



# Gen3 Model Development Project

Update + Trip Mode Choice

July 22, 2022

IN PARTNERSHIP WITH

**BASELINE  
MOBILITY**



Metropolitan Washington  
Council of Governments

# Quick Model Update

- Auxiliary Models Implemented
  - Auto Passenger IX, XI, XX
  - Truck & Commercial Vehicle
  - Visitors
  - Others
- Preparing for Trip Mode Choice Model Estimation
  - Data Preparation
  - Status



# Data Preparation - Survey Data Cleaning

- Imputing missing values (income, age, person type)
- Data Value Checks
- Data Integrity Checks
- Data Formatting



# Trip-Specific Data Cleaning

- Minimum of 2 trips per tour (1 outbound + 1 inbound)
- Max of 4 trips per tour and direction
- Tour and trip mode availability
  - Walk tours must be 3 miles or less
  - Bike tours must be 8 miles or less
- Joint tours must use lowest person id in tours/trips
  - Except if school, then it uses the student
- Tour and trip origins and destinations must align
  - Tour origin = first trip origin = last trip destination
  - Tour destination = last outbound trip D = first inbound trip O
  - Next trip origin must be prior trip's destination



# Data Inferring

- Using the survey data to infer choices
  - Coordinated Daily Activity Pattern
  - Mandatory Tour Frequency
  - Non-mandatory Tour Frequency
  - Joint Tour Frequency
  - Joint Tour Participants
  - Tour Scheduling
  - At-work Subtour Frequency
  - Stop frequency
- Prepares Override Files for ActivitySim

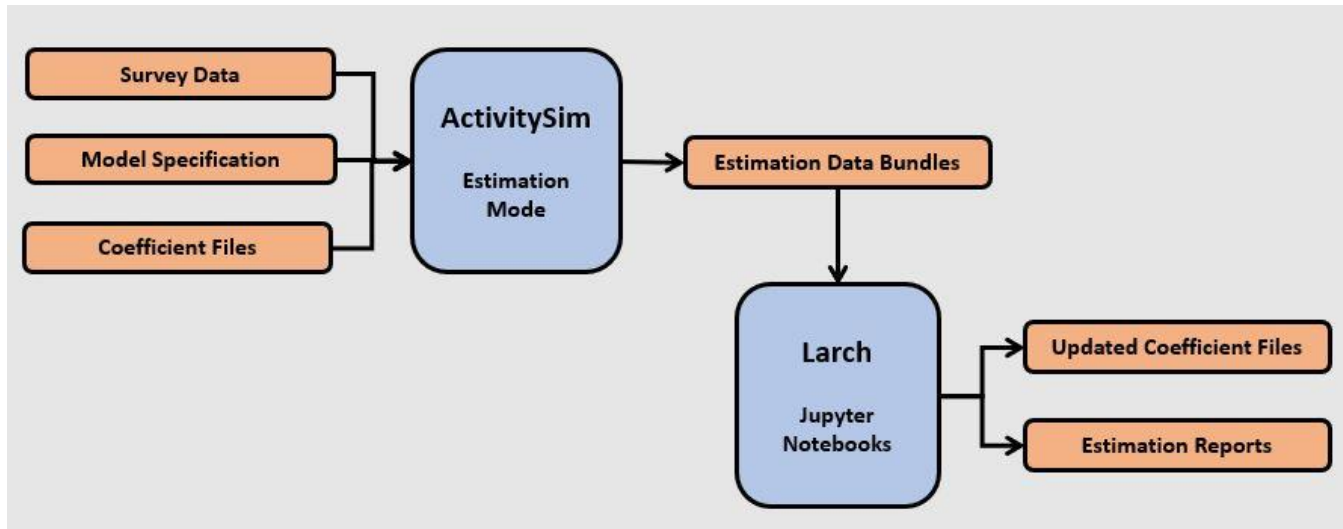


# Override Files

- Five Files That Override ActivitySim Choices
  - Households
  - Persons
  - Joint Tour Participants
  - Tours
  - Trips
- ActivitySim outputs it's choice and the override choice
  - Part of Estimation Data Bundles
- Subsequent models continue with overridden choice



# ActivitySim Estimation Mode



## Estimation Data Bundles

- Model Settings
- Current coefficients
- Utility Specification
- Chooser and Alternatives Data

# Data Bundles: Model Settings

- File, Table, and Field Names
- Model Type
- Model Constants

```
trip_mode_choice_coefficients.csv x trip_mode_choice_coefficients_template.csv x trip_mode_choice.csv x trip_mode_choice.yaml x
1 # trip_mode_choice.yaml
2
3 SPEC: trip_mode_choice.csv
4 COEFFICIENTS: trip_mode_choice_coefficients.csv
5 COEFFICIENT_TEMPLATE: trip_mode_choice_coefficients_template.csv
6
7 LOGIT_TYPE: NL
8
9 ▼NESTS:
10   name: root
11   coefficient: 1.00
12   ▼ alternatives:
13     - name: AUTO
14       coefficient: 0.72
15     ▼ alternatives:
16       - DRIVEALONE
17       - SHARED?
```





# Data Bundles: Current Coefficients

```
trip_mode_choice_coefficients.csv x trip_mode_choice_coefficients_template.csv x trip_mode_choice.csv x trip_mode_choice.yaml x
1 coefficient_name,value,constrain
2 coef_unavailable,-15.0,T
3 coef_one,1.0,T
4 coef_nest_root,1.0,T
5 coef_nest_AUTO,0.72,T
6 coef_nest_NONMOTORIZED,0.72,T
7 coef_nest_TRANSIT,0.72,T
8 coef_nest_WALKACCESS,0.5,T
9 coef_nest_PNRACCESS,0.5,T
10 coef_nest_KNRACCESS,0.5,T
11 coef_nest_RIDEHAIL,0.36,T
12 #,,F
13 coef_ivt_othmaint_social,-0.02,F
14 coef_ivt_work,-0.02,F
15 coef_ivt_univ_school,-0.03,F
16 coef_ivt_escort_shopping_eatout_othdiscr_atwork,-0.03,F
17 #,,F
18 coef_age1619_da,0.0,F
19 coef_age010_trn,0.0,F
20 coef_age16p_sr,0.0,F
21 coef_hhsize1_sr,-0.73,F
22 coef_hhsize2_sr,0.0,F
23 coef_walktimeshort_atwork,1.35,F
24 coef_walktimeshort_work_univ_school_escort_shopping_eatout_othmaint_social_othdiscr,2.0,T
25 coef_biketimeshort_atwork,2.7,F
26 coef_biketimeshort_work_univ_school_escort_shopping_eatout_othmaint_social_othdiscr,4.0,T
27 coef_dtim_atwork,1.35,F
28 coef_dtim_work_univ_school_escort_shopping_eatout_othmaint_social_othdiscr,2.0,T
29 coef_ivt_xb_multiplier,1.0,T
30 coef_ivt_mr_multiplier,0.9,T
31 coef_ivt_br_multiplier,0.9,T
```



# Data Bundles: Utility Specification

```
settings.yaml | trip_mode_choice_SPEC.csv | trip_mode_choice_coefficients.csv | trip_mode_choice_coefficients - Copy.csv
1 Label,Description,Expression,DRIVEALONE,SHARED2,SHARED3,WALK,BIKE,WALK_AB,WALK_BM,WALK_MR,WALK_CR,PNR_A
2 #Drive_alone_no_toll,#Drive alone no toll,,,,,,,,,,,,,,,,,,,,,
3 util_DRIVEALONE_Unavailable,DRIVEALONE - Unavailable,sov_available == False,coef_unavailable,,,,,,,,,,,,,
4 util_DRIVEALONE_Unavailable_for_persons_less_than_16,DRIVEALONE - Unavailable for persons less than 16,
5 util_DRIVEALONE_Unavailable_for_joint_tours,DRIVEALONE - Unavailable for joint tours,is_joint == True,c
6 util_DRIVEALONE_Unavailable_if_didn't_drive_to_work,DRIVEALONE - Unavailable if didn't drive to work,is
7 util_DRIVEALONE_In_vehicle_time,DRIVEALONE - In-vehicle time,@odt_skims['SOV_TIME'],coef_ivt,,,,,,,,,,,,,
8 util_DRIVEALONE_Terminal_time,DRIVEALONE - Terminal time,@coef_walktimeshort_multiplier * df.total_term
9 util_DRIVEALONE_Operating_cost,DRIVEALONE - Operating cost,@ivt_cost_multiplier * df.ivot * costPerMi
10 util_DRIVEALONE_Parking_cost,DRIVEALONE - Parking cost,@ivt_cost_multiplier * df.ivot * df.total_park
11 util_DRIVEALONE_Person_is_between_16_and_19_years_old,DRIVEALONE - Person is between 16 and 19 years ol
12 #Shared_ride_2,#Shared ride 2,,,,,,,,,,,,,,,,,,,,,
13 util_SHARED2_Unavailable,SHARED2 - Unavailable,hov2_available == False,,coef_unavailable,,,,,,,,,,,,,
14 util_SHARED2_Unavailable_based_on_party_size,SHARED2 - Unavailable based on party size,is_joint & (numk
15 util_SHARED2_In_vehicle_time,SHARED2 - In-vehicle time,@odt_skims['HOV2_TIME'],coef_ivt,,,,,,,,,,,,,
16 util_SHARED2_Terminal_time,SHARED2 - Terminal time,@coef_walktimeshort_multiplier * df.total_terminal_t
17 util_SHARED2_Operating_cost,SHARED2 - Operating cost,@ivt_cost_multiplier * df.ivot * costPerMile * odt
18 util_SHARED2_Parking_cost,SHARED2 - Parking cost,@ivt_cost_multiplier * df.ivot * df.total_parking_cost
19 util_SHARED2_One_person_household,SHARED2 - One person household,@(df.hhsize == 1),coef_hhsize1_sr,,,
20 util_SHARED2_Two_person_household,SHARED2 - Two person household,@(df.hhsize == 2),coef_hhsize2_sr,,,
21 util_SHARED2_Person_is_16_years_old_or_older,SHARED2 - Person is 16 years old or older,@(df.age >= 16),
22 #Shared_ride_3+,#Shared ride 3+,,,,,,,,,,,,,,,,,,,,,
23 util_SHARED3_Unavailable,SHARED3 - Unavailable,hov3_available == False,,coef_unavailable,,,,,,,,,,,,,
24 util_SHARED3_Unavailable_based_joint_tour_mode,SHARED3 - Unavailable based joint tour mode,@df.is_joint
25 util_SHARED3_Unavailable_if_tour_mode_is_shared_2,SHARED3 - Unavailable if tour mode is shared 2,@df.i
26 util_SHARED3_In_vehicle_time,SHARED3 - In-vehicle time,@odt_skims['HOV3_TIME'],coef_ivt,,,,,,,,,,,,,
27 util_SHARED3_Terminal_time,SHARED3 - Terminal time,@coef_walktimeshort_multiplier * df.total_terminal_t
28 util_SHARED3_Operating_cost,SHARED3 - Operating cost,@ivt_cost_multiplier * df.ivot * costPerMile * odt
29 util_SHARED3_Parking_cost,SHARED3 - Parking cost,@ivt_cost_multiplier * df.ivot * df.total_parking_cos
30 util_SHARED3_One_person_household,SHARED3 - One person household,@(df.hhsize == 1),coef_hhsize1_sr,,,
31 util_SHARED3_Two_person_household,SHARED3 - Two person household,@(df.hhsize == 2),coef_hhsize2_sr,,,
32 util_SHARED3_Person_is_16_years_old_or_older,SHARED3 - Person is 16 years old or older,@(df.age >= 16),
33 #Walk,#Walk,,,,,,,,,,,,,,,,,,,,,
34 util_WALK_Time_up_to_2_miles,WALK - Time up to 2 miles,@coef_walktimeshort_multiplier * od_skims['DISTW
35 util_WALK_Time_beyond_2_of_a_miles,WALK - Time beyond 2 of a miles,@walktimelong_multiplier * (od_skims
36 util_WALK_Destination_zone_densityIndex,WALK - Destination zone densityIndex,@density_index_multiplier
37 #util_WALK_Topology,WALK - Topology,@topology_walk_multiplier * df.trip_topology,coef_ivt
```







## **Trip Mode Choice Starting Points**

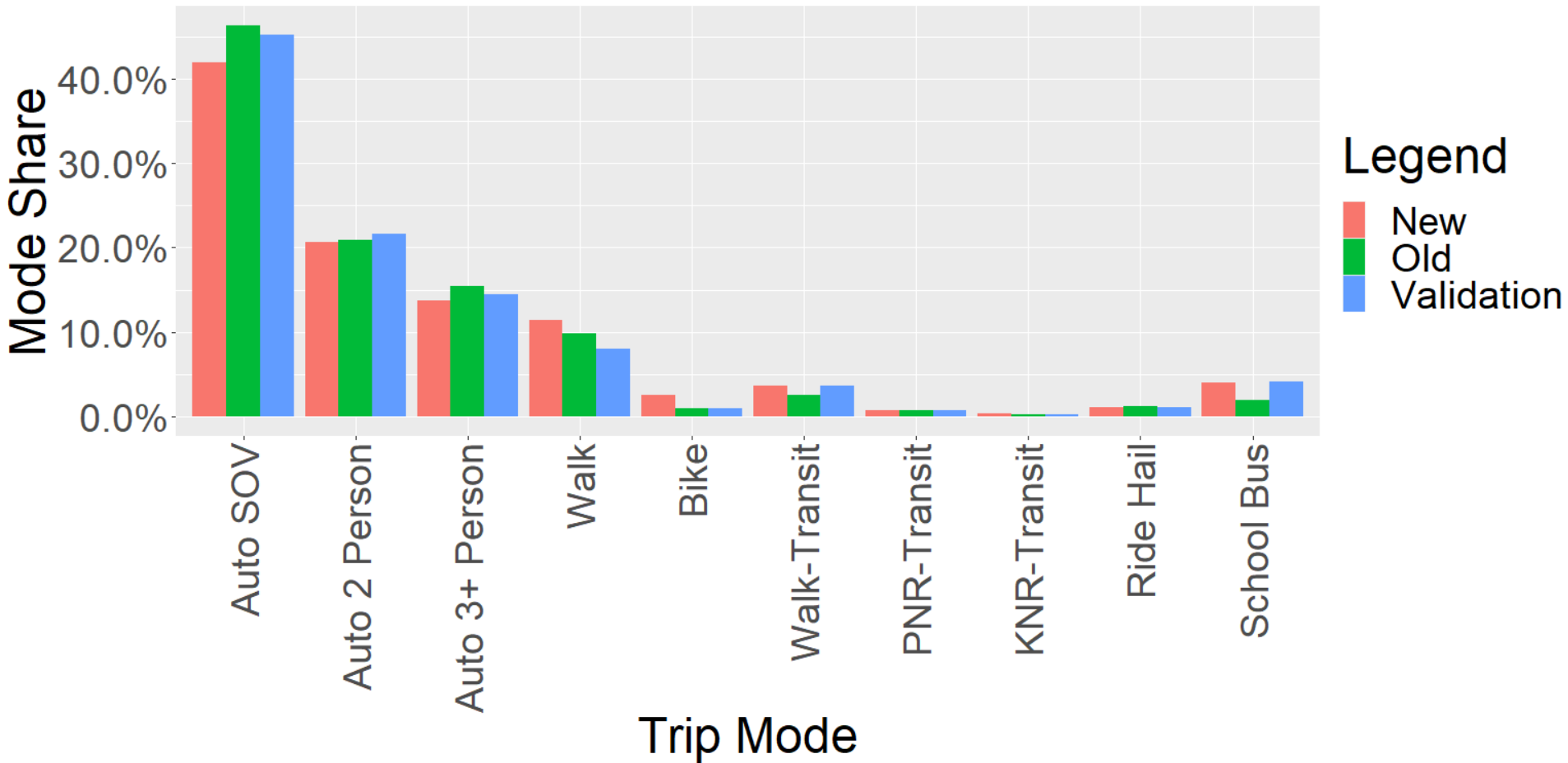
# Disclaimers!

- This is work in progress! NONE of this is final!
- Larch is reporting some concerns
- I have some concerns from a prior estimation run



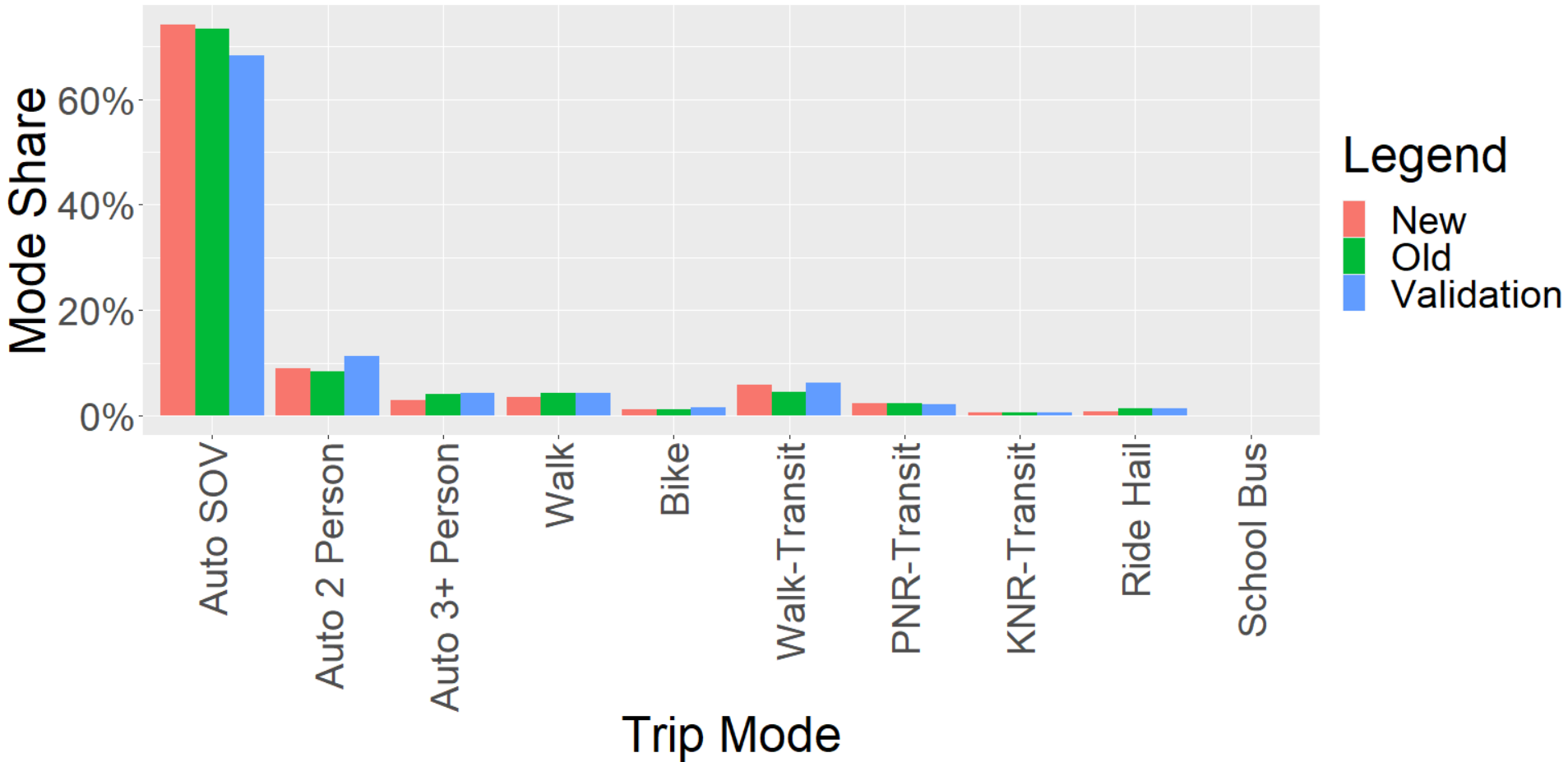
# Total Trips

## Total Trip Mode Choice



# Work Trips

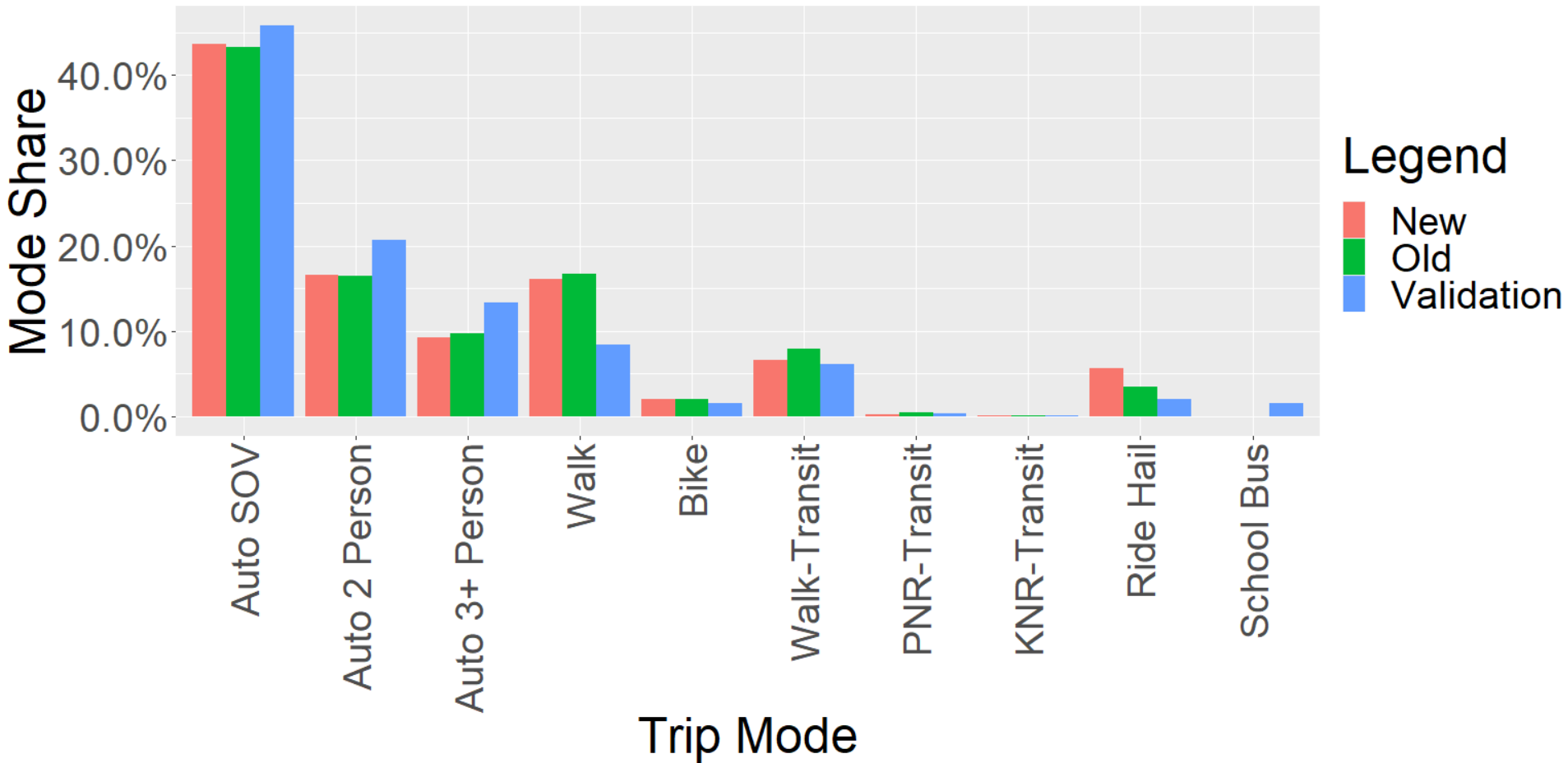
## Work Trip Mode Choice





# University Trips

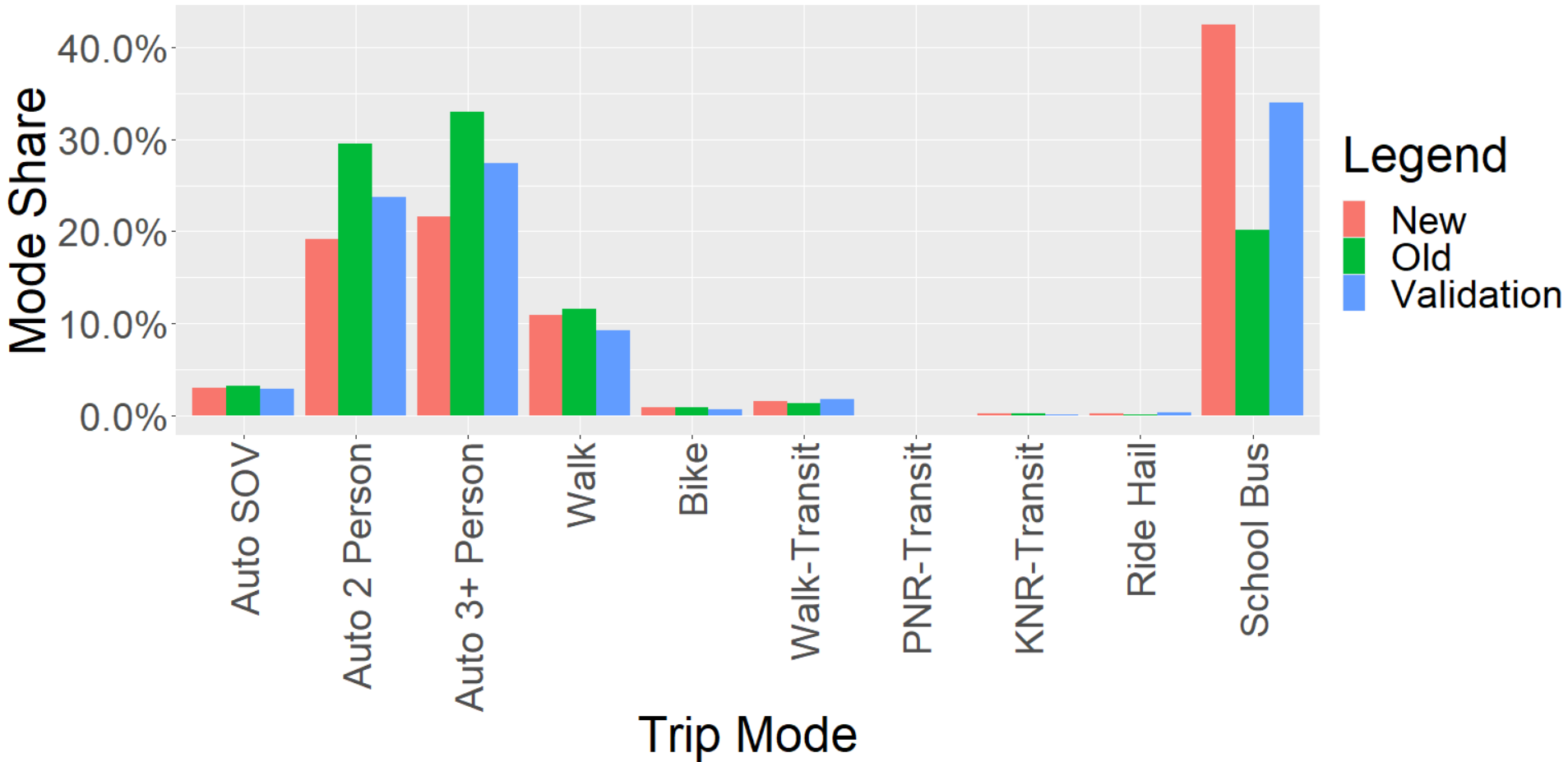
## University Trip Mode Choice





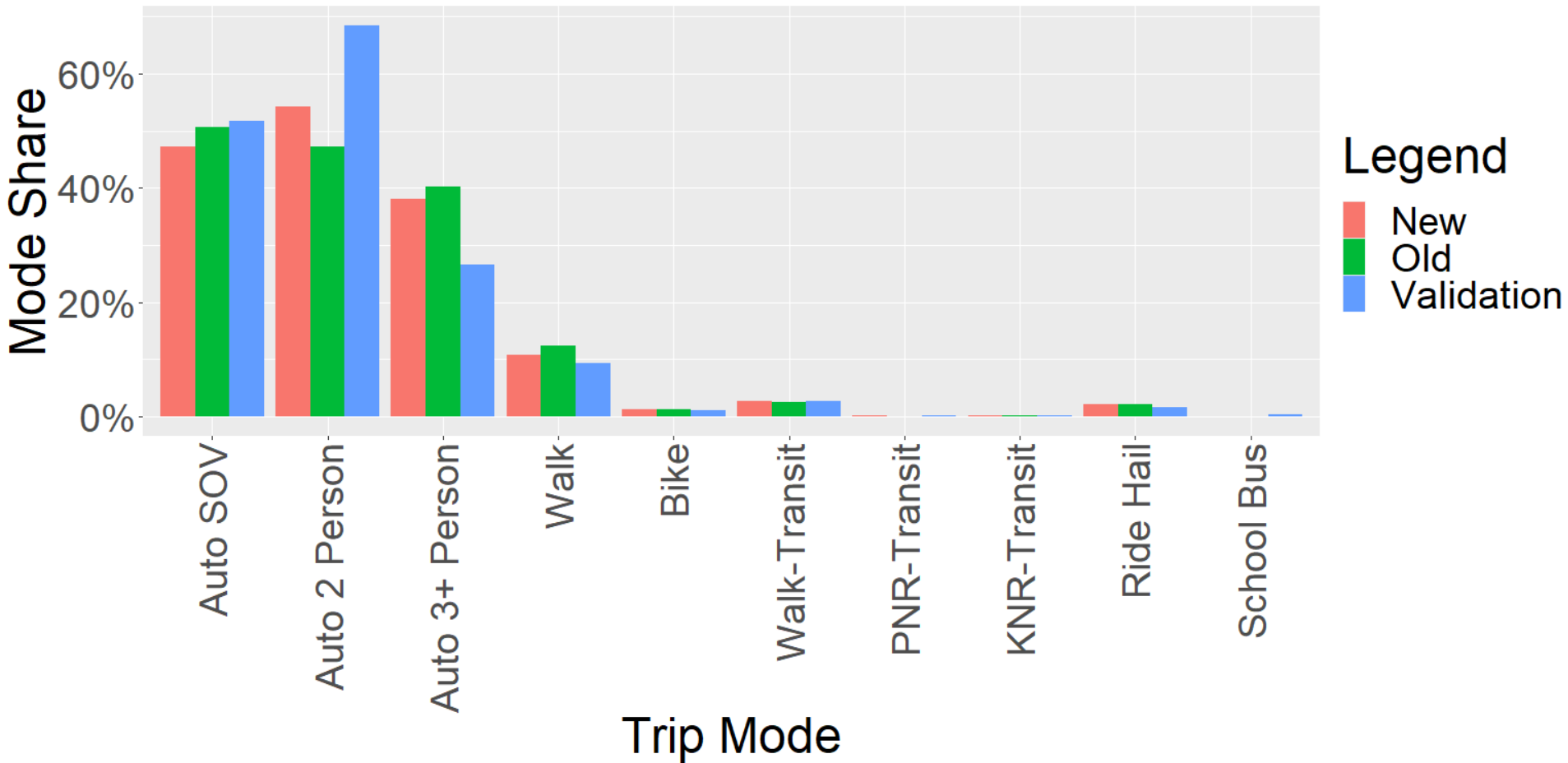
# School Trips

## School Trip Mode Choice



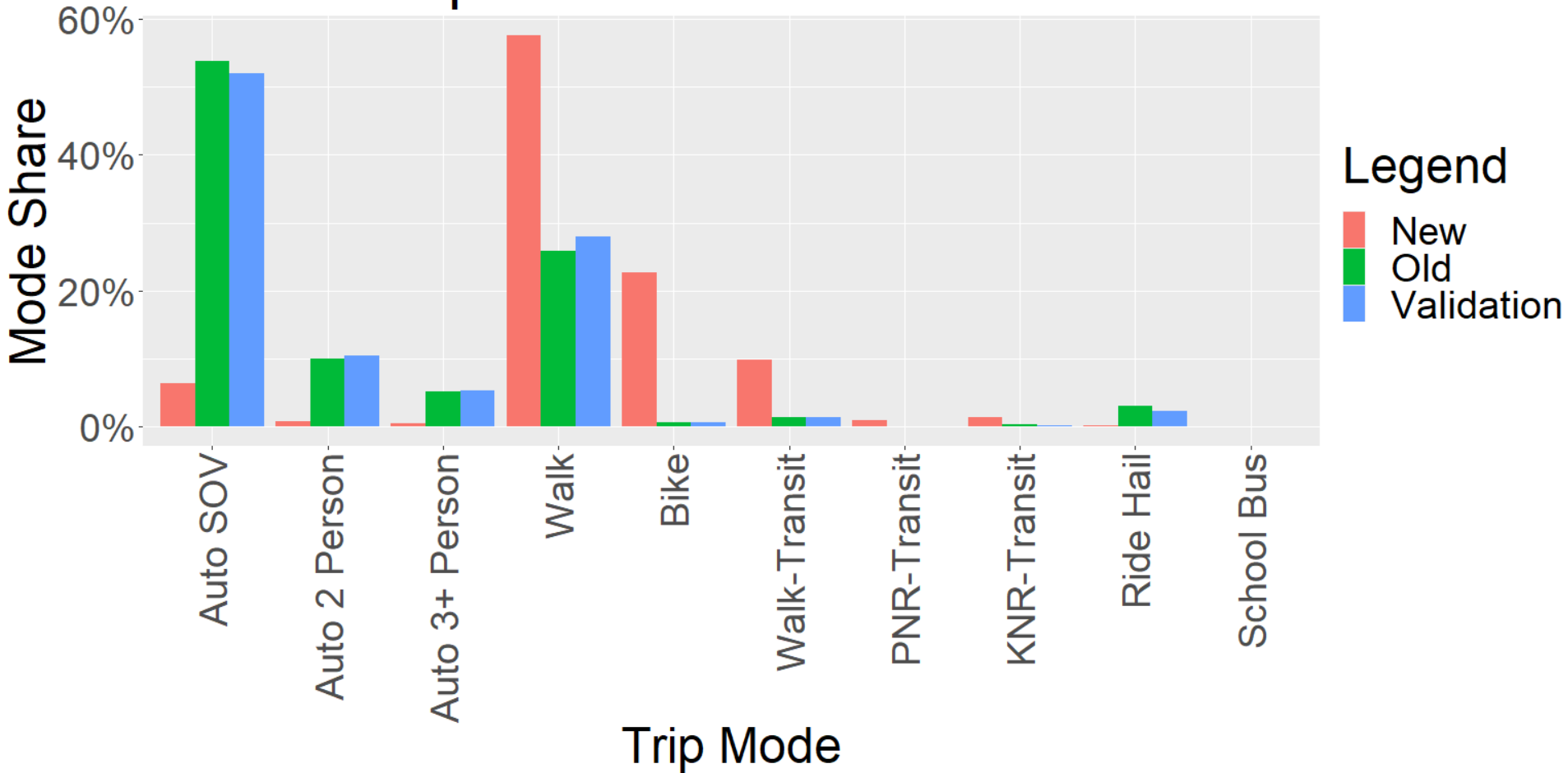
# Maintenance & Discretionary Trips

## Maintenance and Discretionary Trip Mode Choice



# At-Work Subtour Trips

## At-Work Trip Mode Choice





the science of insight



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