TRANSPORTATION ANALYTICS WITH LOCUS
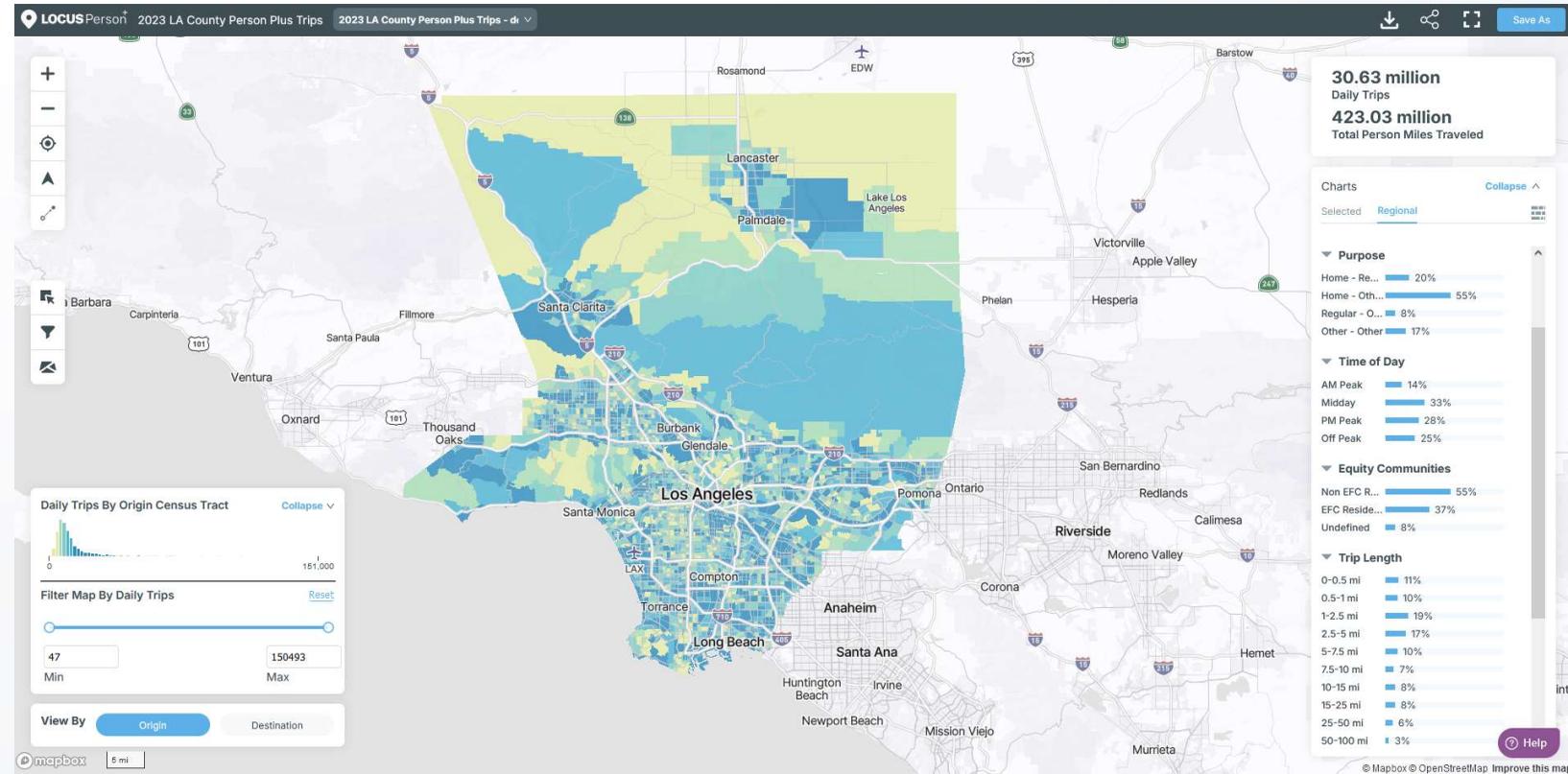
TURNING DATA INTO HUMAN DECISIONS

LOCUS

What is LOCUS?

LOCUS is a mobility and location intelligence platform. We discover, process, standardize, and enrich mobility and built environment data to provide the most accurate view of communities of today and tomorrow.
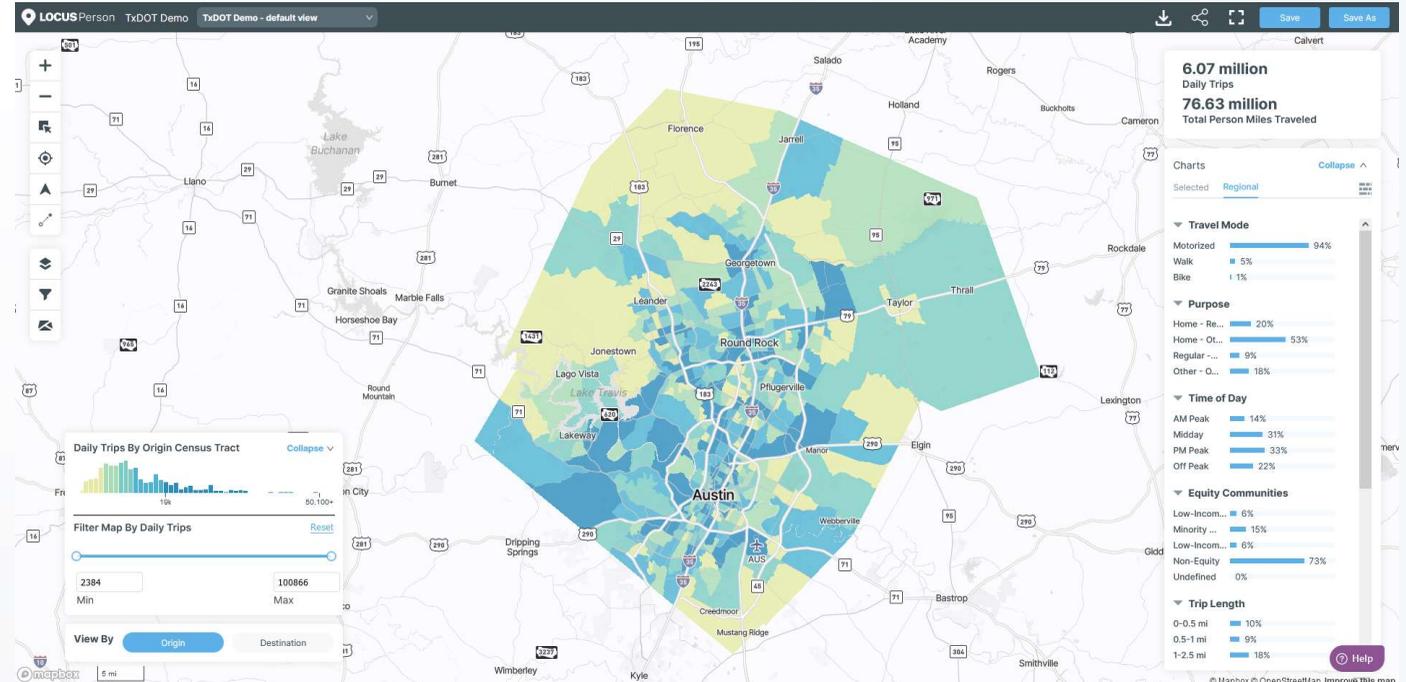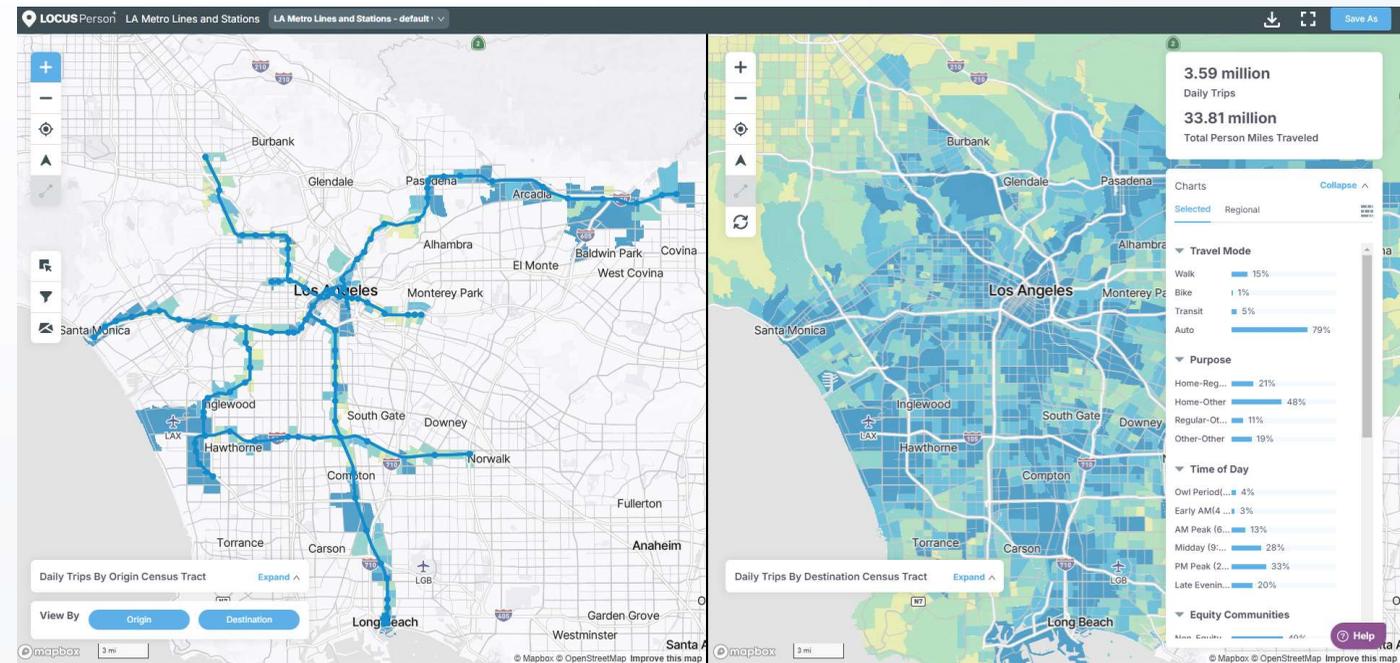
LOCUS Person

LOCUS Person

- **Multimodal person O-D flows expanded to match population and employment levels.**

- **Key features**
  - Total trips, person miles traveled, VMT
  - Available at block groups, tracts, counties

- **Segment travel by**
  - Trip purpose, trip length, and mode
  - Time-of-day, day of the week, and seasonality
  - Resident vs. visitors
  - Internal vs. external travel
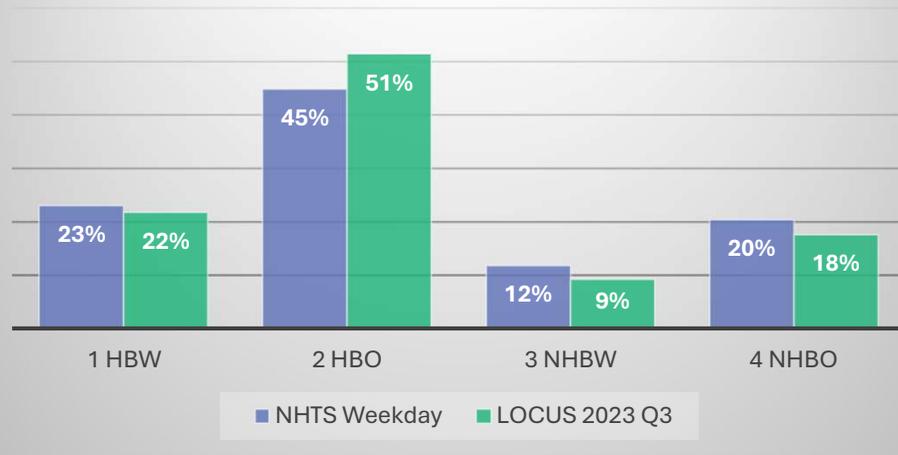 - Communities of concern/interest

What Makes LOCUS Person Unique?

- We use behavioral, land-use, and weather information to generate modal inference.

- We have developed custom algorithms to identify home and regular locations – which drives our expansion process.

- We have data available from 2019 to today – allowing for consistent trending analysis

- We support a wide variety of use cases – ranging from modeling to safety to resilience.

- We can generate **trip chains and tours** to support trip and activity-based models.

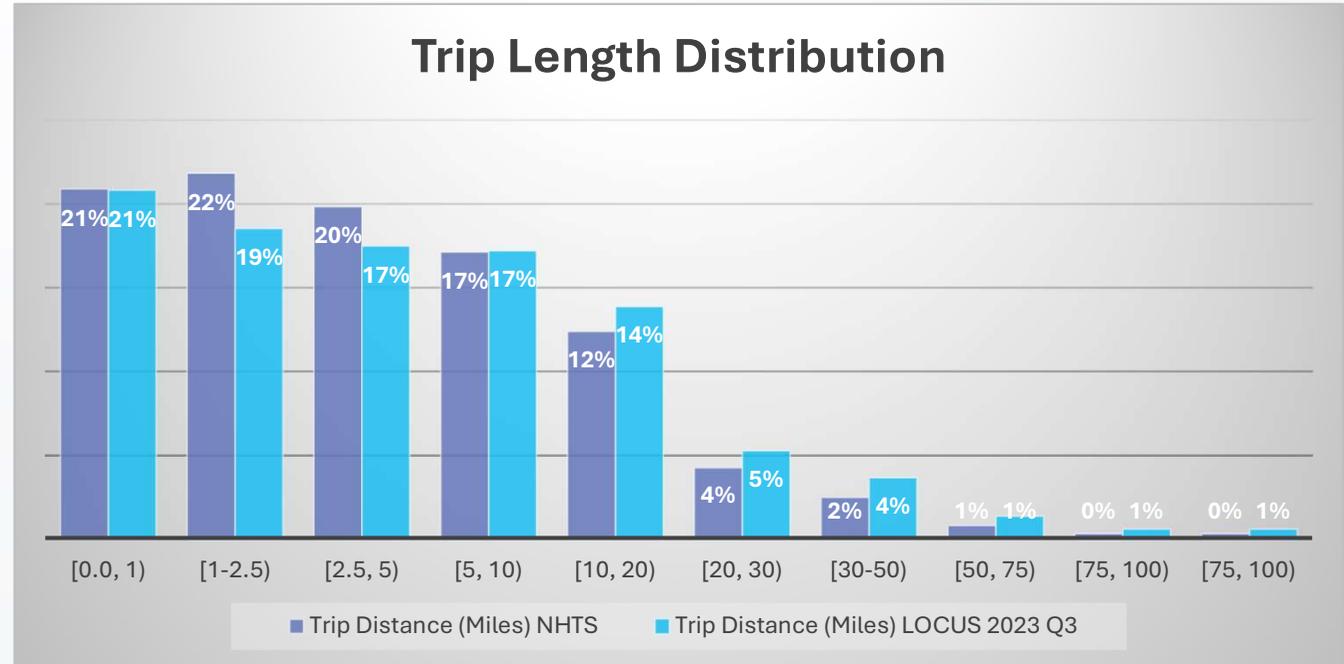

LOCUS

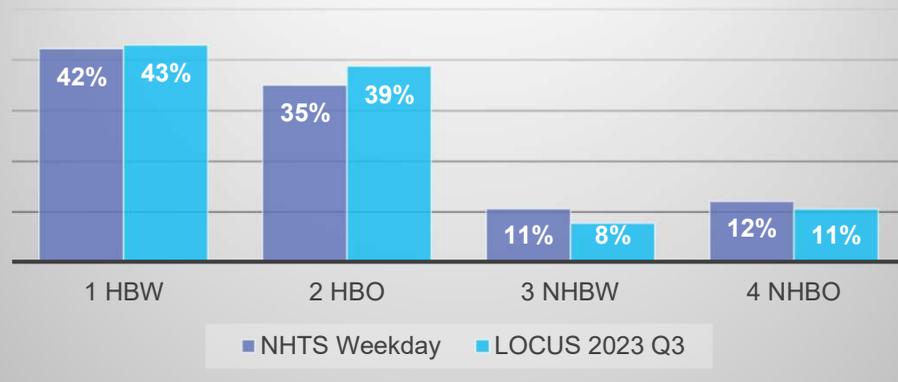# Comparison Against Household Travel Surveys

Trip Purpose Distribution

- 1 HBW: NHTS Weekday 23%, LOCUS 2023 Q3 22%
- 2 HBO: NHTS Weekday 45%, LOCUS 2023 Q3 51%
- 3 NHBW: NHTS Weekday 12%, LOCUS 2023 Q3 9%
- 4 NHBO: NHTS Weekday 20%, LOCUS 2023 Q3 18%

AM Peak Trip Purpose Distribution

- 1 HBW: NHTS Weekday 42%, LOCUS 2023 Q3 43%
- 2 HBO: NHTS Weekday 35%, LOCUS 2023 Q3 39%
- 3 NHBW: NHTS Weekday 11%, LOCUS 2023 Q3 8%
- 4 NHBO: NHTS Weekday 12%, LOCUS 2023 Q3 11%

Capture **more non-commuting trips** than traditional surveys

Capture **more long-distance** travel

Trip Length Distribution

- [0.0, 1): NHTS 21%, LOCUS 2023 Q3 21%
- [1-2.5): NHTS 22%, LOCUS 2023 Q3 19%
- [2.5, 5): NHTS 20%, LOCUS 2023 Q3 17%
- [5, 10): NHTS 17%, LOCUS 2023 Q3 17%
- [10, 20): NHTS 12%, LOCUS 2023 Q3 14%
- [20, 30): NHTS 4%, LOCUS 2023 Q3 5%
- [30-50): NHTS 2%, LOCUS 2023 Q3 4%
- [50, 75): NHTS 1%, LOCUS 2023 Q3 1%
- [75, 100): NHTS 0%, LOCUS 2023 Q3 1%
- [75, 100): NHTS 0%, LOCUS 2023 Q3 1%

HBW = Home based work
HBO = Home based other
NHBW = non-home based work
NHBO = non-home based other

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LOCUS Truck

LOCUS Truck

- **Commercial vehicle O-D flows expanded using a behavioral framework and validated against national surveys.**

- **Key features**
  - Largest sample of commercial fleet telematics data
  - Captures impact of major freight generators
  - Trends from 2021
  - Expanded to total truck movements

- **Segment truck travel by**
  - Vehicle class (light, medium, heavy-duty trucks)
  - Time of day and seasonality.
  - Trip length, trip duration, and stop duration
  - Vocation (e.g., hub-and spoke, long distance)
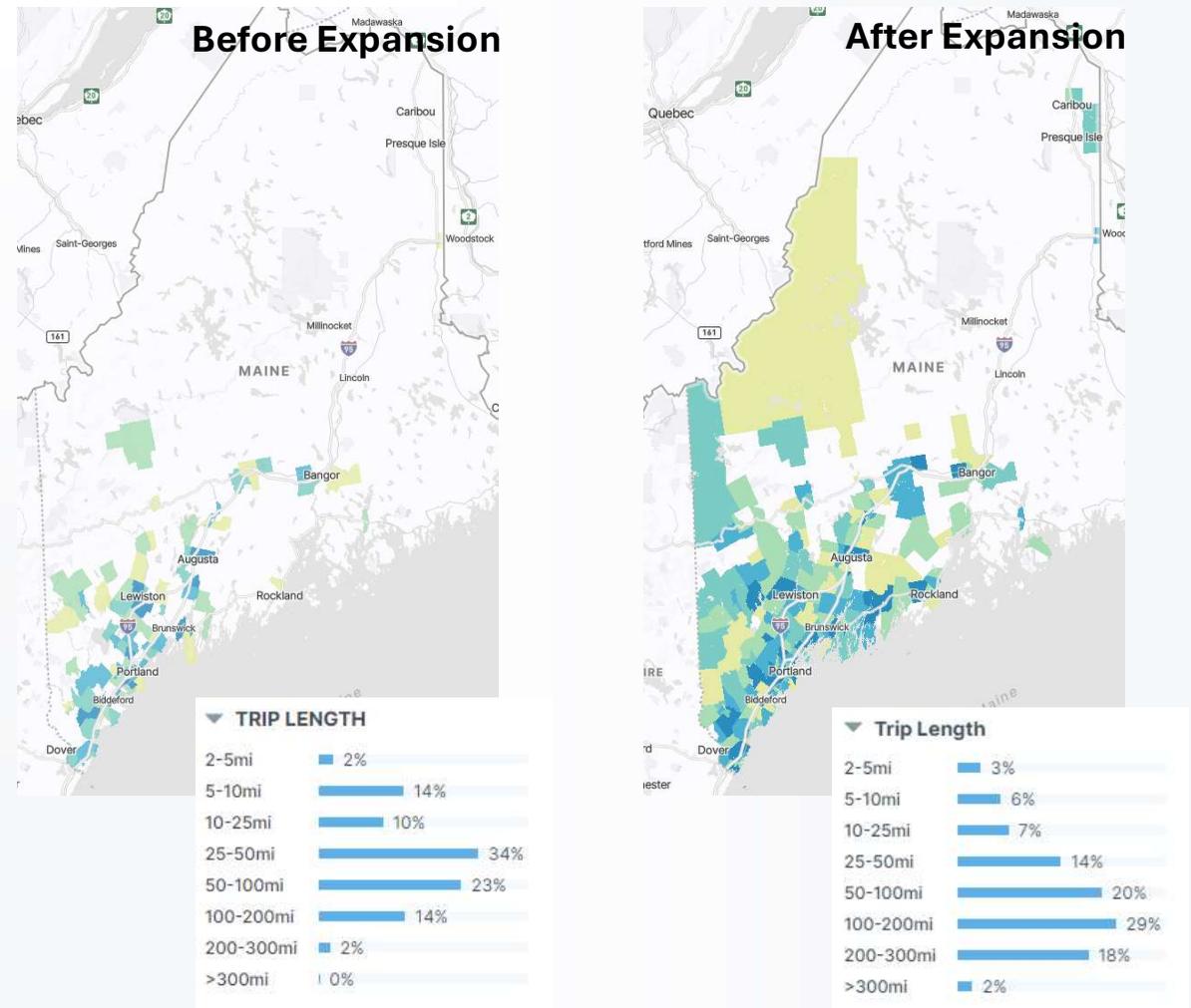 - Industry (e.g., manufacturing, retail)
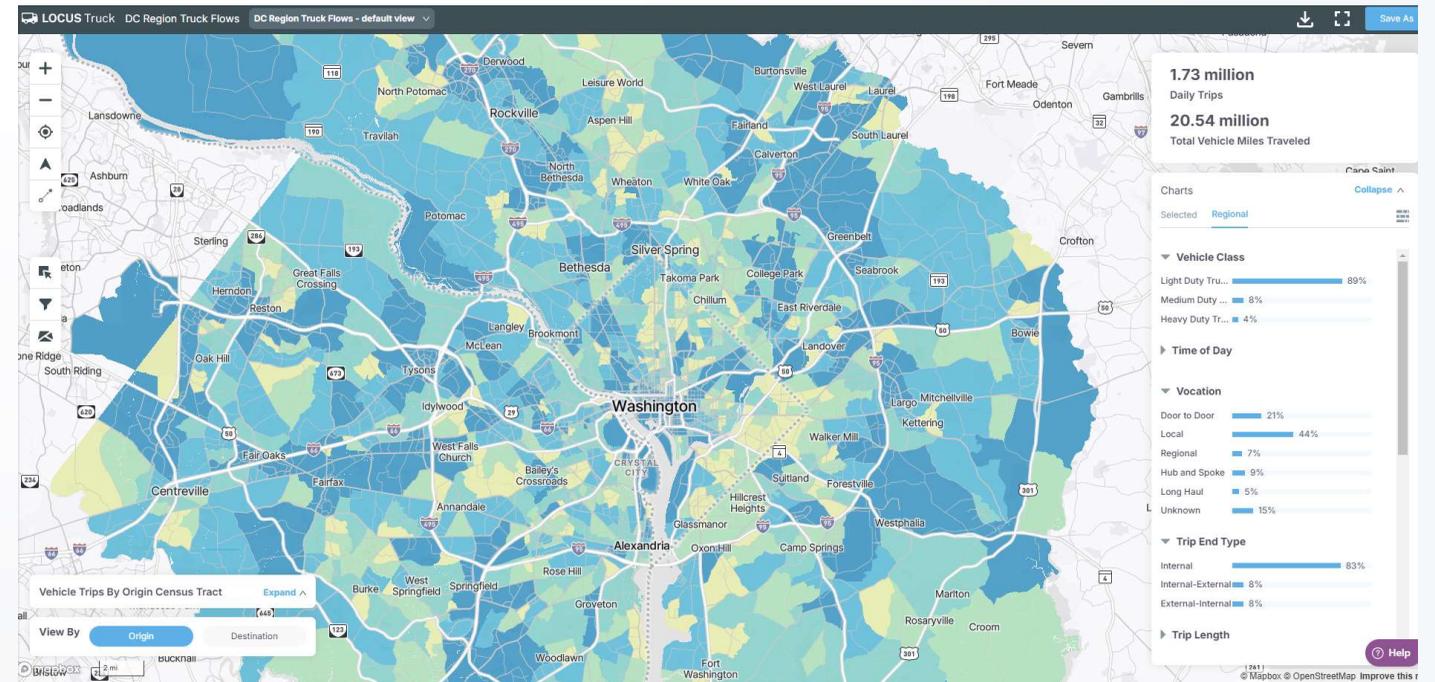
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What makes LOCUS Truck Unique?

Comprehensive data expansion

We account for penetration rates and provide expanded measures of truck flows at Census Tract Level.

- **Novel behavioral expansion framework** that uses socio-economic data – makes it easy to generate future forecasts

- **Eliminate short-trip bias** (e.g. removing intra-facility trips)

- **Account for data loss at lower resolutions** due to privacy filters

- **Account for special generators** – ports, warehouses, intermodal facilities, truck parking locations

Impacts of Expansion. Heavy-duty trucks originating in Portland, ME. Destinations (Tracts) and Trip Length Distribution

Before Expansion

TRIP LENGTH	
2-5mi	2%
5-10mi	14%
10-25mi	10%
25-50mi	34%
50-100mi	23%
100-200mi	14%
200-300mi	2%
>300mi	0%

After Expansion

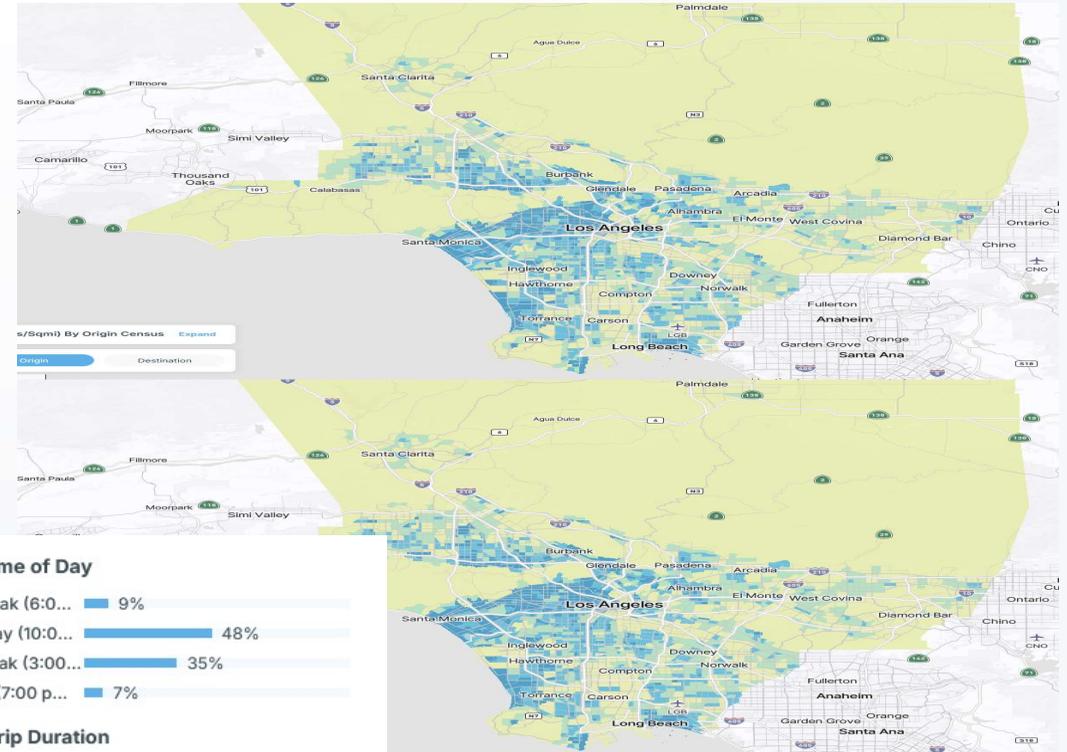| Trip Length	
2-5mi	3%
5-10mi	6%
10-25mi	7%
25-50mi	14%
50-100mi	20%
100-200mi	29%
200-300mi	18%
>300mi	2%

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LOCUS Truck | Expanded light-duty truck trips

Industry-first measures of expanded light-duty trucks, including e-commerce trips

- We expand door-to-door delivery and other service trips separately

- For door-to-door delivery trips, additional layer of adjustments

  - Incorporate package delivery surveys and package delivery route data

  - Slowly incorporating information from travel behavior surveys

- Agencies can use it to accurately study ecommerce impacts both at regional and local/neighborhood levels
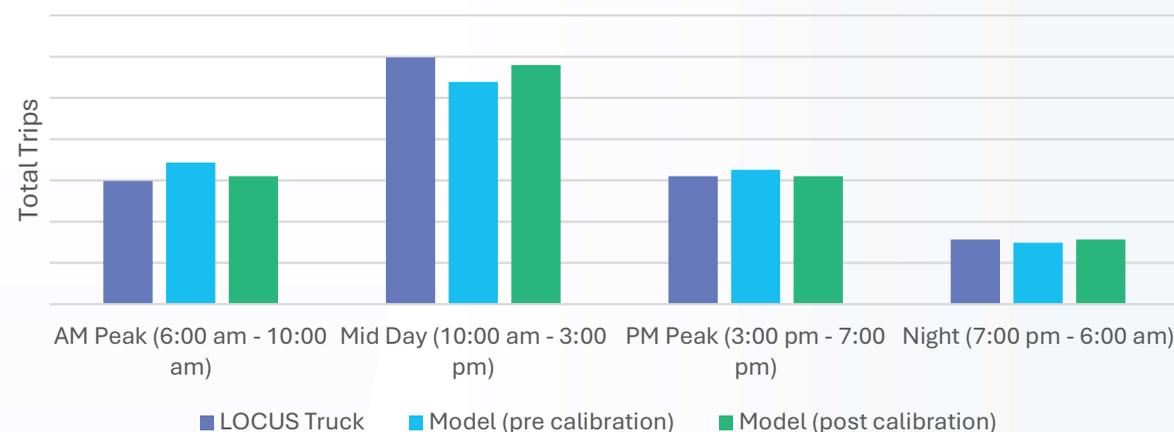
Door-to-door delivery trips in Los Angeles county

Time of Day

AM Peak (6:0...	9%
Mid Day (10:0...	48%
PM Peak (3:00...	35%
Night (7:00 p...	7%

Trip Duration

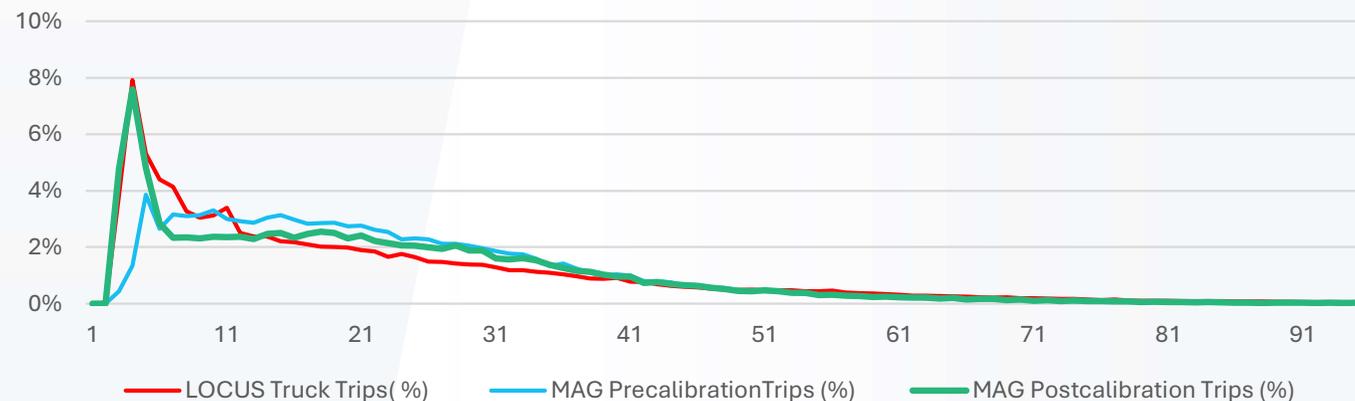|	
< 15 min	96%
15-30 min	2%
30 min - 1 hour	1%
1-2 hours	1%
2-4 hours	0%
4-8 hours	0%
> 8 hours	0%

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Example: Modeling Workflow

Off-the-shelf metrics that can be readily used by agencies.

- Trips by Truck Type – Light, Medium, and Heavy
  - Based on Gross Vehicle Weight
- Time of Day Distributions
  - Can be customized at hourly intervals
- Trip Length Frequency Distribution
- Trip Purpose/Vocation
  - 6 different vehicle movements – local, regional etc
- External/Internal Trip Validation
  - Trips coming into/going out of the region
- Origin-Destination Distribution
  - Percentage of trips between different county pairs
- Vehicle Miles Traveled Validation

Time of Day Calibration

■ LOCUS Truck   ■ Model (pre calibration)   ■ Model (post calibration)

Trip Length Frequency Distribution

— LOCUS Truck Trips(%)   — MAG PrecalibrationTrips (%)   — MAG Postcalibration Trips (%)

Maricopa Association of Governments (MAG) Truck Model Calibration using LOCUS

Documenting Sample Sizes at Different Zonal Aggregations
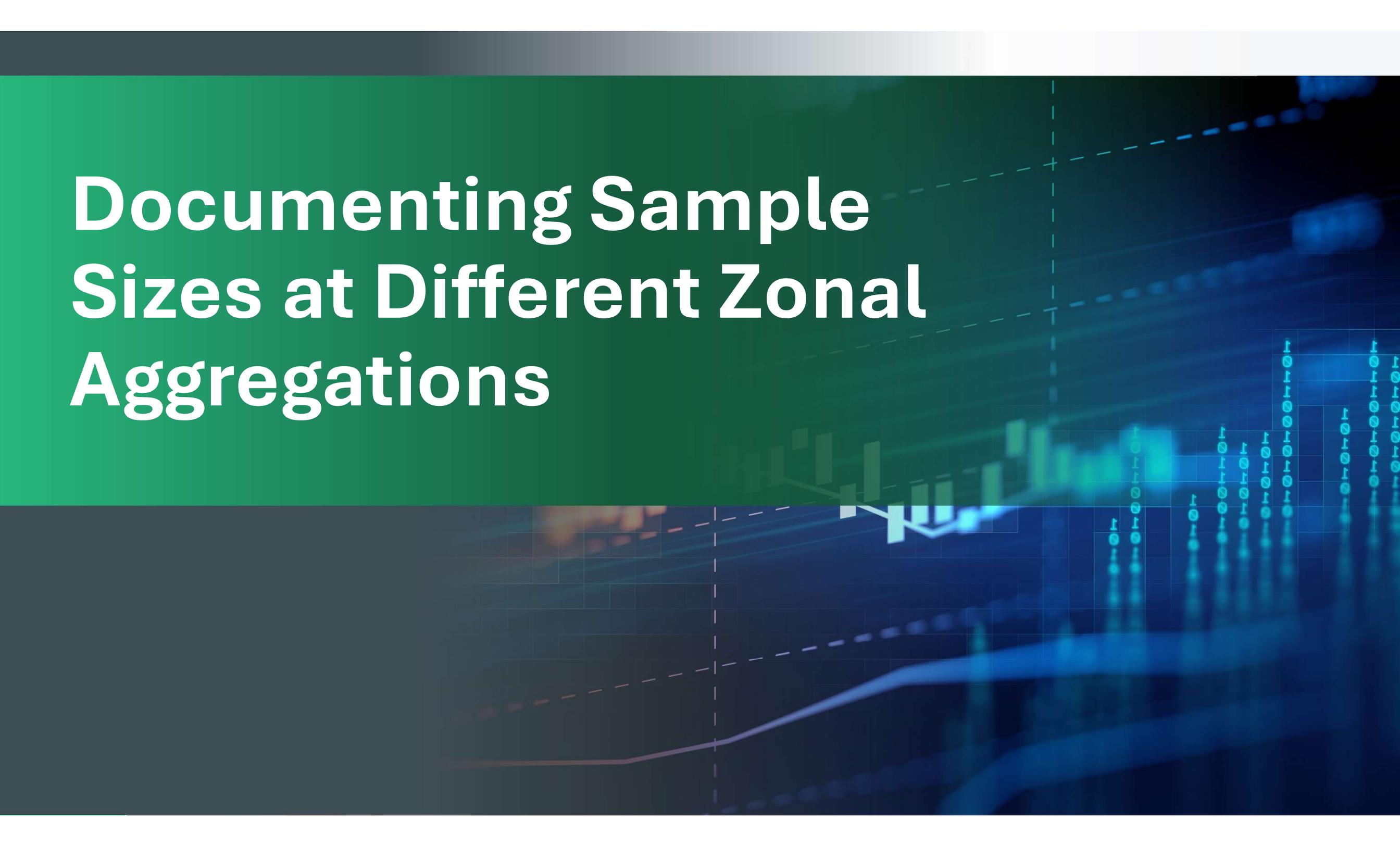
Georgia Sample Size At Different Geographic Levels

	Light Duty Trucks			Medium Duty Trucks			Heavy Duty Trucks		
	State	County	Census Tract	State	County	Census Tract	State	County	Census Tract
Trips	15.10M	15.08M	12.30M	5.90M	5.84M	4.27M	7.36M	7.28M	4.88M
Unique Vehicles	37,067	36,991	35,197	30,193	30,080	27,523	79,319	79,186	74,906
Avg. Trip Length (mi)	16.09	15.72	10.35	31.92	30.31	17.47	108.09	104.33	79.99
Avg. Trip Duration (hr)	0.45	0.45	0.35	0.94	0.92	0.66	2.79	2.72	2.35

Data privacy rules impact the data size when zones are smaller because there are many more zone-zone pairs. It is important to understand where/how the loss is occurring.

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