



Gen3 Model Development Project

Travel Forecasting Subcommittee Meeting

May 21, 2021

IN PARTNERSHIP WITH



Metropolitan Washington
Council of Governments

Discussion Topics

- Gen3 Model Status
- Gen3 Phase 1 Model Performance
 - ABM Visualizer
 - Initial Gen3 Model results prior to any model estimation/calibration using local data
- Gen3 Phase 1 Model Development
 - Ongoing activities and next steps





Gen3 Model Status

Phase 1 Development (Task Order 3) Status

- Population Synthesis (95%)
 - Implementing household-size control adjustments to improve validation performance
- Data Development (75%)
 - Generated external transit demand matrices
 - Developing mode choice targets for Phase 1 model calibration
- ActivitySim Deployment: Ongoing Activities
 - Deployed ActivitySim
 - Developed ABM Visualizer
 - Assessed initial model performance
 - Integrating ActivitySim with other Gen2 Model components





Gen3 Phase 1 Model Performance

ABM Visualizer

Gen3 Model: ActivitySim Deployment

- RSG recently deployed ActivitySim for the Southeastern Michigan Council of Governments (SEMCOG)
- SEMCOG implementation includes various enhancements compared to the MTC TM1 version
 - 30-minute time windows for tour/trip time-of-day models
 - Ride-hailing modes
 - Telecommuting frequency model
- The SEMCOG implementation was transferred as Phase 1 ActivitySim implementation for MWCOCG



Key Differences

SEMCOG

- Time Periods
 - EA, AM, MD, PM, EV
- Modes
 - SOV, HOV2, HOV3
 - Walk, Bike
 - Walk-Local, Walk-Premium, Walk-Mix
 - PNR-Local ...
 - KNR-Local ...
 - Taxi, TNC-Single, TNC-Shared
 - School Bus

MWCOG

- Time Periods
 - AM, MD, PM, NT
- Modes
 - SOV, HOV2, HOV3
 - Walk, Bike
 - Walk-All Bus, Walk-Bus Metro, Walk-Metro Rail, Walk-Com. Rail
 - PNR-AB ...
 - KNR-AB ...
 - Taxi, TNC-Single, TNC-Shared
 - School Bus



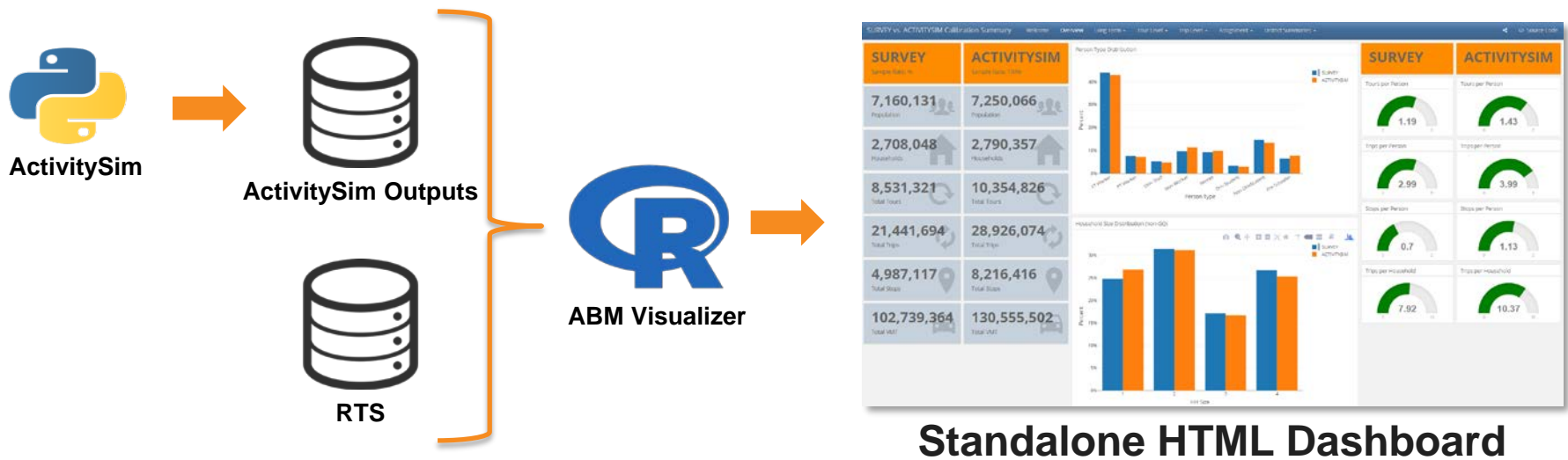
ActivitySim Deployment Process

- Input preparation
 - Generated synthetic population (PopulationSim)
 - Updated the skimming process (Cube PT)
- ActivitySim configuration
 - Updated time-of-day period definitions
 - Updated mode choice structure
 - Asserted size terms for destination choice
 - Updated utility expressions (173 expression files)
- Performance assessment
 - Performed QA/QC
 - Developed ABM Visualizer to compare model outputs against observed data
 - COG staff reviewed initial model results and the visualizer



ABM Visualizer

Visualization and diagnostic tool for ActivitySim models



Built in R using dplyr, Rmarkdown, flexdashboard, plotly, and ggplot libraries

Two comparison modes are available:

- Model vs Survey
- Model_base vs Model_build



ABM Visualizer Layout

- Charts are grouped in order of implementation in ActivitySim
- Each drop down menu opens a new page

**Aggregate
travel behavior**

**Longer term
choices**

**Day/Tour-level
choices**

**Stop/Trip-level
choices**

Overview

Long Term ▾

Tour Level ▾

Trip Level ▾

Long Term Models
Flows & Tour Lengths
Employment vs Workers
Zero Auto Households

Tour Summaries
Joint Tours
Destination
TOD
Tour Mode

Stop Frequency
Location
TOD
Trip Mode

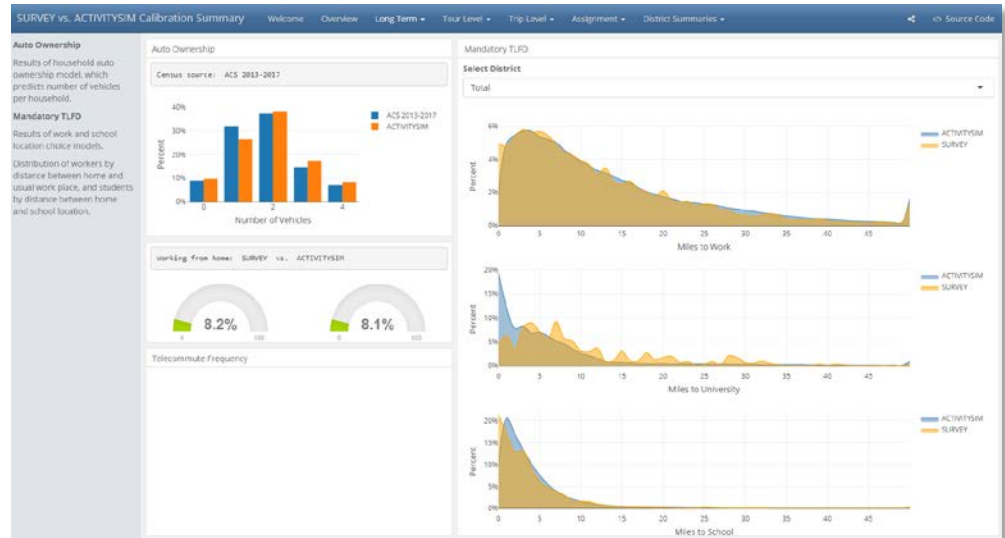


ABM Visualizer



Overview Page

Longer term choices



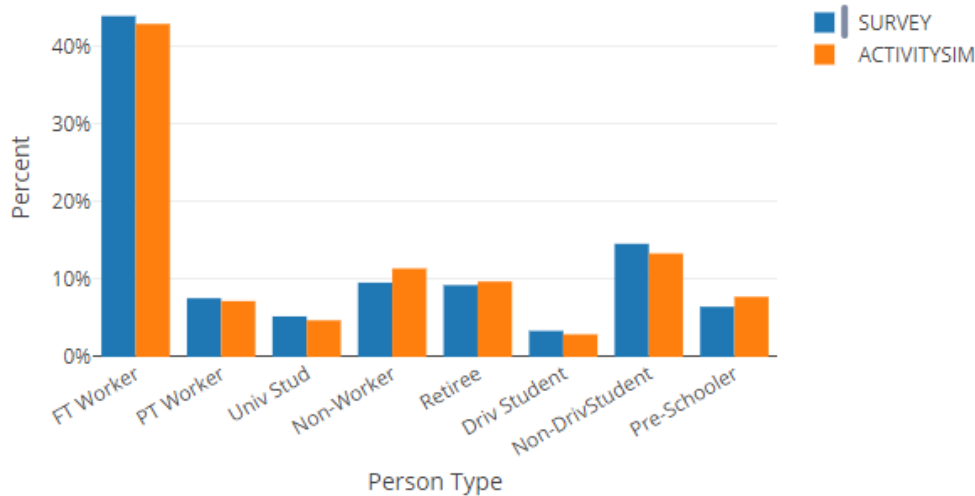
Model Performance Assessment

- Using ABM Visualizer
- Observed data
 - 2017-2018 COG Regional Travel Survey (RTS) and 2018-2019 Maryland Travel Survey (MTS) data, processed in ActivitySim format
- Model
 - Transferred SEMCOG ActivitySim implementation
 - Asserted size terms
 - Uncalibrated, unvalidated
 - No adjustments to any model constants



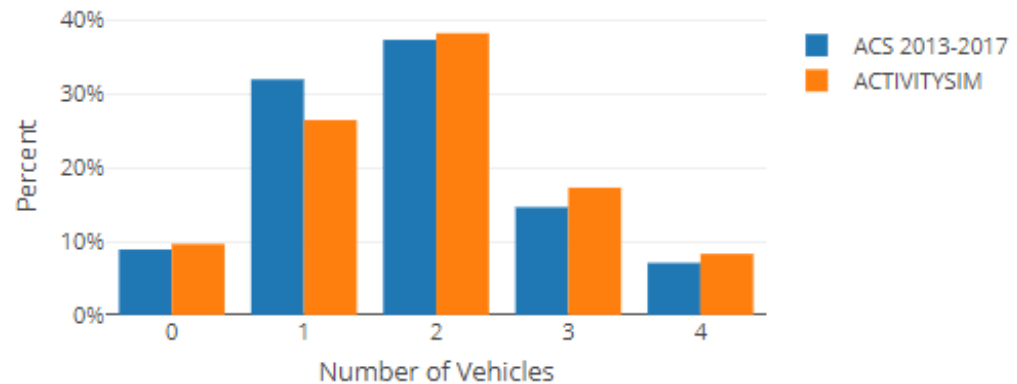
Model Performance

Person Type Distribution



- The uncalibrated auto ownership model compared to the ACS 2013-17 distribution

- 8 Person Types in ActivitySim



Auto Ownership Model

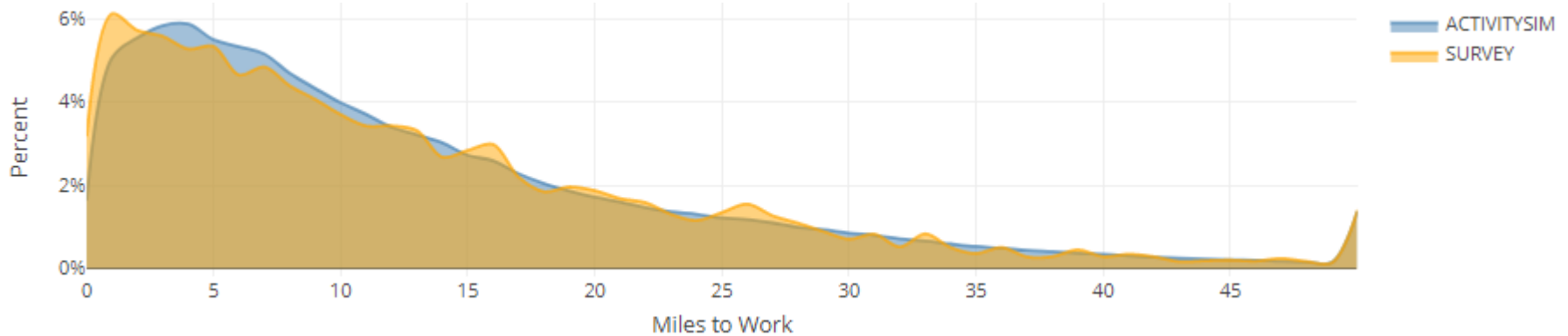


Model Performance

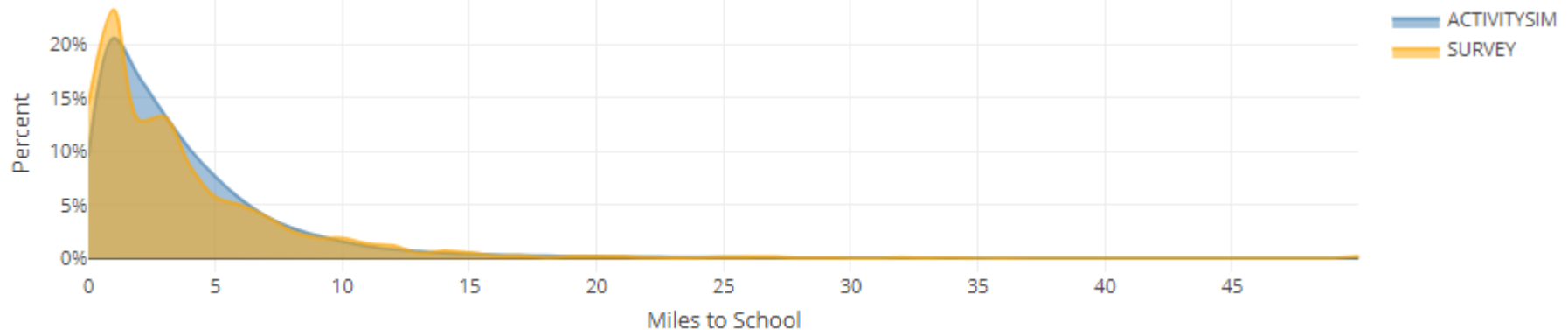
Mandatory TLFD

	Average Tour Length (miles)	
	Survey	ActivitySim
Work	13.38	13.53
School	4.19	4.24

Work TLFD



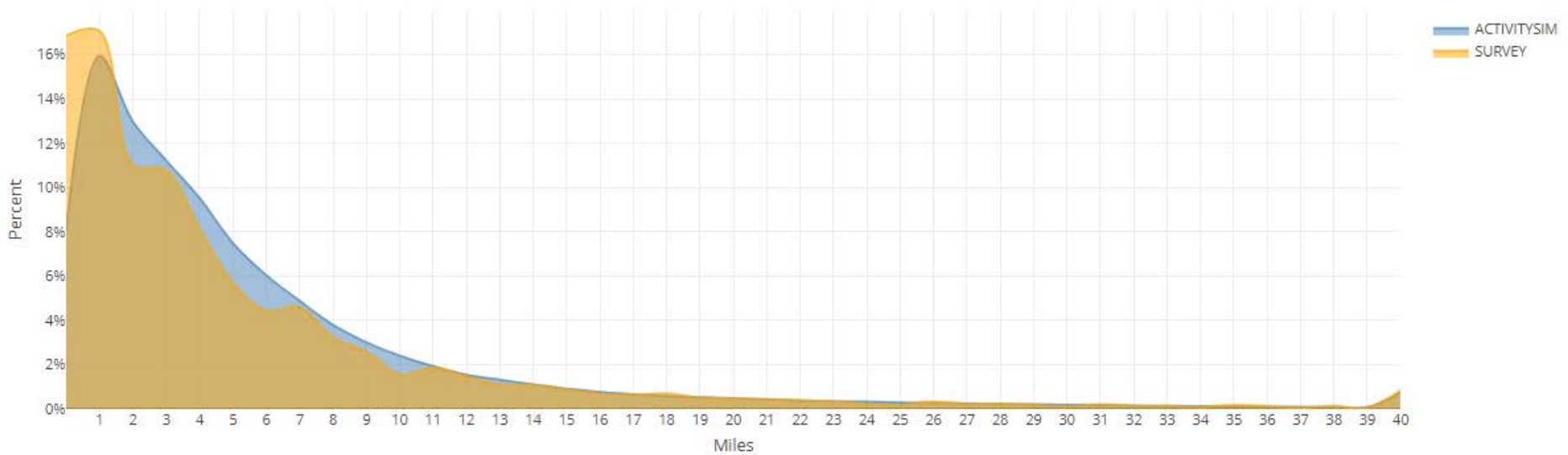
School TLFD



Model Performance

Non-Mandatory TLFD

Non-Mandatory TLFD



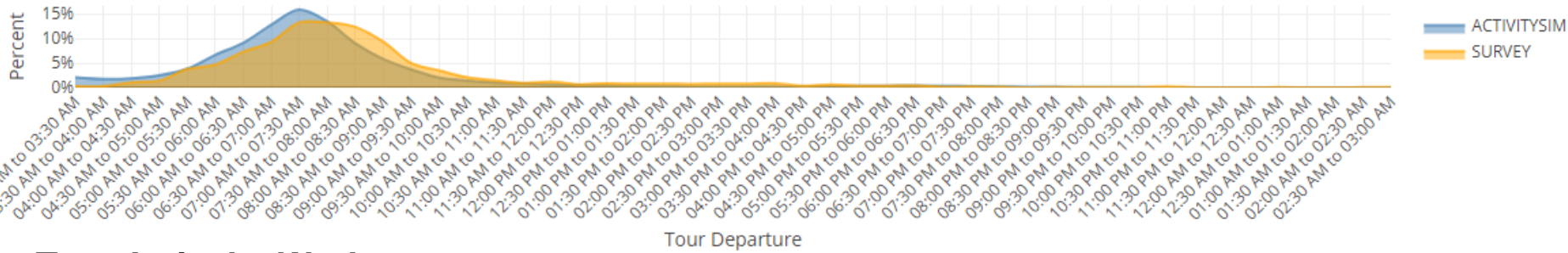
	Average Tour Length (miles)	
	<i>Survey</i>	<i>ActivitySim</i>
All Non-Mandatory Tours	5.84	6.34



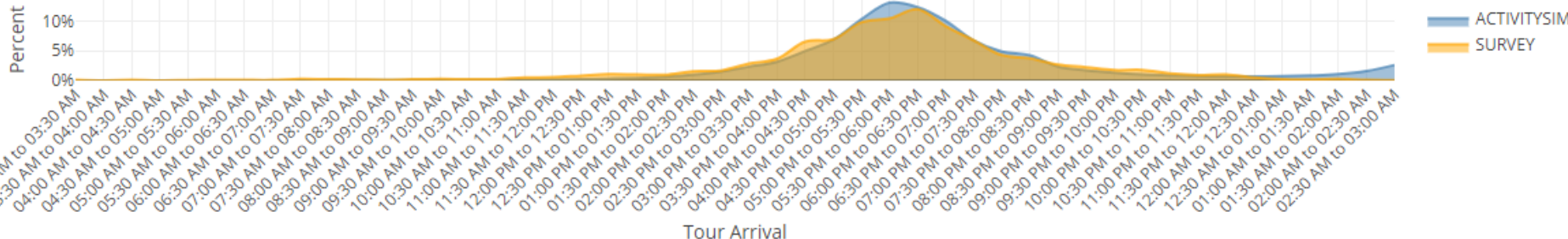
Model Performance

Time-of-Day Profile

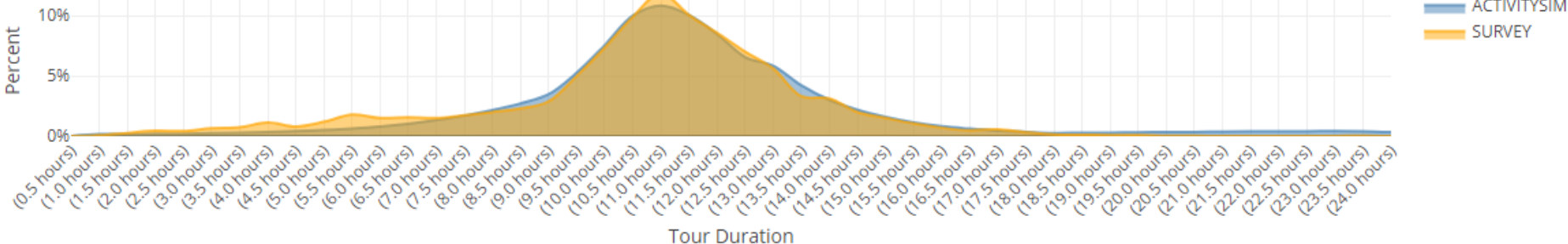
Tour Departure – Work



Tour Arrival – Work



Tour Duration – Work



Key Takeaways

1. Model is predicting more travel
 - SEMCOG model was calibrated to data with GPS sample adjustments
2. Tour/trip-length frequency distributions look reasonable. Further analysis required on commuter flows
3. Model overpredicts night-time travel
4. Mode choice model is uncalibrated
5. Model aggregate VMT closely matches the Gen2 Model aggregate VMT
6. **Model is performing reasonably well, even without calibration!**





Phase 1 Model Development

Ongoing Activities and Next Steps

Phase 1: Ongoing Activities

- Transit network update (COG staff)
 - Preparing transit networks for four Gen3 Model time-of-day periods
 - Converting PNR connectors from one-way to two-way links
 - Adding dummy stops and connectors for assigning external transit demand
- Model integration and assignment (RSG)
 - Removing unnecessary trip-based model code
 - Merging ActivitySim trip tables with non-resident demand
 - Incorporating external and visitor transit trips
 - Updating highway and transit assignment procedures



Phase 1: Next Steps

- Model estimation and implementation
 - Tour destination choice
 - Tour mode choice
 - Implementation of revised coefficients
- Phase 1 Model calibration and validation
 - Calibrate ActivitySim to RTS/MTS data and on-board surveys
 - Validate Phase 1 model against observed traffic counts and transit ridership
- Sensitivity testing
 - Define sensitivity tests
 - Run three sensitivity tests
- Documentation
- Phase 1 model development expected to be completed by November 2021





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