- The NYMTC region comprises 10 counties, including New York City, Long Island, and the Lower Hudson Valley.
- NYMTC's model – the New York Best Practice Model (NYBPM) – is an activity-based model that covers 31 counties in NY, NJ, and CT.
- Replica can supplement the NYBPM by providing existing conditions data about trips and trip takers beyond the NYBPM counties.





NYMTC Example Continued: Activity-Based Model Coverage

O/D Pairs

	NYMTC Region	Dutchess, Orange, Sullivan & Ulster Counties, NY	Rest of NY	Fairfield, New Haven & Litchfield Counties, CT	Rest of CT	14 Counties in NJ	Rest of NJ	PA & DE
NYMTC Region	NYBPM	NYBPM		NYBPM		NYBPM		
Dutchess, Orange, Sullivan & Ulster Counties, NY	NYBPM	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	Outside NYMTC Region
Rest of NY		Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region
Fairfield, New Haven & Litchfield Counties, CT	NYBPM	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	Outside NYMTC Region
Rest of CT		Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region
14 Counties in NJ	NYBPM	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	NYBPM	Outside NYMTC Region	Outside NYMTC Region
Rest of NJ		Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region
PA & DE		Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region	Outside NYMTC Region

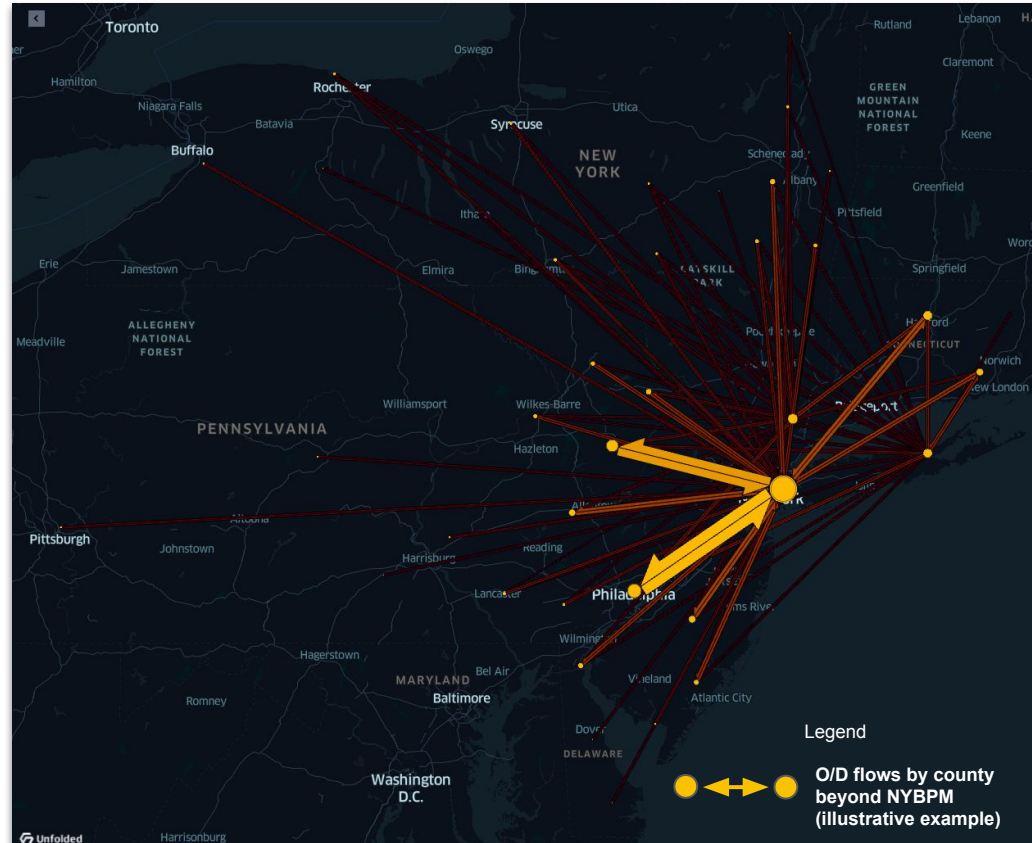
Replica can augment the NYBPM by expanding model coverage for existing conditions



Expanding Model Coverage with Replica Data

Visualizing O/D Flows

- Replica provides **disaggregated data** from our activity-based model that spans the **entire North Atlantic Megaregion**.
- **Data downloads** in multiple file formats enable quick and easy **out-of-app analysis** in third-party platforms.
- Replica data can inform a comprehensive and granular understanding of **statewide and interstate O/Ds** to guide **short- and long-range planning**.

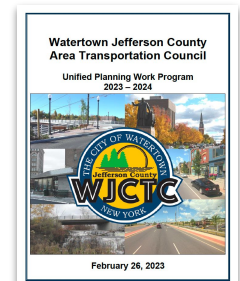
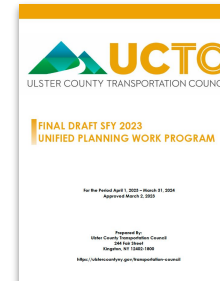
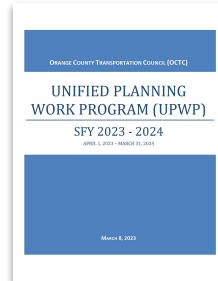
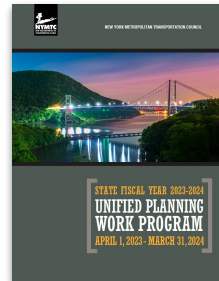
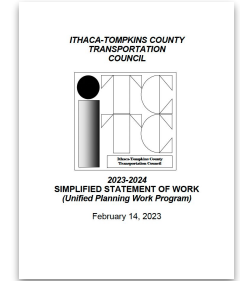
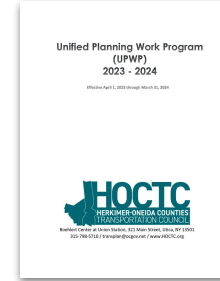
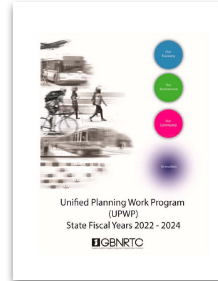
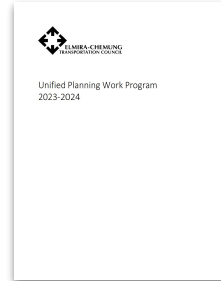
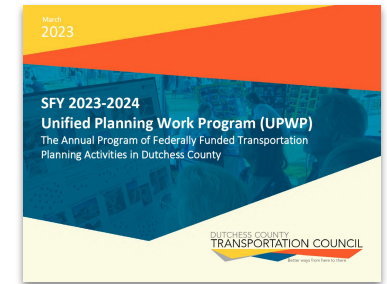
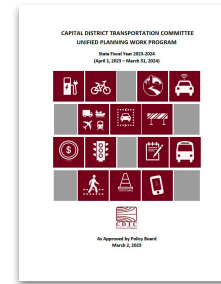
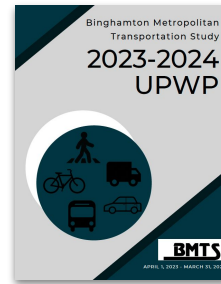
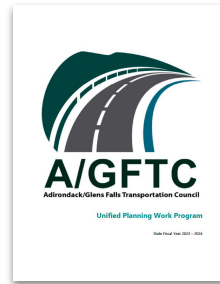


Additional Opportunities to Integrate Replica Data into MPO Workflows



Advancing Projects in the UPWP

- Support **core program activities** related to short- and long-range transportation planning:
 - Transportation Improvement Program (**TIP**)
 - Regional Transportation Plan (**RTP**)
 - Congestion Management Process (**CMP**)
 - Transportation Performance Management (**TPM**)
 - Data collection
 - Model development / enhancement
 - Public participation
- Support **discretionary program activities**
 - MPO staff projects
 - Member agencies' projects



Advancing the Federal Planning Emphasis Areas (PEAs)

- Updated PEAs jointly issued by FTA and FHWA Offices of Planning in December 2021
 - Relevant to UPWPs and Statewide Planning and Research Program
 - Complements the National Performance Goals:
 - Safety
 - Infrastructure Condition
 - Congestion Reduction
 - System Reliability
 - Freight Movement and Economic Vitality
 - Environmental Sustainability
 - Reduced Project Delivery Delays
- Tackling the **Climate** Crisis – Transition to a Clean Energy, Resilient Future
 - **Equity and Justice40** in Transportation Planning
 - **Complete Streets**
 - **Public Involvement**
 - **Strategic Highway Network** (STRAHNET) / U.S. Department of Defense (DOD) Coordination
 - Federal Land Management Agency (**FLMA**) Coordination
 - Planning and Environmental Linkages (**PEL**)
 - **Data** in Transportation Planning



Advancing Priorities of NYSAMPO Working Groups

- **Bicycle & Pedestrian** Working Group
- **Climate Change** Working Group
- **Freight** Working Group
- **GIS** Working Group
- **Modeling** Working Group
- **Safety** Working Group
- **Transit** Working Group
- **Transportation Systems Management and Operations** Working Group



NEW YORK STATE ASSOCIATION OF METROPOLITAN PLANNING ORGANIZATIONS

2022-2023 Working Groups Work Program



REPLICA

Appendix – Additional Illustrative Use Cases



Use Case: Corridor Study

Case Study: Town of Brunswick Hoosick Road Corridor Study (CDTC)



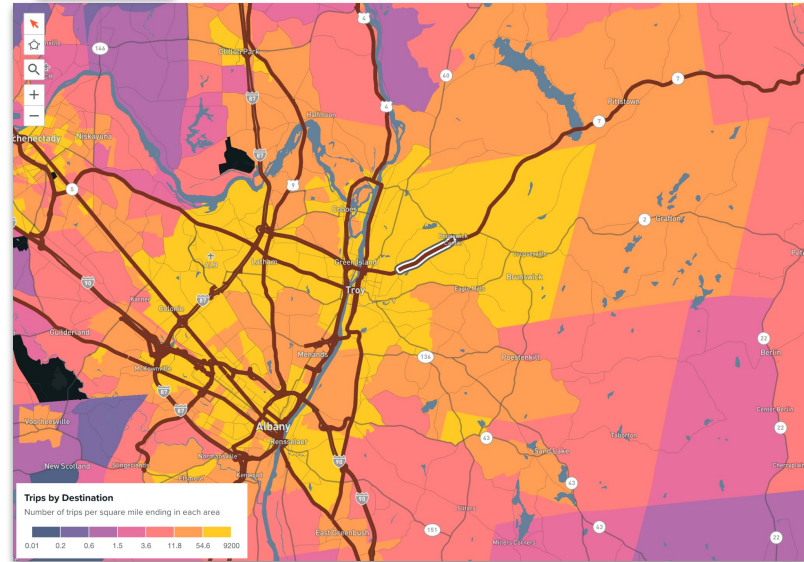
Challenge: Understanding travel patterns and trip taker characteristics along a priority corridor.

Solution: Use Replica's mobility data to derive insights about travel activity:

- What are the origins/destinations of the trips that pass through the corridor?
- What is the distance and duration of those trips?
- What is the mode split along the corridor, and how does this differ by trip purpose?
- What is the socioeconomic and demographic makeup of the trip takers?

Further analysis:

- What is the predominant land use in the area around the corridor?
- What are the characteristics of freight activity along the corridor?
- How has travel activity changed since before the pandemic?



Potential application to other sample MPO projects:

- NYS Route 17M and US Route 6 Corridor Study (OCTC)
- Village of Elmira Heights: 14th Street Circulation and Traffic Study (ECTC)
- US Route 11 Corridor Plan - Mattydale (SMTC)
- Route 44/55 Corridor Management Plan (UCTC)
- Route 5 Corridor South Land Use & Mobility (GBNRTC)

Use Case: Freight Plan

Case Study: Genesee-Finger Lakes Regional Freight Plan Update (GTC)



Challenge: Accessing near-real-time data to track freight demand.

Solution: Utilize Replica Trends data to monitor weekly changes in online retail spending:

- How has the pandemic affected online retail spending – countywide and by census tract?
- To what extent does the change in online retail spending reflect a change in shopping trips?
- What is the geographic distribution of online retail spending within the county, and to what extent does it reflect existing land use?

Further analysis:

- Where are commercial vehicle origins/destinations in the county and to/from the Finger Lakes?
- What roadways are most traveled by commercial vehicles?
- What is the time-of-day distribution for commercial vehicle trips in the county?

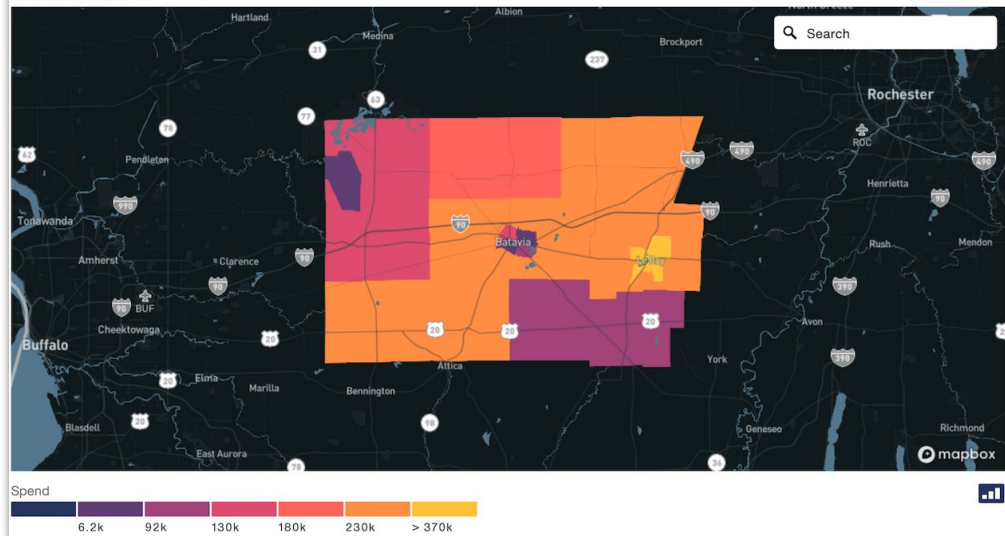
Tracts In Genesee County, NY

Online: Retail

Spend by home location in this geography, weekly total

Week of Aug 29, 2022

REPLICA

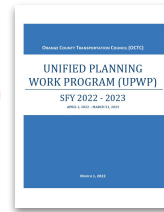


Potential application to other sample MPO projects:

- Transportation element of LRTP
- Miscellaneous freight plans/studies

Use Case: Transit Planning (1 of 2)

Case Study: Countywide Transit Feasibility Study (OCTC)



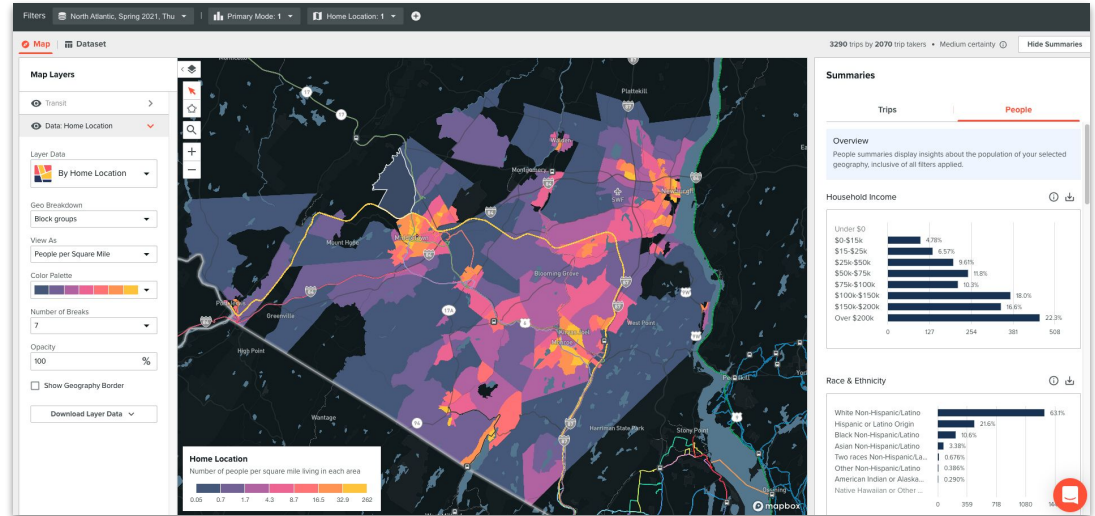
Challenge: Assessing the feasibility of expanding transit services to meet the mobility needs of residents.

Solution: Leverage Replica mobility and demographic data to create a shared understanding of existing conditions:

- What was the baseline transit demand among Orange County residents pre-pandemic, and how has that changed?
- Where do transit trip takers live, what are the destinations of the transit trips, and what is the breakdown of different trip purposes?
- What are the socioeconomic and demographic characteristics of the trip takers?

Further analysis:

- How do transit travel patterns differ between residents and workers?
- Are there concentrations of trip origins/destinations that are not served by the existing fixed-route transit network?
- To what extent do travel characteristics differ between transit trip takers and auto trip takers? (see next slide)



Potential application to other MPO projects:

- *Exploring Tomorrow's Transit* (SMTC)
- Analysis of Bus Routes and Origin/Destination Study (ECTC)
- TCAT Transit Development Plan (ITCTC)



Use Case: Transit Planning (2 of 2)

Case Study: Profile of the MTA Region

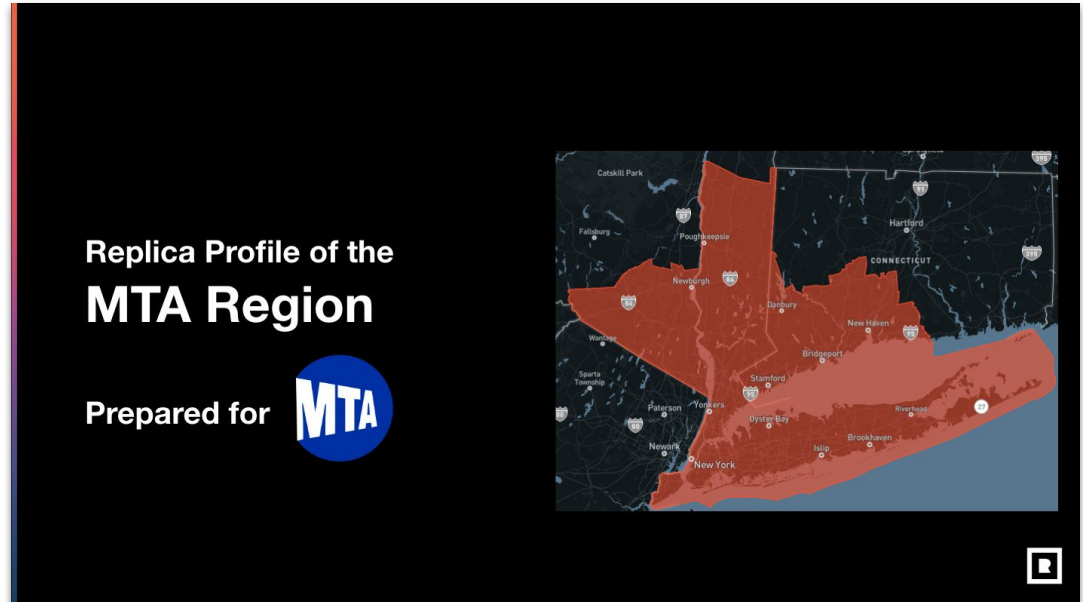
Challenge: Uncovering nuanced characteristics of trips and trip takers throughout a transit agency's service area.

Solution: Use Replica Places and Trends to analyze disaggregated and regionwide data:

- To what extent do travel characteristics differ between transit trip takers and auto trip takers?
- Are certain population groups in the region more likely than others to work from home?

Further analysis:

- How can travel patterns among disadvantaged communities / vulnerable populations (e.g., low-income minorities) inform project prioritization?
- How can telecommuting patterns by industry of employment inform regional planning?

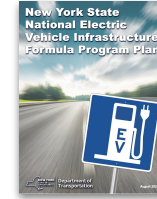


Potential application to other MPO projects:

- Transportation element of LRTP
- Miscellaneous transit plans/studies

Use Case: Equitable Deployment of EV Charging Stations

Case Study: NEVI Formula Program & MPO Initiatives (multiple MPOs)



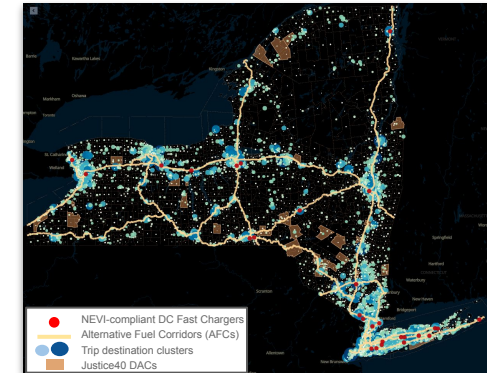
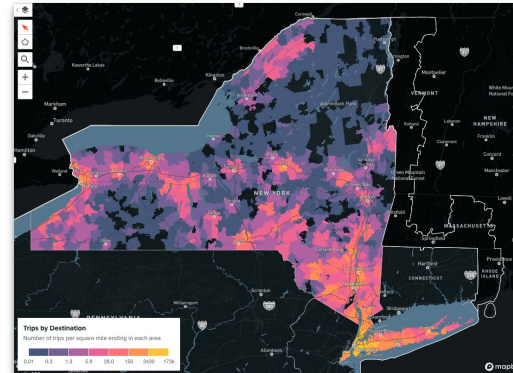
Challenge: Demonstrating how the benefits of EV charging station locations could accrue to USDOT-defined Disadvantaged Communities (DACs), consistent with the Justice40 Initiative.

Solution: Leverage a custom geography to understand travel behavior of DAC residents.

- What is the statewide distribution of trip origins and destinations among the DACs?
- How can Replica data supplement publicly available data on EV charging stations and Alternative Fuel Corridors?
 - Where are concentrations of DAC residents' auto trip destinations for specific trip purposes (that would be conducive to DC Fast Charging)?

Further analysis:

- How could we demonstrate the benefits of EV charging station locations to NYS-defined DACs (i.e., distinct from USDOT-defined DACs)?



[Click here to view the Places Study](#)

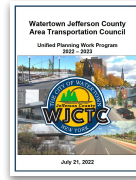
[note: map on right prepared using Unfolded; DCFC and AFC data downloaded 09/22]

Potential application to MPO projects:

- Rural Warren County EV Charging Station Siting Assessment (A/GFTC)
- EV Charging Stations (ECTC)
- Ulster County EV Infrastructure Planning Project (UCTC)
- Misc. MPO initiatives to promote increased availability of EV charging stations

Use Case: Active Transportation

Case Study: *Bicycle/Pedestrian Linkages Study (WJCTC)*



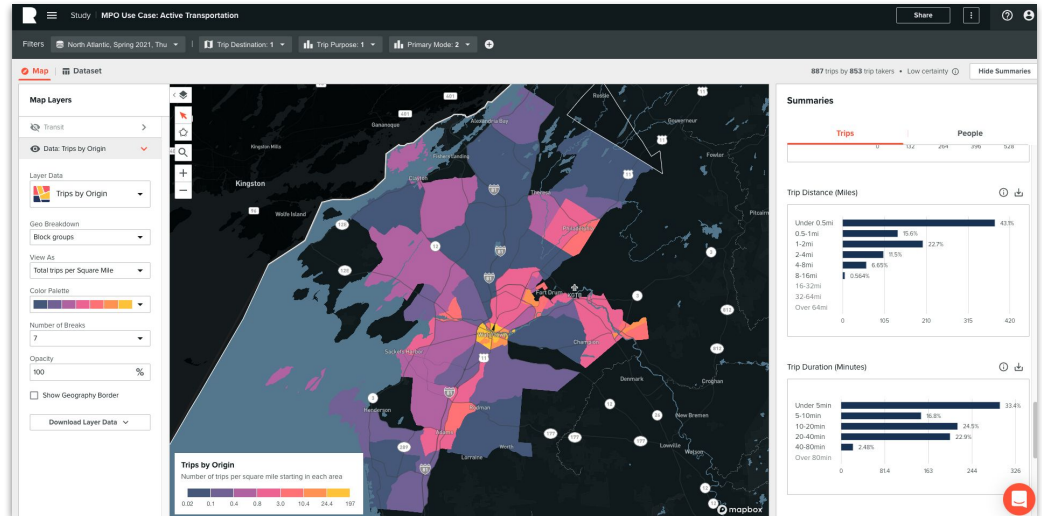
Challenge: Identifying concentrations of school trips made by bike/ped to inform project planning and prioritization.

Solution: Apply filters for trip purpose and mode in Places to explore travel patterns.

- Where are common origins/destinations for school trips in Jefferson County?
- What is the mode split for trips to school?
[note: Replica does not model school bus trips.]
- How far do bike/ped trip takers travel to get to school, and how does that compare to school trips by auto?
- Are there any concentrations of short-distance auto trips (that could serve as candidates for mode shift)?

Further analysis:

- What network links are most common for bike/ped trips to school?
- What is the socioeconomic and demographic makeup of bike/ped trip takers compared to all trip takers for school trips?

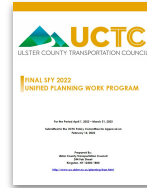


Potential application to other MPO projects:

- Alternative Transportation Promotion and Development (A/GFTC)
- Local Pedestrian Planning Initiative – Town of Dover (DCTC)
- Complete Streets Study for Chestnut Street, City of Rome (HOCTC)
- NYC Pedestrian Planning Studies (NYMTC)

Use Case: Safe Streets for All

Case Study: Ulster County Location-Specific Road Safety Analyses (UCTC)



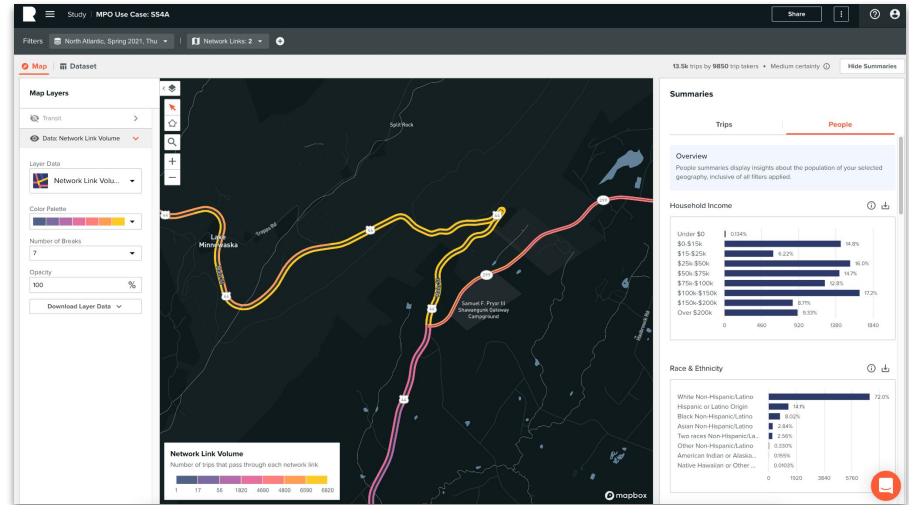
Challenge: Identifying locations for safety improvements that benefit disadvantaged/vulnerable populations.

Solution: Leverage Replica's disaggregated data to understand travel patterns of specific populations – do the following groups use the corridors/intersections prioritized for improvements?

- Low-income populations
- Minority populations
- Individuals without access to a private automobile
- Seniors

Further analysis:

- To what extent do residents of USDOT-defined Disadvantaged Communities (DACs) use the prioritized corridors/intersections?



Potential application to other sample MPO projects:

- Road Safety Assessments (BMTS)
- Corridor and Intersection Management Programs (DCTC)
- Traffic Calming and Control Initiative (ITCTC)
- Orange County Roadway Safety Action Plan (OCTC)
- Manlius Village Pedestrian Safety & Mobility Study (SMTc)

