

# PSRC Model Updates

Model Users' Group  
January 15, 2025



Puget Sound Regional Council



*We are leaders in the region to realize equity for all. Diversity, racial equity and inclusion are integrated into how we carry out all our work.*

[psrc.org/equity](https://psrc.org/equity)



# Background

## Updating tools for the 2026–2050 Regional Transportation Plan

- Refreshing base year to Spring 2023, including:
  - roadway & transit networks,
  - performance data for validation from Apr–May
- Focused update for travel behavior from the Spring 2023 Regional Household Travel Survey



# Future Land Use is not changing

- Recent growth trends between 2018 and 2024 are within **3%** of forecasts despite the pandemic.
- The Latest post-pandemic growth projections are within **5%** of previous forecasts for 2050 and show the region hitting 5.8m people and 3.3m jobs around **2053**.

To remain consistent with Comprehensive Plans, the RTP will use the **same** 2050 forecasts as **VISION 2050**.

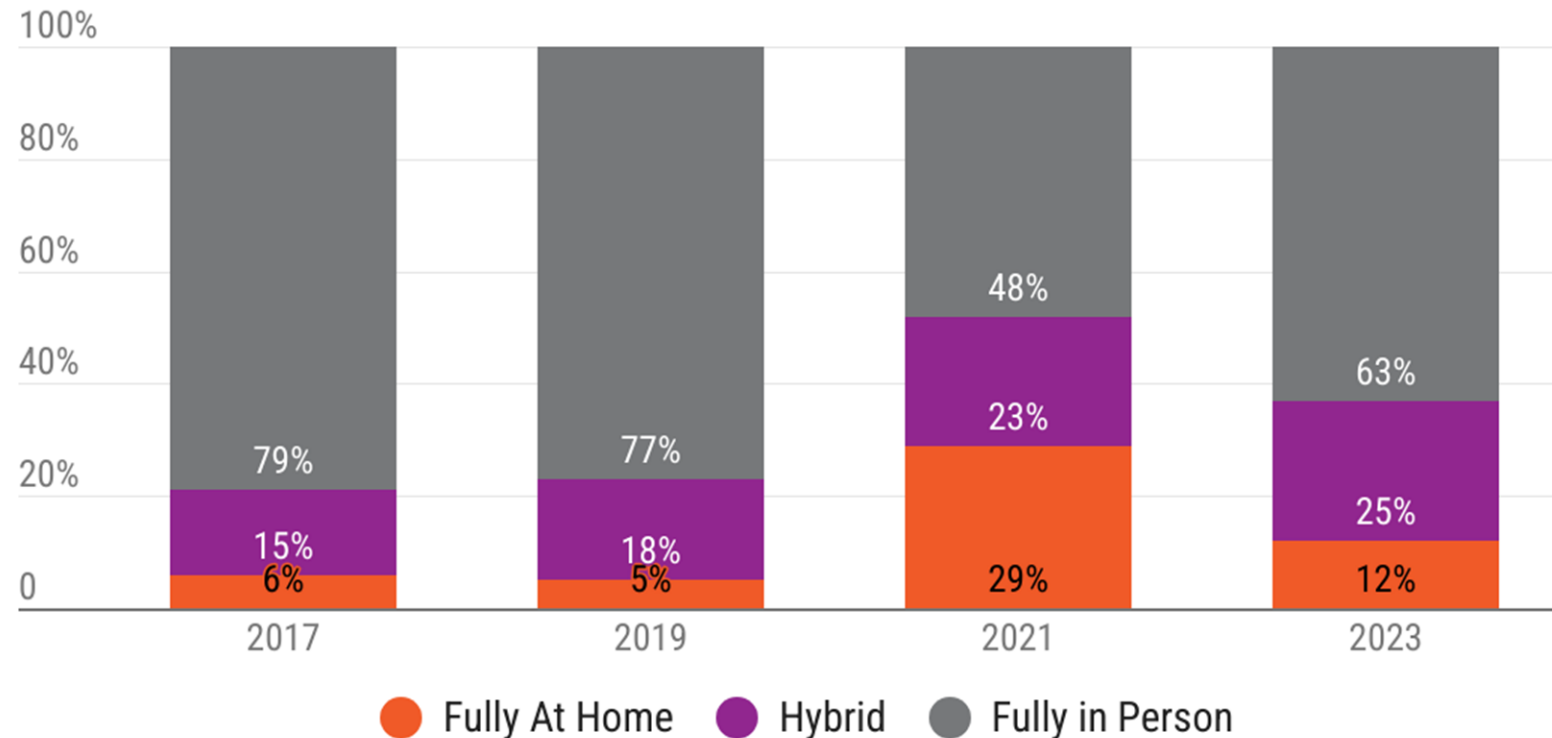




# Key Travel Behavior Differences: Flexible Work

Work-from-home levels still fluctuating, but hybrid work is becoming more stable. Fully at-home is around 12%.

**Work from Home Status**

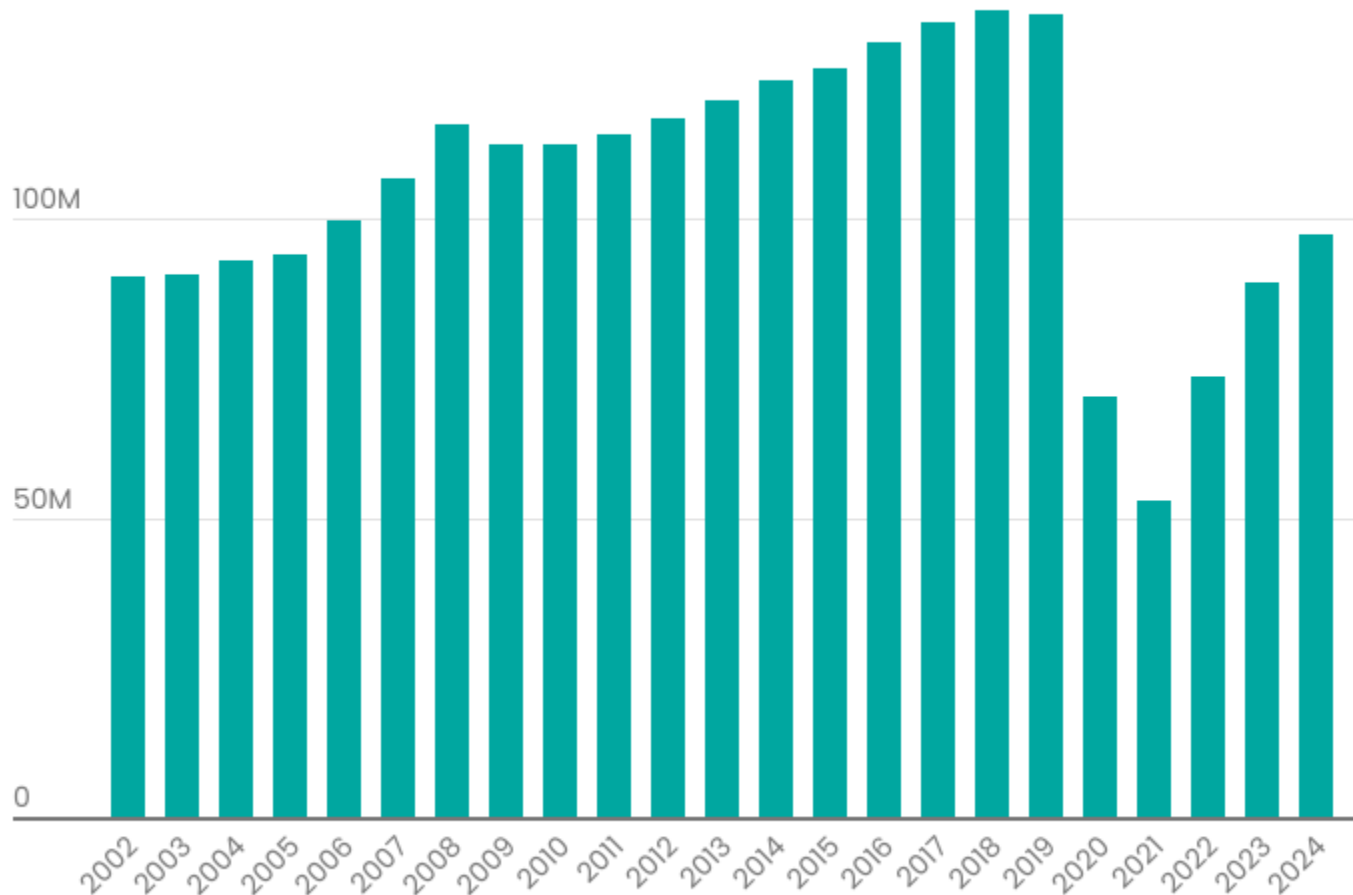


Source: PSRC Regional Household Travel Survey 2017, 2019, 2021 & 2023



# Key Travel Behavior Differences: Transit is growing

## Jan-July Total Boardings, 2002-2024



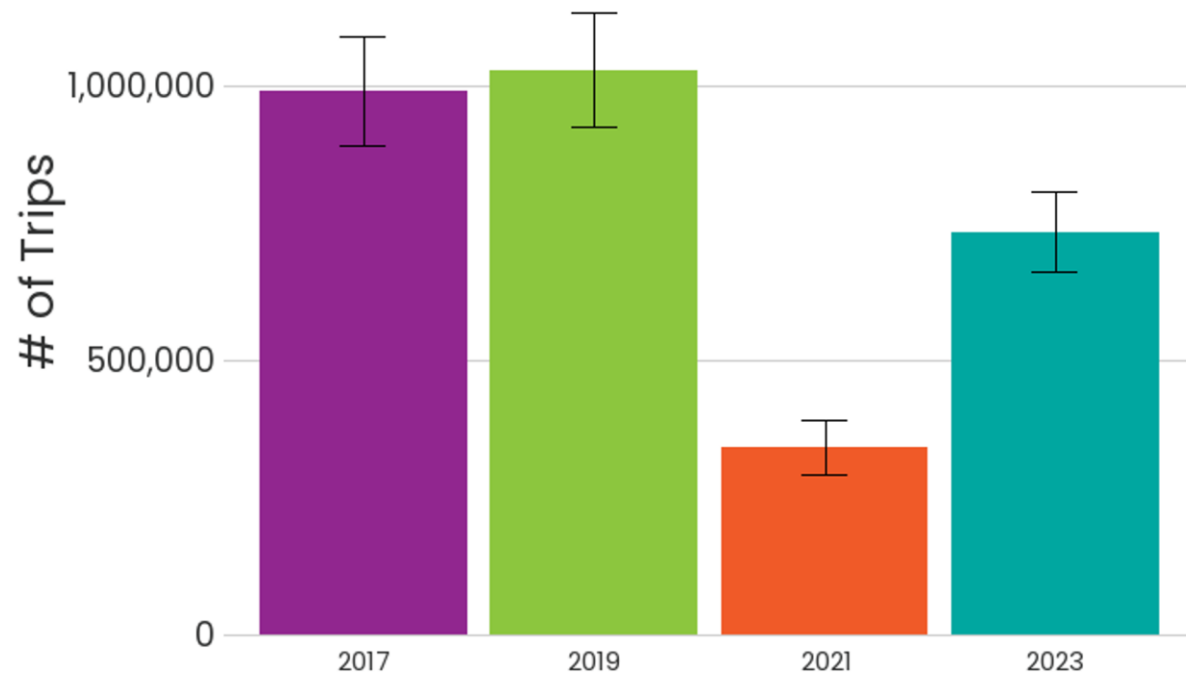
There were approximately **98 million** boardings from January to July 2024 on the Region's transit system (**73%** of 2019 ridership)



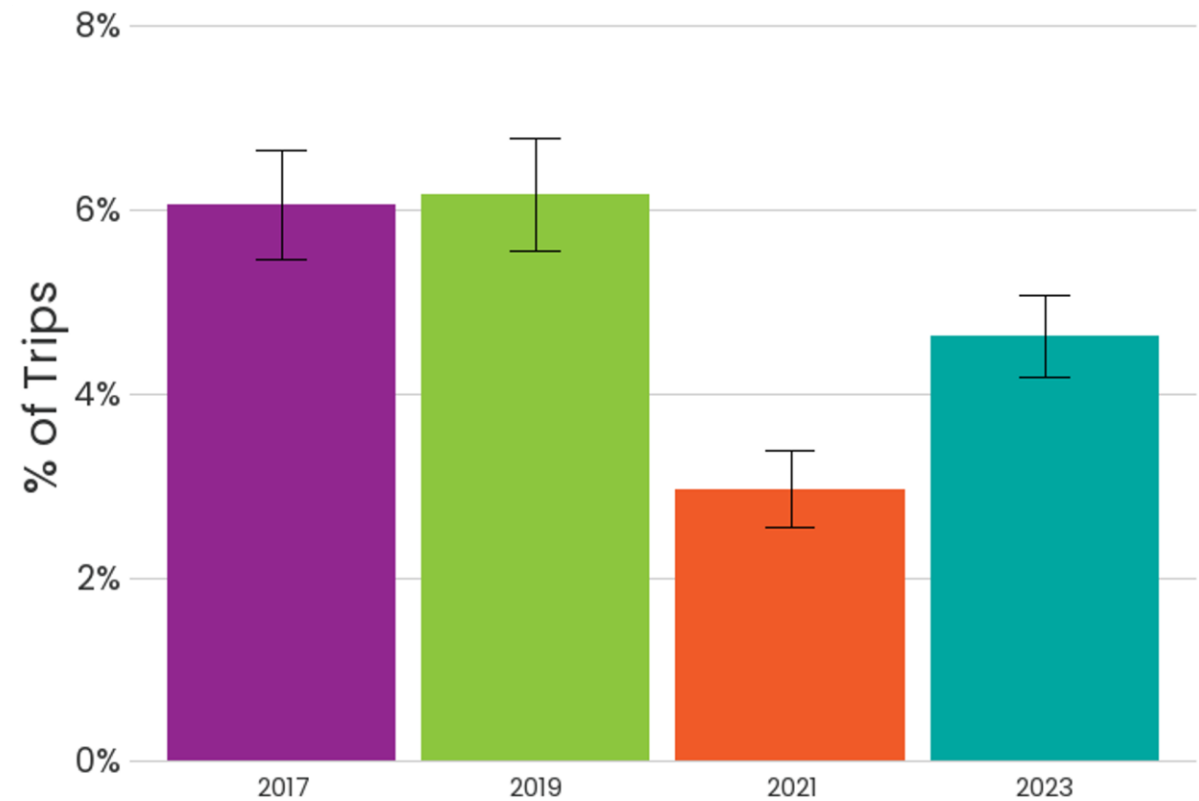
# Key Travel Behavior Differences: Transit is growing

## Transit trips from HHTS

Transit Trips - Count

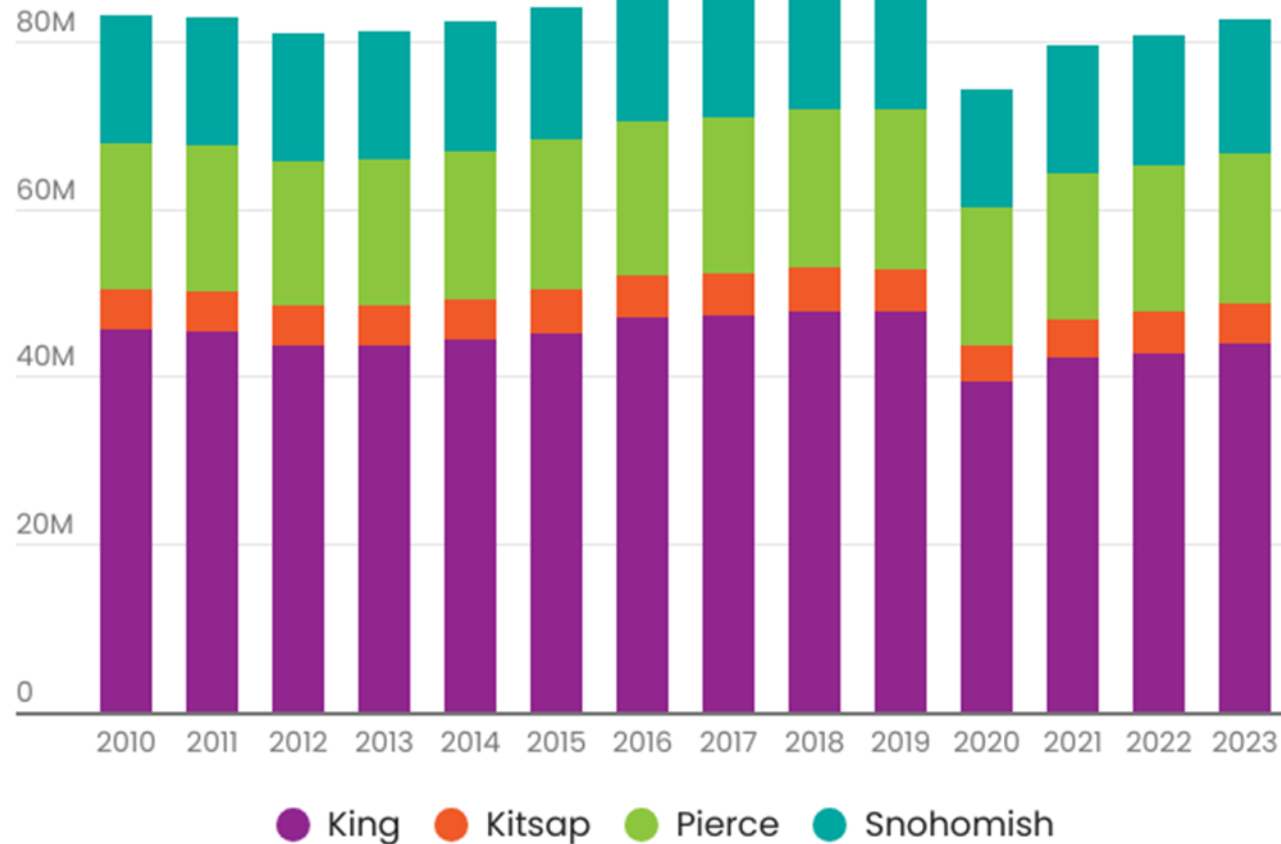


Transit Trips - Share



# Key Travel Behavior Differences: VMT is slowly growing

## Daily Vehicle Miles Traveled, 2010–2023



People in the region drove about **82.5** million miles a day in 2023 – about the same as people drove in **2014**.





# Model Update: Flexible Work



# Model Updates for Flexible Work

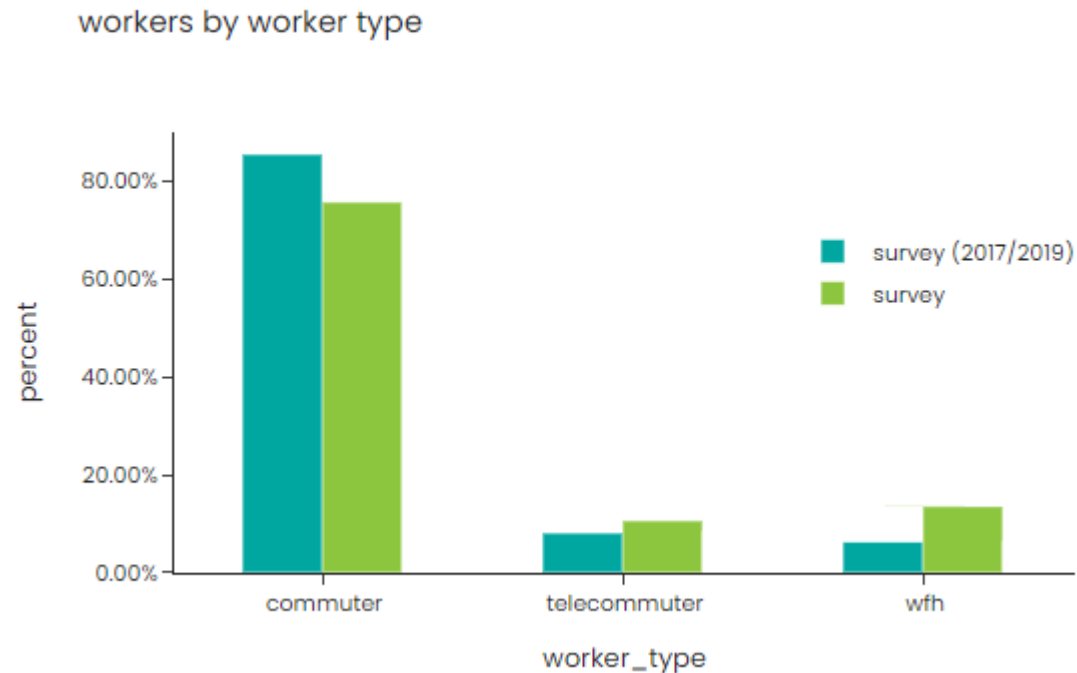
Soundcast now includes a Telecommute Model:

- Sub-model in Daysim:
  - Predicts if a worker with out-of-home work location is a telecommuter
  - Results used in Day Pattern, which predicts the type and number of activities each person does
  - Telecommuters are still able to make work tours, but they do so at a lower rate.



# Worker Types

- **Commuter:** never works from home (~75% of workers)
- **Telecommuter:** works from home 3+ days/week (~10%)
- **WFH:** reported work location same as home (~14%)



# Work Tours by Worker Type

teleworker

commuter

work from home

teleworker

commuter

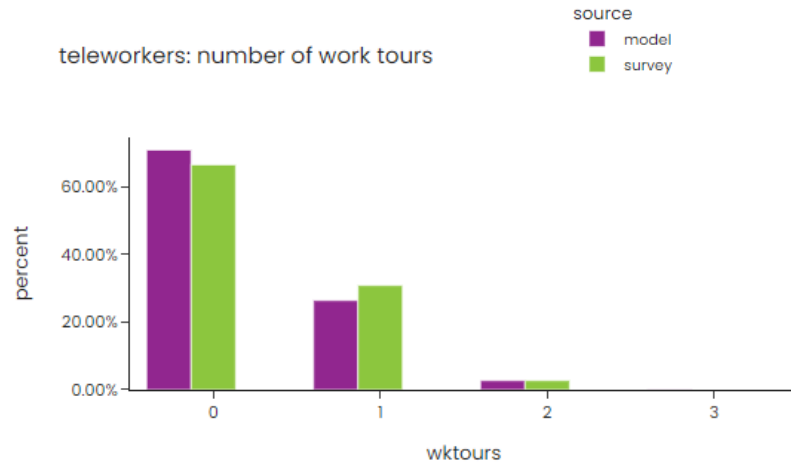
work from home

teleworker

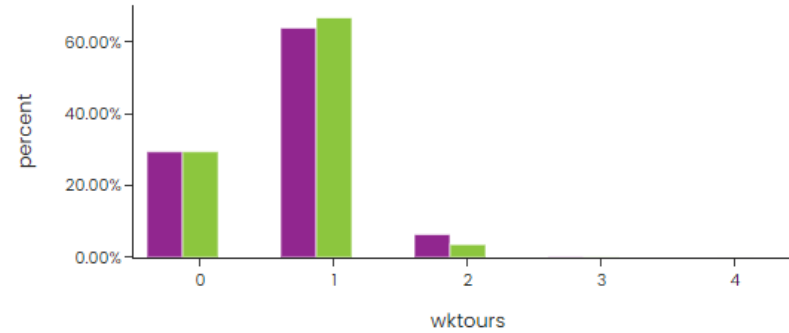
commuter

work from home

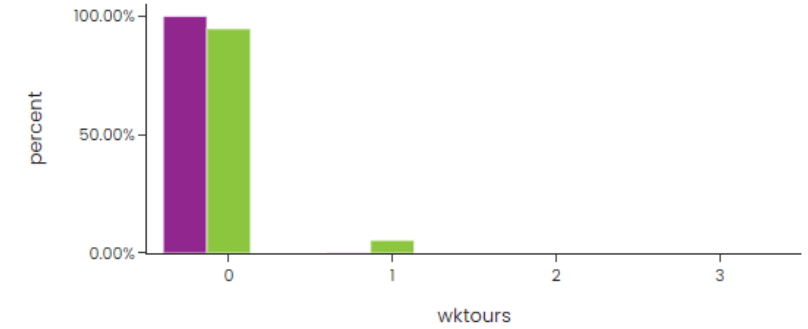
teleworkers: number of work tours



commuters: number of work tours



work from home workers: number of work tours



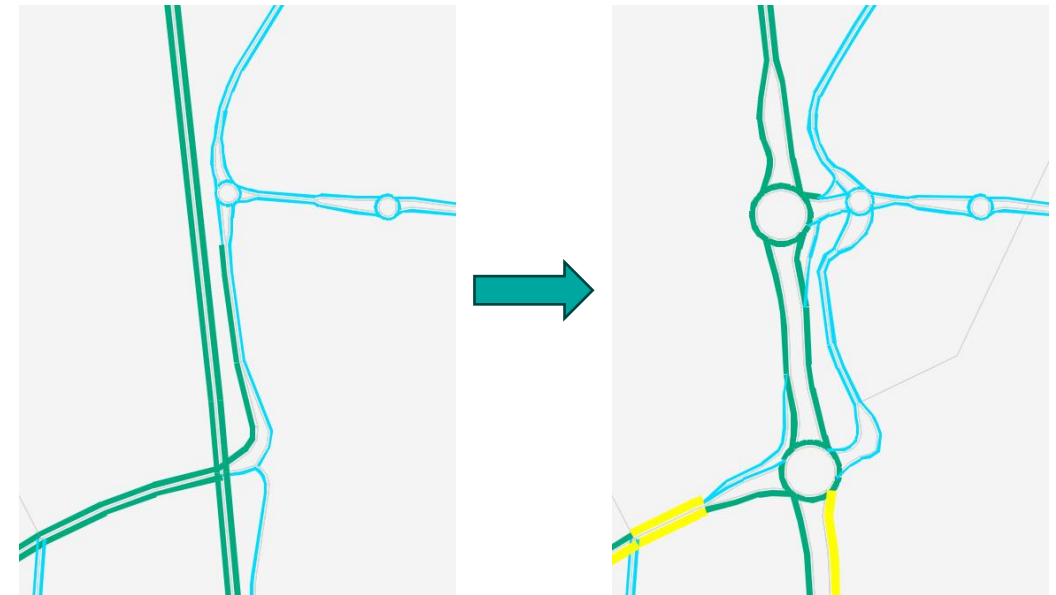


# Model Update: Networks



# New road networks based on updated OSM linework

- New road alignments for areas of recent construction (I-5 in Tacoma, SR-520 at Montlake and SR-99 tunnel downtown)
- More roundabout conversions
- AM Network parameters:
  - 3,870 centroids
  - 30,858 nodes (+2%)
  - 90,499 links (+2%)



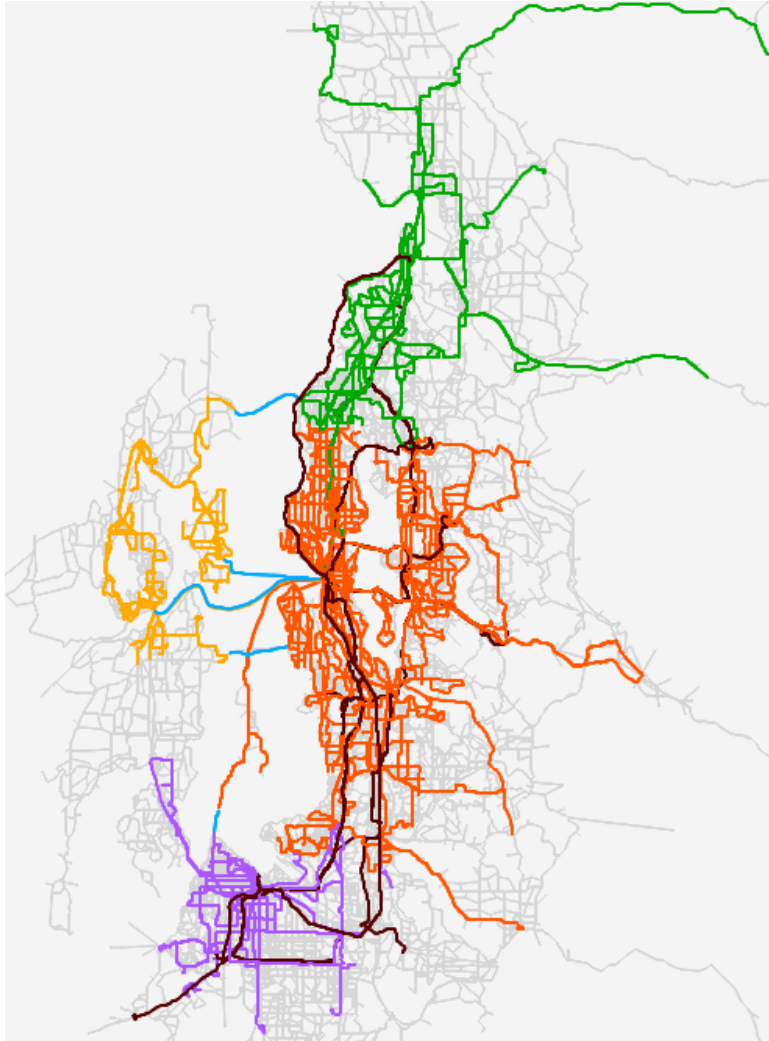
# Network attribute refresh

- Updated lane configurations for all arterials and freeways
  - BAT lanes – 67 miles → 87 miles
  - HOV lanes – 261 miles → 283 miles
- Speed limit updates – reductions across many arterial corridors (Seattle, Tacoma, Bellevue, WSDOT state routes)
- New observed count locations. 1389 freeway, 200+ arterial

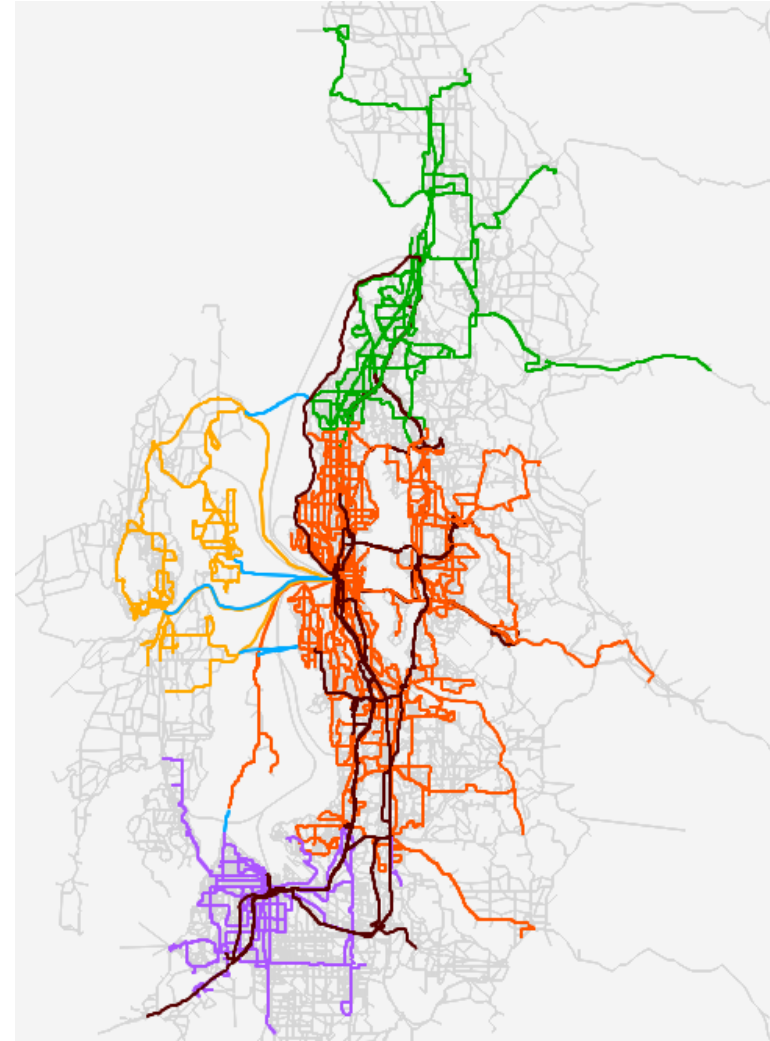


# Transit networks via gtfs from each operator

2018 – 622 AM routes, 7570 service miles



2023 – 526 AM routes, 6307 service miles





Model  
Update:  
Other  
Travel  
Behavior



# Estimation/Calibration Status

Model	Re-estimated	Initial Calibration
Auto Ownership	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Telecommute	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Work Location	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
School Location	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Individual Day Pattern		<input checked="" type="checkbox"/>
Tour Destination Choice		<input checked="" type="checkbox"/>
Tour Mode		<input checked="" type="checkbox"/>
Escort	<input checked="" type="checkbox"/>	
Work	<input checked="" type="checkbox"/>	
School		
Other	<input checked="" type="checkbox"/>	
Work-based Subtour		
Trip Mode		
Transit Pass Ownership		<input checked="" type="checkbox"/>



# Model Calibration and Data Refresh

- Re-estimation/calibration of work location, mode choice, destination choice, day pattern to 2023 survey
- Updated external travel with 2023 LEHD LODES commute patterns

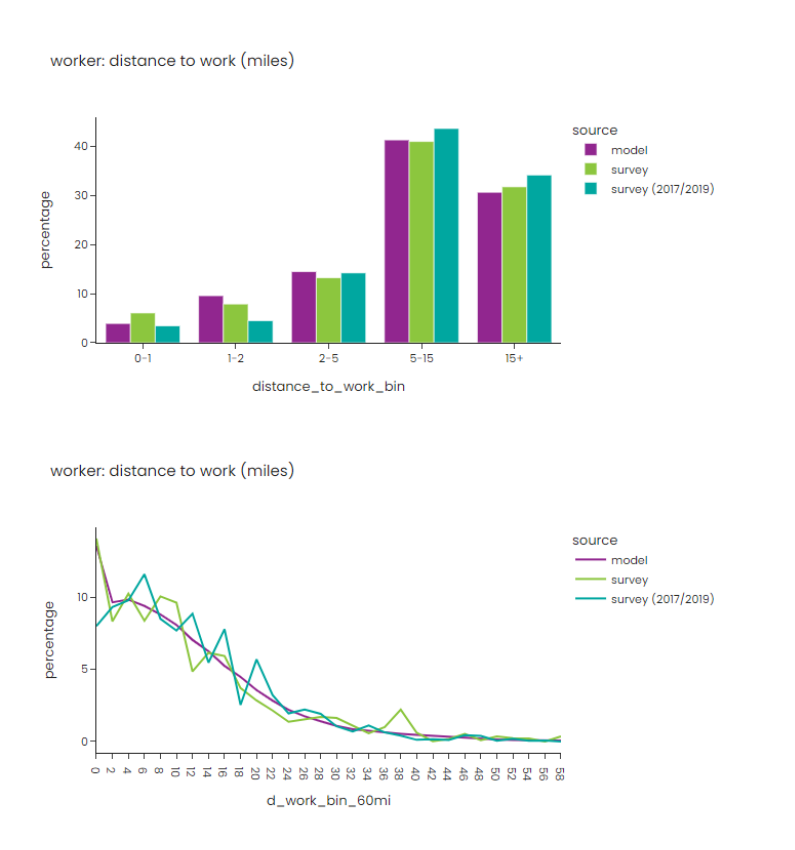


Dayim Estimation Results

- 1 Quarto tips
- 2 Telecommute
- 3 Auto Ownership
- 4 Transit Pass Ownership
- 5 Day Pattern
- 6 Intermediate Stop Generation
- 7 Time Choice
- LOCATION CHOICE**
- 8 Work Location
- 9 School Location
- TOUR MODE CHOICE**
- 10 All Tours
- 11 Work Tour Mode
- 12 School Tour Mode
- 13 Escort Tour Mode
- 14 Other Home-Based Tour Mode
- 15 Workbased Subtour Mode
- TRIP MODE CHOICE**
- 16 Trip Mode
- 17 Work Trip Mode
- 18 School Trip Mode
- 19 Escort Trip Mode
- 20 Other Home-Based Trip Mode
- DESTINATION CHOICE**
- 21 Tour Destination
- 22 Trip Destination
- REGIONAL SUMMARY**
- 23 Persons
- 24 Households

All Workers Worker Type Income Household Density Work County

Work Regional Geography

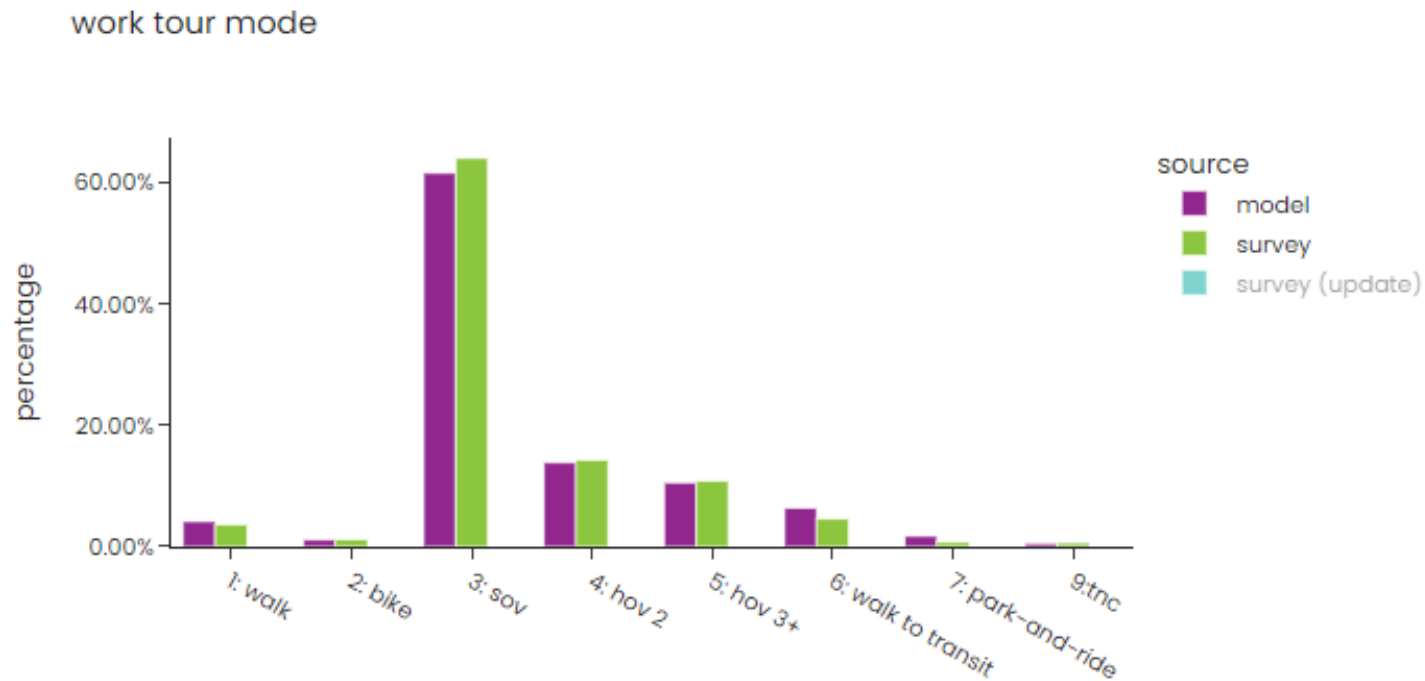


# Daysim Validation Process

The Daysim model results are validated with survey data

- Work Tour Mode Choice Model:

 `work_tour_mode.ipynb`





# Daysim Validation Process

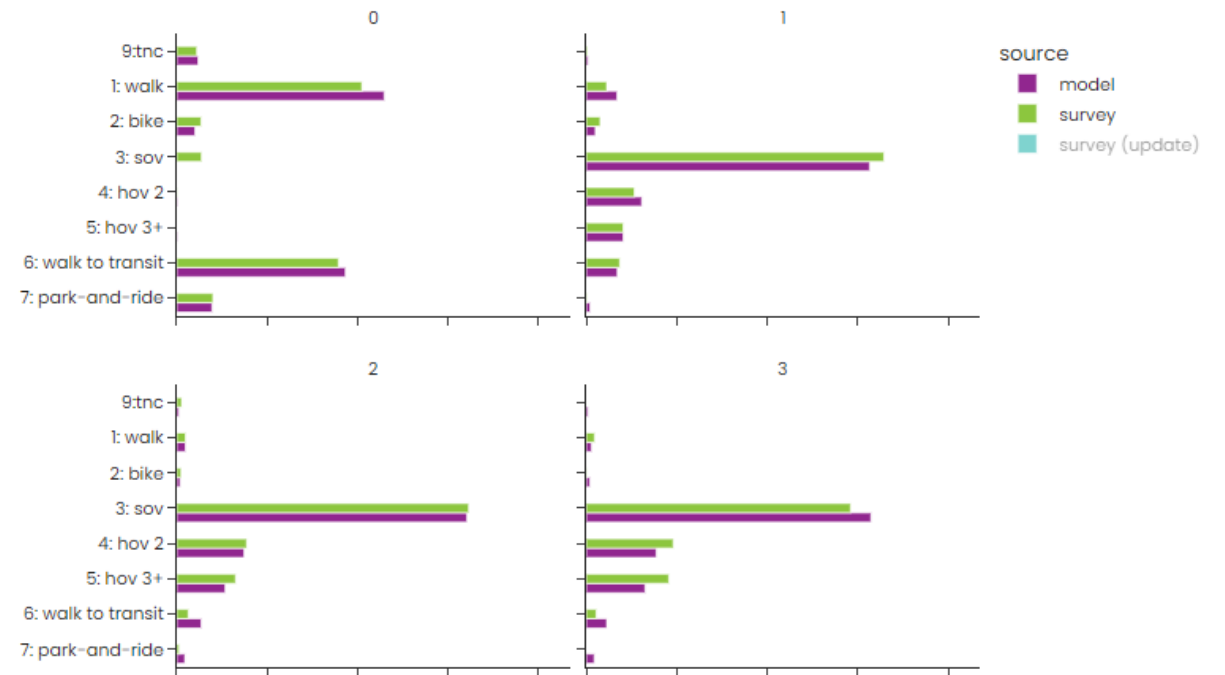
The Daysim model results are validated with survey

- Work Tour Mode Choice Model:

 [work\\_tour\\_mode.ipynb](#)

- work tour mode by person type
- work tour mode by auto ownership
- work tour mode by household size
- work tour mode by jurisdictions






work tour mode choice by auto ownership



# Daysim Validation Process

The Daysim model results are validated with survey data

- All Tour Mode Choice Models

-  `work_tour_mode.ipynb`
-  `school_tour_mode.ipynb`
-  `escort_tour_mode.ipynb`
-  `other_home_based_tour_mode.ipynb`
-  `workbased_subtour_mode.ipynb`



# Daysim Validation Process

The Daysim model results are validated with Survey

- A notebook for every model

- all\_tour\_mode.ipynb
- all\_trip\_mode.ipynb
- auto\_ownership.ipynb
- day\_pattern.ipynb
- escort\_tour\_mode.ipynb
- escort\_trip\_mode.ipynb
- intermediate\_stop\_generation.ipynb
- network\_validation.ipynb
- other\_home\_based\_tour\_mode.ipynb
- other\_home\_based\_trip\_mode.ipynb
- school\_location.ipynb
- school\_tour\_mode.ipynb
- school\_trip\_mode.ipynb
- telecommute.ipynb
- time\_choice.ipynb
- tour\_destination.ipynb
- transit\_pass\_ownership.ipynb
- trip\_destination.ipynb
- work\_location.ipynb
- work\_tour\_mode.ipynb
- work\_trip\_mode.ipynb
- workbased\_subtour\_mode.ipynb





## Hello, Quarto

Python

R

Julia

Observable

Combine Jupyter notebooks with flexible options to produce production quality output in a wide variety of formats. Author using traditional notebook UIs or with a plain text markdown representation of notebooks.

cell-options.ipynb Python 3 (ipykernel)

### Palmer Penguins

```
author: Norah Jones
format:
  html:
    code-tools: true
    code-fold: true
```

```
[3]: #| echo: false
import pandas as pd
df = pd.read_csv("palmer-penguins.csv")
```

### Exploring the Data

See @fig-bill-sizes for an exploration of bill sizes by species.

```
[6]: #| label: fig-bill-sizes
#| fig-cap: Bill Sizes by Species
import matplotlib.pyplot as plt
import seaborn as sns
g = sns.FacetGrid(df, hue="species", height=3, aspect=3.5/1.5)
g.map(plt.scatter, "bill_length_mm", "bill_depth_mm").add_legend()
```

```
[6]: <seaborn.axisgrid.FacetGrid at 0x2946720e0>
```

## Palmer Penguins

AUTHOR  
Norah Jones

PUBLISHED  
March 12, 2023

Show All Code

Hide All Code

### Exploring the Data

See [Figure 1](#) for an exploration of bill sizes by species.

▼ Code

```
import matplotlib.pyplot as plt
import seaborn as sns
g = sns.FacetGrid(df, hue="species", height=3, aspect=3.5/2)
g.map(plt.scatter, "bill_length_mm", "bill_depth_mm").add_legend()
```

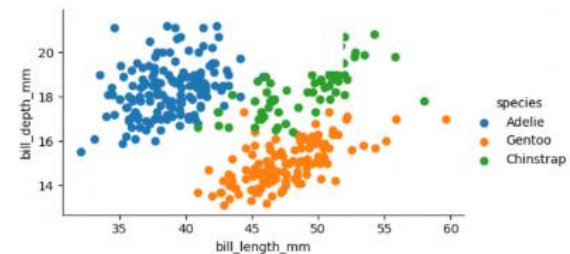


Figure 1: Bill Sizes by Species







# 11 Work Tour Mode

PUBLISHED  
December 31, 2024

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[11.0.1 mode choice by segment](#)

## Dayim Estimation Results



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### LOCATION CHOICE

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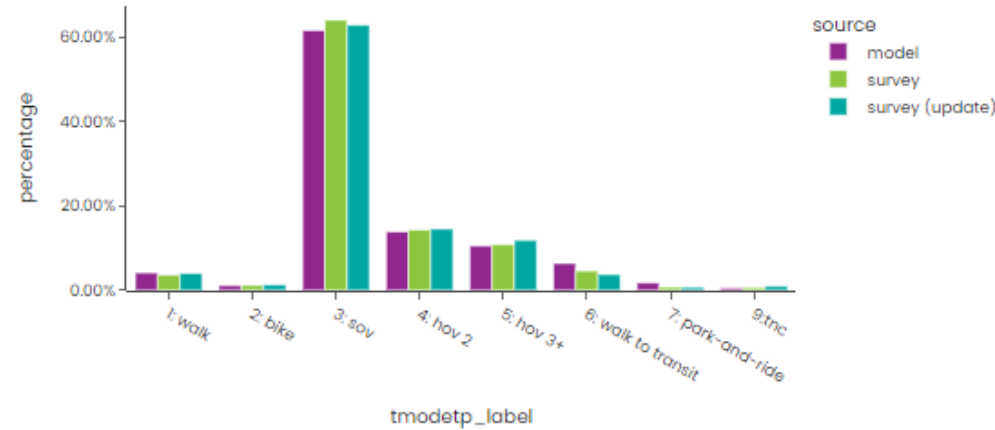
### DESTINATION CHOICE

- 21 Tour Destination
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### REGIONAL SUMMARY

- 23 Persons
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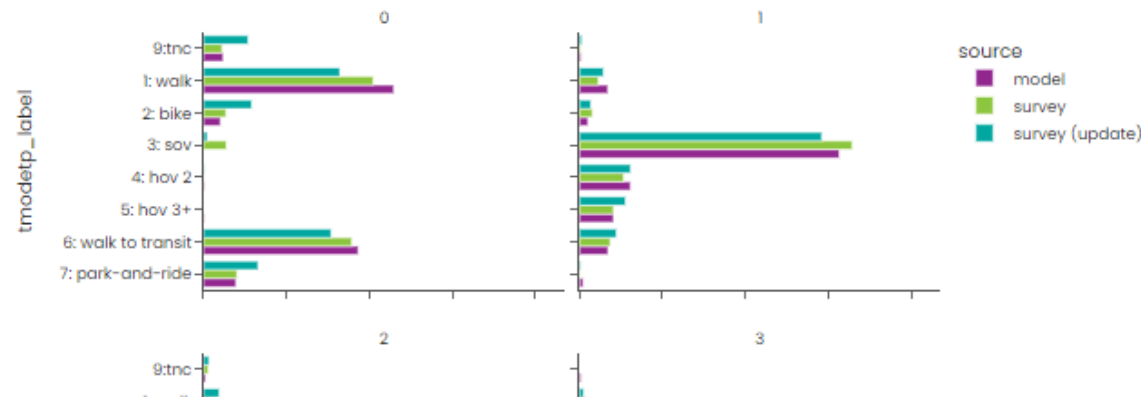
work tour mode



## 11.0.1 mode choice by segment

- person type
- household size
- auto ownership**
- auto availability

work tour mode choice by auto ownership



# Advantages of using Quarto

- works well with our Jupyter notebook workflow
- interactivity
- integrated formatting options



# Schedule & Next Steps

- Base Year model calibration and validation will be complete in early 2025:
  - 2050 Transit networks will be available in April 2025
  - Roadway projects will follow in May 2025
- Scenarios and sensitivity test modeling will begin in the summer of 2025 and wrap up in the fall.
- Draft Plan will be released in early 2026 for public comment





# Thank You!

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