TELECOMMUTE SENSITIVITY TESTS

For COG/TPB Gen2 and Gen3 Travel Models

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Travel Forecasting Subcommittee
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Agenda Item 4

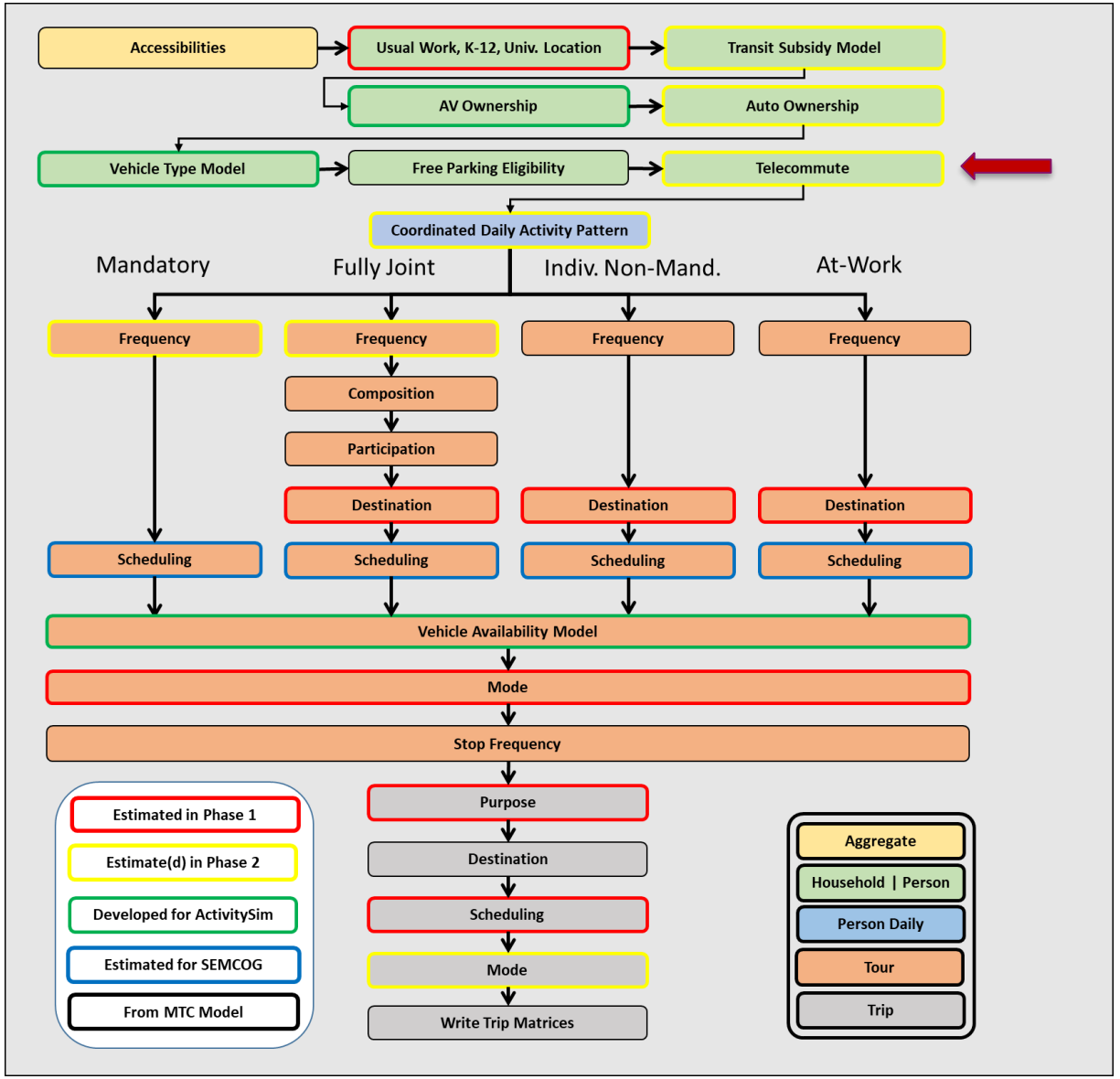
National Capital Region
Transportation Planning Board

Usability Testing

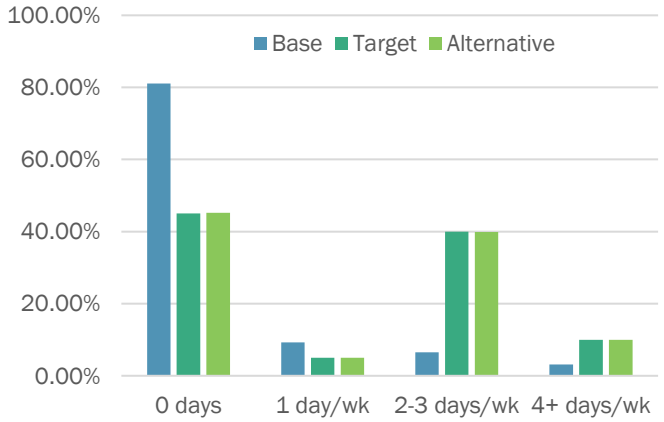
- Sensitivity tests were conducted in Phase 3 of the Gen3 Model development as a part of usability testing, mainly aiming to:
  - Compare Gen2 and Gen3 Model responses under similar conditions.
  - Showcase Gen3 Model's capability for in-depth analysis with disaggregate data.
- Staff completed three sensitivity tests representing year-2025 conditions:
  - Adding one lane, per direction, on I-95 between the DC and Baltimore beltways.
  - Imposing cordon pricing for trips going to the CBD in DC.
  - **Increasing the telecommute frequency in the TPB Planning Area.**

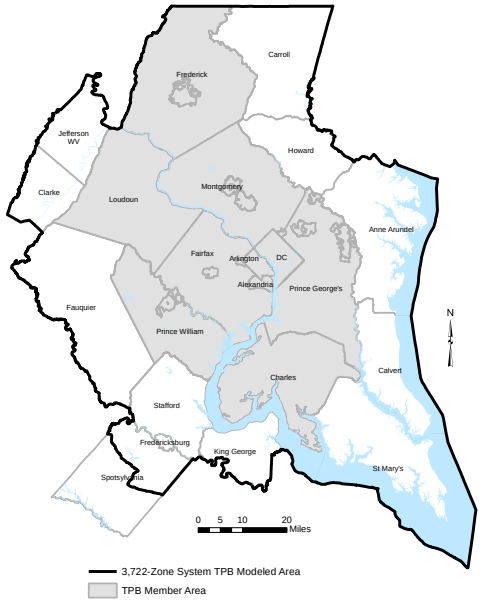
Telecommute Frequency Modeling in the Gen2 and Gen3 Models

- The Gen2 Model lacks explicit controls on telecommuting levels. The underlying telecommute levels in the calibration data (2007/2008 Household Travel Survey) are implicitly included in the Gen2 Model.
- By contrast, the Gen3 Model, which was calibrated with the 2017/2018 Regional Travel Survey, includes explicit ways to change assumptions about telecommute levels and to see the resultant travel response.



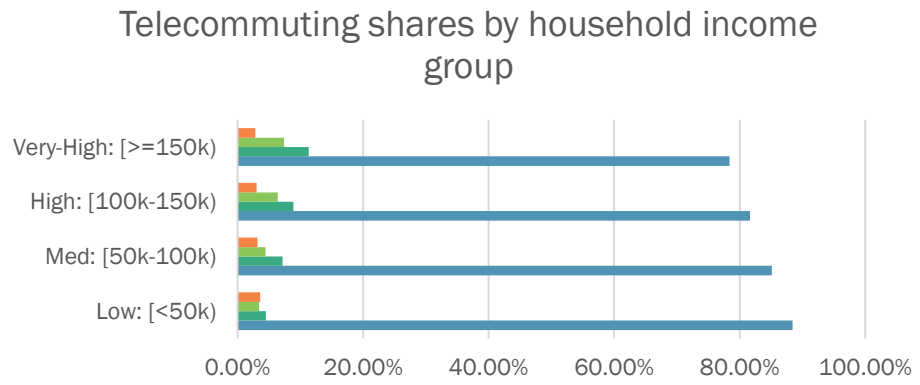
Telecommute Frequency Testing - Methodologies

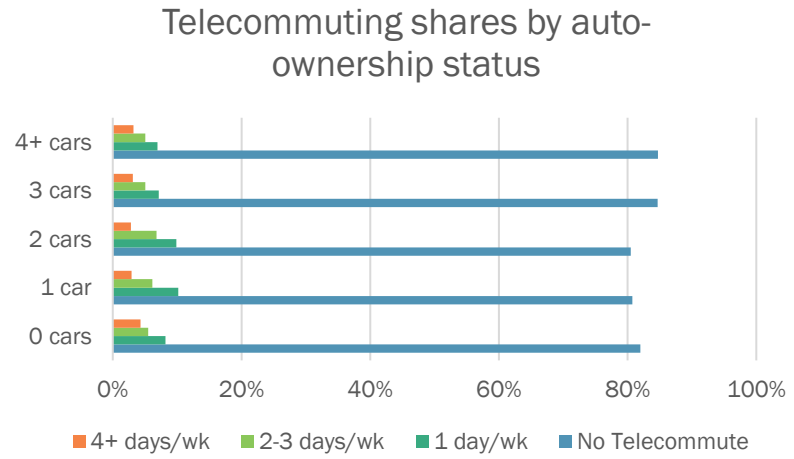


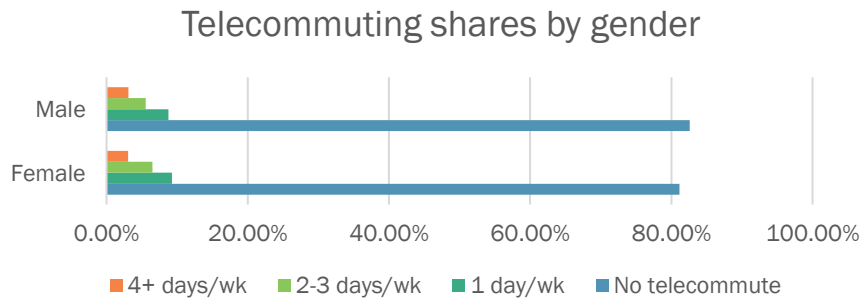


- Hypothetical assumption: Increased telecommuting frequency among workers working in the TPB Planning Area for year-2025.
- Scenarios and implementation methods:
  - Gen3: Added 3 new telecommute frequency coefficients and calibrated them to ensure that the resulting shares of workers by telecommute frequency align with the target shares.
  - Gen2: Reduced HBW trip production factors for TPB member jurisdictions by 14%, which is the reduction of HBW trips observed between the Gen3 Base and Alternative scenarios.
- Conducted model runs for Alternatives in both Gen2 and Gen3 models and compared model response (Alternative minus Baseline) between Gen2 and Gen3 Models and developed additional disaggregate - level summaries for Gen3 Model.

Overview of the Base Scenario (2025, TPB Planning Area, Gen3)

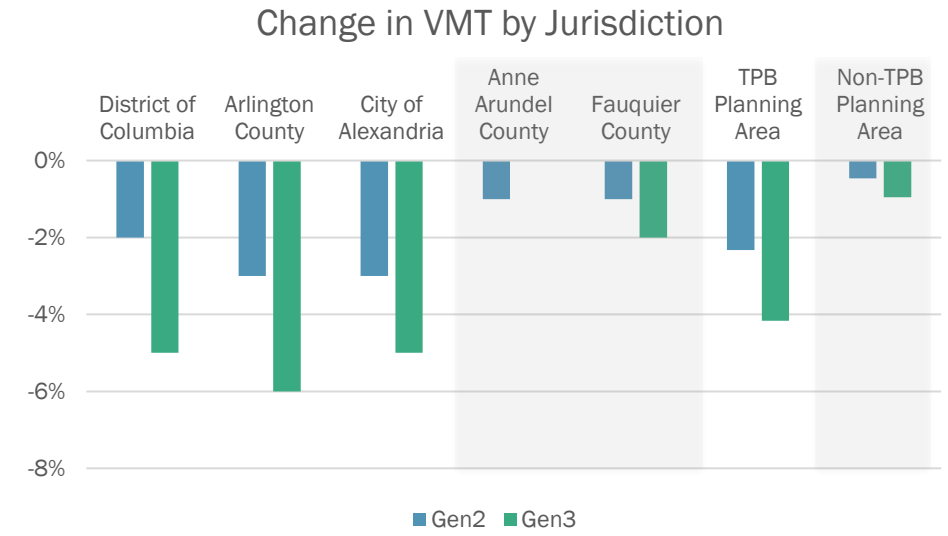


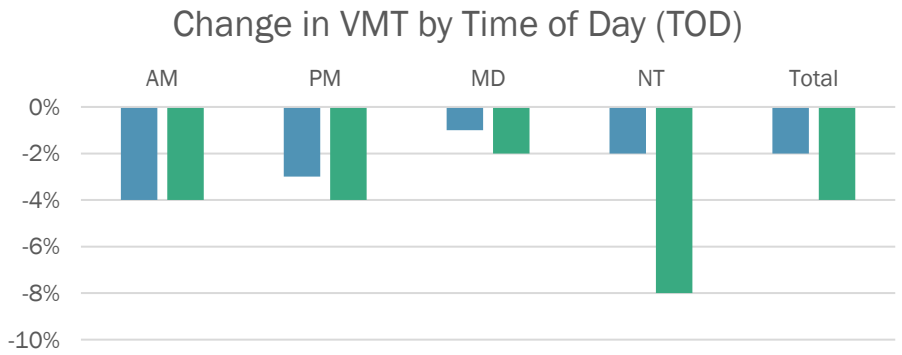




- With increasing household income, the share of workers who do not telecommute decreases.
- There are marginal differences between male and female telecommute patterns.
- For every auto ownership group, the share of workers who telecommute decreases as telecommuting frequency increases.

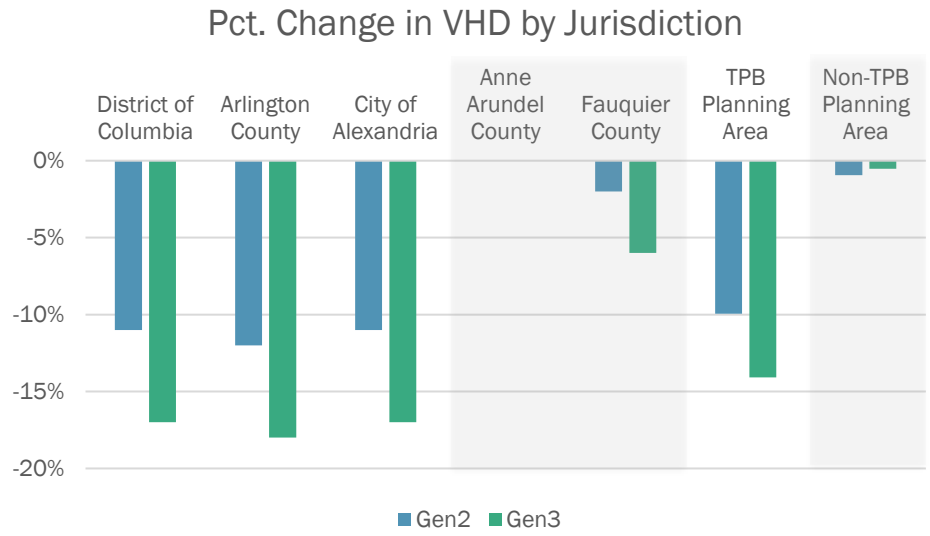
Aggregate Data Comparison – Vehicle Miles of Travel (VMT)

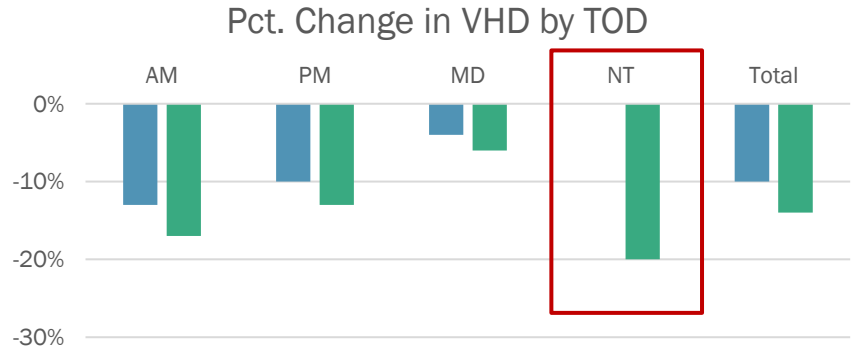




- The reduction in VMT was generally consistent in both models, with jurisdictions belonging to the TPB Planning area showing a greater percentage difference between the Base and Alternative scenarios than the peripheral, non-TPB jurisdictions.
- At the jurisdictional level, the Gen2 Model generally exhibited a less significant decrease in VMT than the Gen3 Model.
- Reductions in VMT were observed all 4 TOD periods for both models, including a noticeable drop in NT VMT in the Gen3 Model.

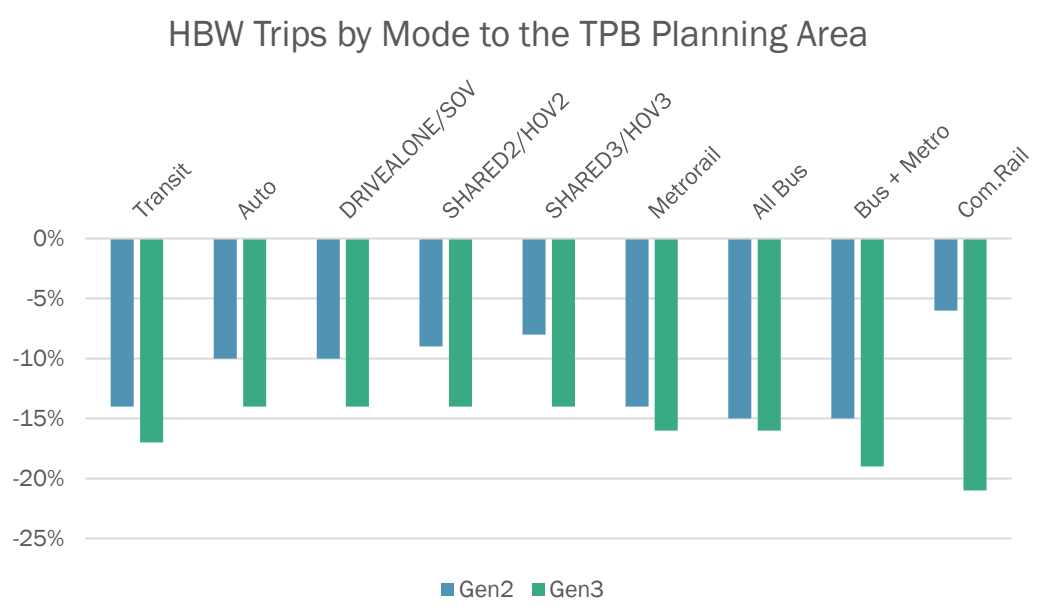
Aggregate Data Comparison – Vehicle Hours of Delay (VHD)





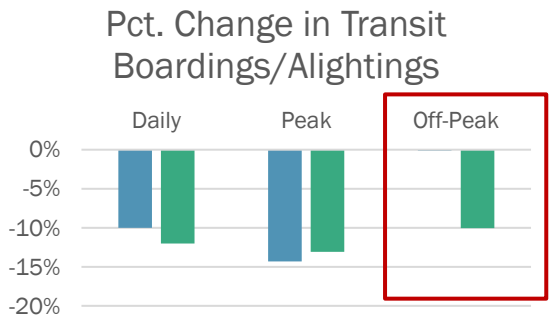
- The VHD in the Alternative scenario was lower than in the Base scenario in both models, indicating a reduction in travel demand and subsequent congestion.
- The largest decreases in VHD were observed for the core jurisdictions, whereas the non-TPB Planning Area experienced much less change in VHD.
- Reduction in VHD for the TPB Planning area was greater in the Gen3 Model than in the Gen2 Model.
- The pattern of change for VHD by time of day (TOD) was similar to that for VMT by TOD.

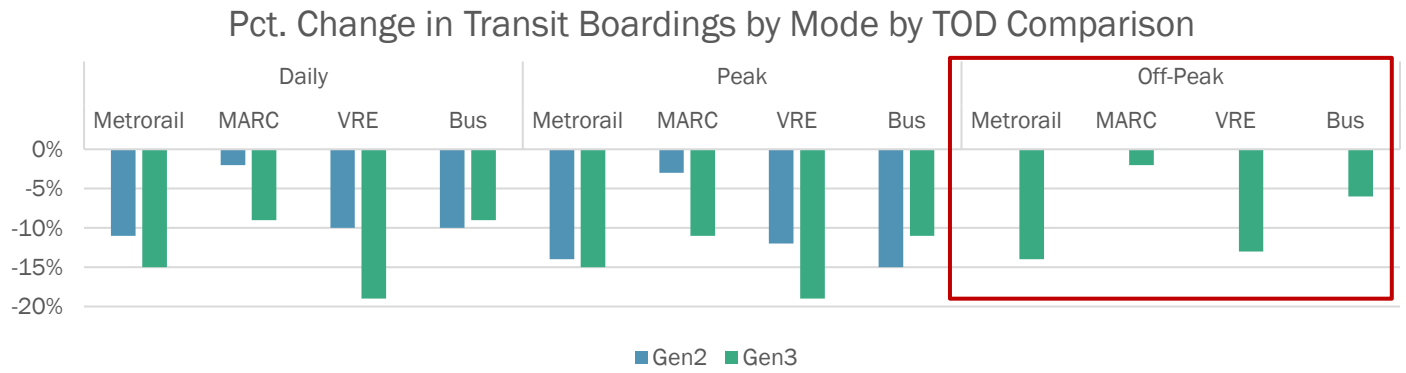
Aggregate Data Comparison – HBW Trips by Mode to the TPB Planning Area



- The Gen3 Model estimated a larger decrease in HBW trips for all modes compared to the Gen2 Model.
- For Commuter Rail, the Gen2 Model showed a reduction of 6%, the Gen3 Model indicated a reduction of 21%.

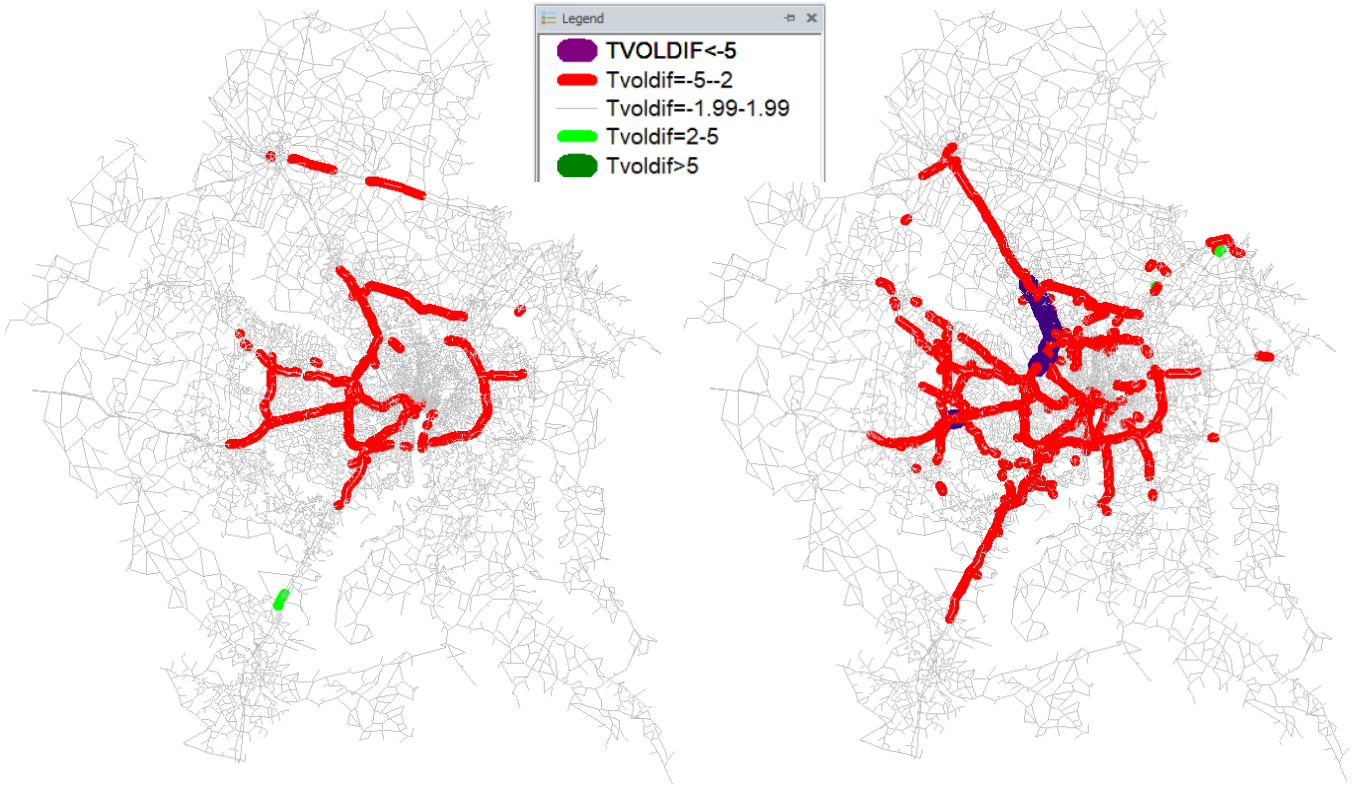
Aggregate Data Comparison – Transit Boardings





- The impacts of the telecommute change were generally comparable in both models.
- The Gen3 Model experienced a larger decrease in commuter rail trips compared to the Gen2 Model.
- Off-peak transit boardings in the Gen2 Model remained unchanged, while in the Gen3 Model, they dropped as expected .
    - HBW (home-based work) trips are assigned exclusively to peak periods in the Gen2 Model.

Aggregate Data Comparison – Daily Traffic Volume

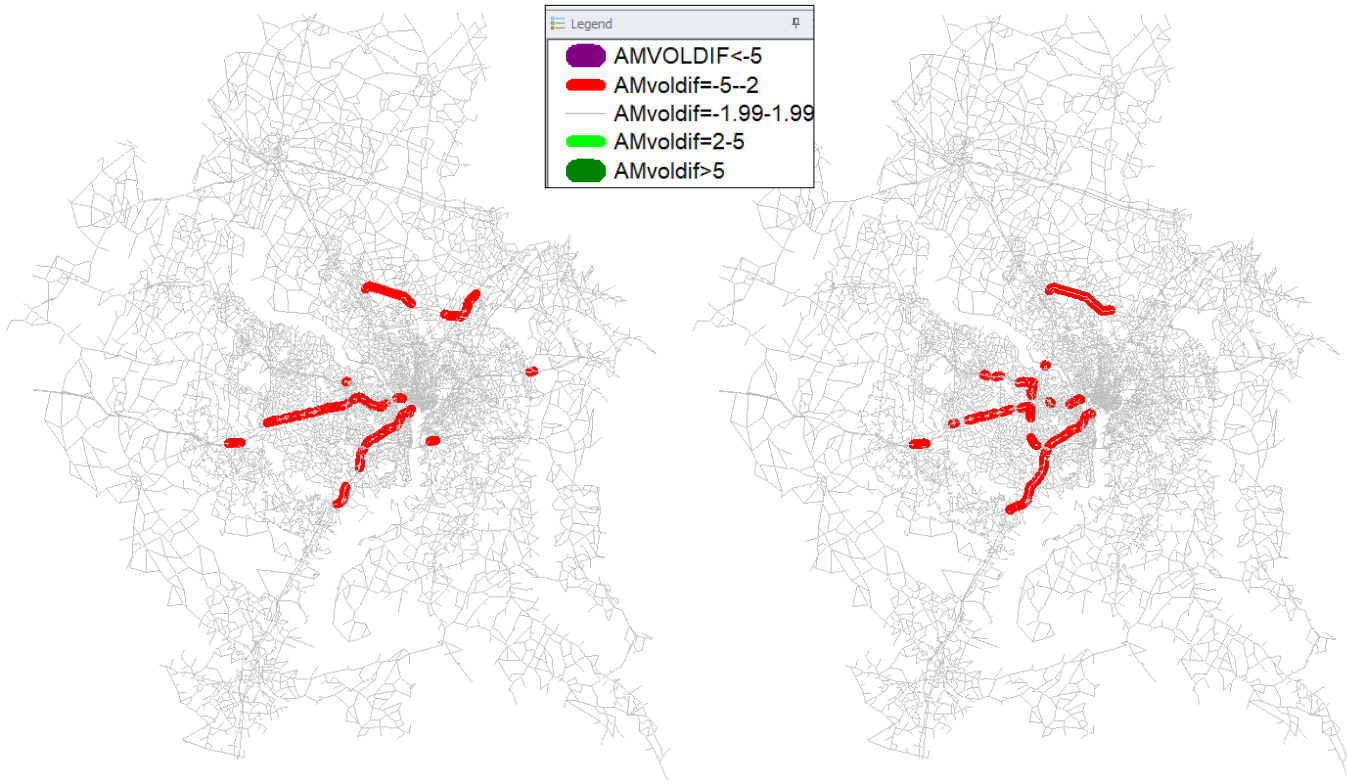


Gen2 daily volume difference

Gen3 daily volume difference

- Daily traffic volumes on freeways and expressways throughout the TPB Planning Area declined.
- The reduction in traffic was more significant and widespread in the Gen3 Model, extending further onto the I-270 and I-395/I-95 corridors.

Aggregate Data Comparison – AM Traffic Volume

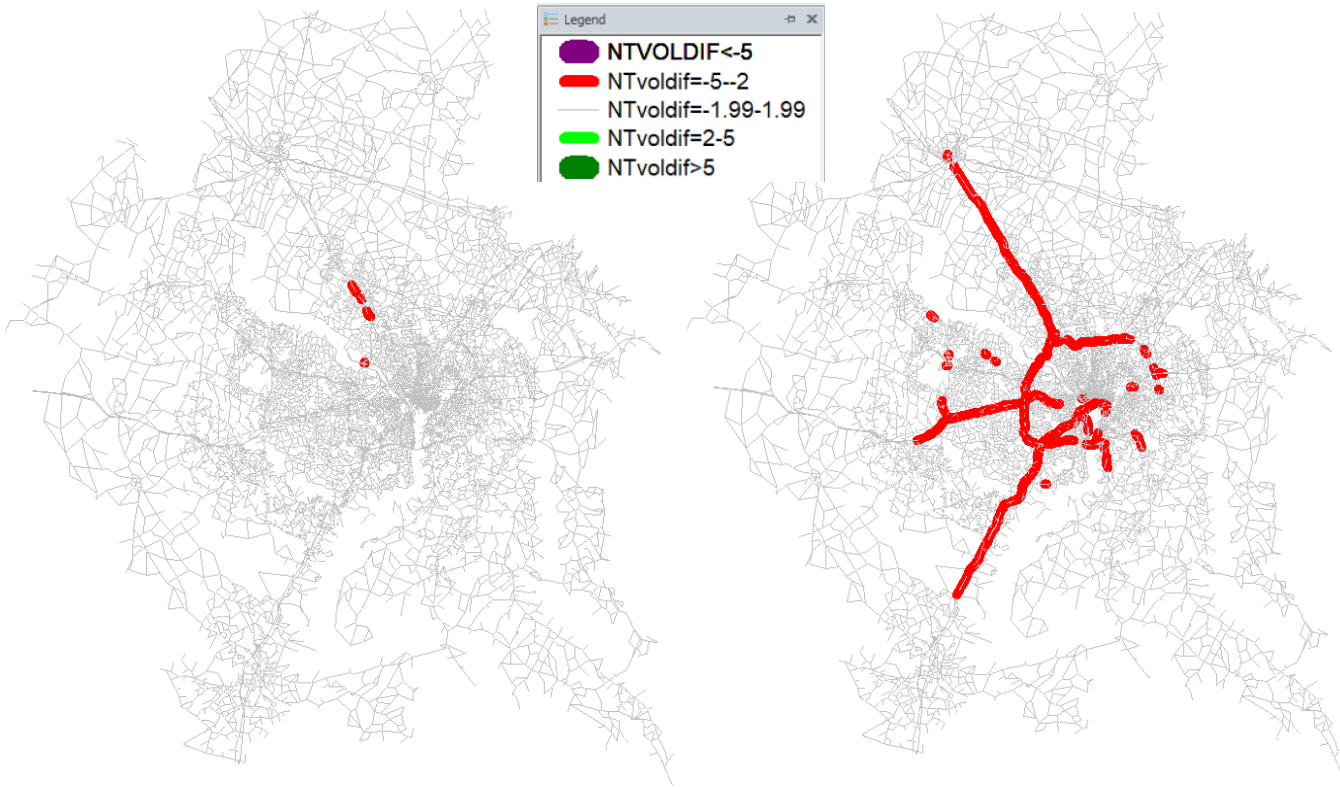


Gen2 AM volume difference

Gen3 AM volume difference

- The patterns of traffic volume reduction in AM peak were similar in both models.

Aggregate Data Comparison – NT Traffic Volume

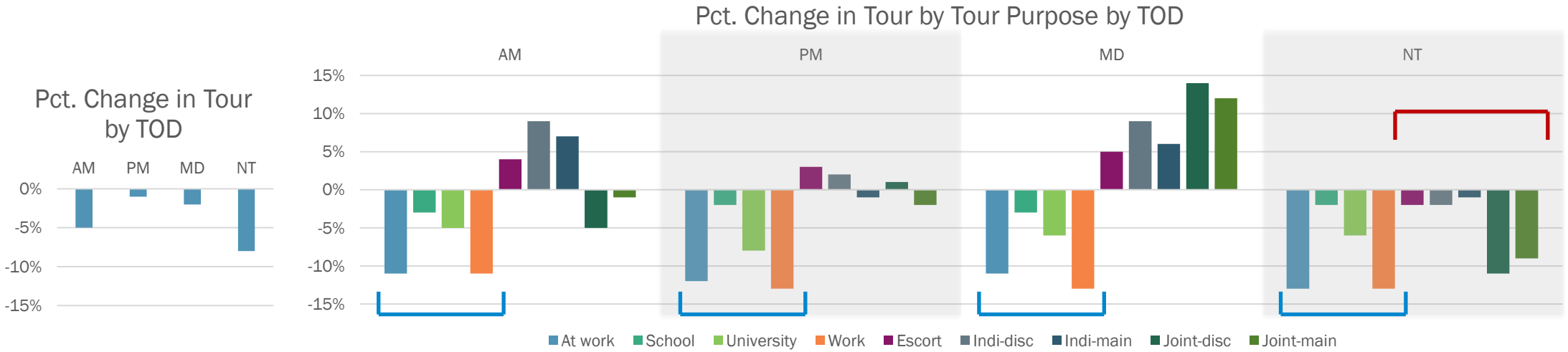


Gen2 NT volume difference

Gen3 NT volume difference

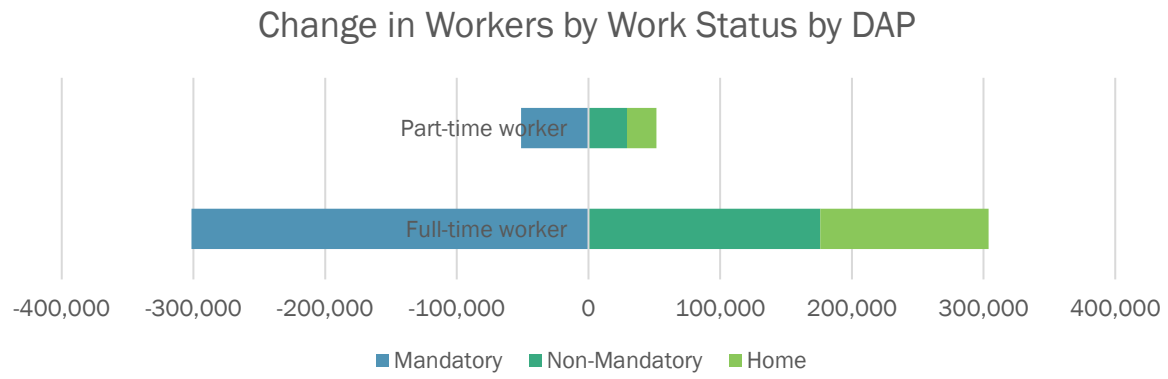
- The Gen2 Model exhibited little change in nighttime traffic volumes, while the Gen3 Model showed a noticeable decrease.

Disaggregate Data (Gen3) – Tour by TOD



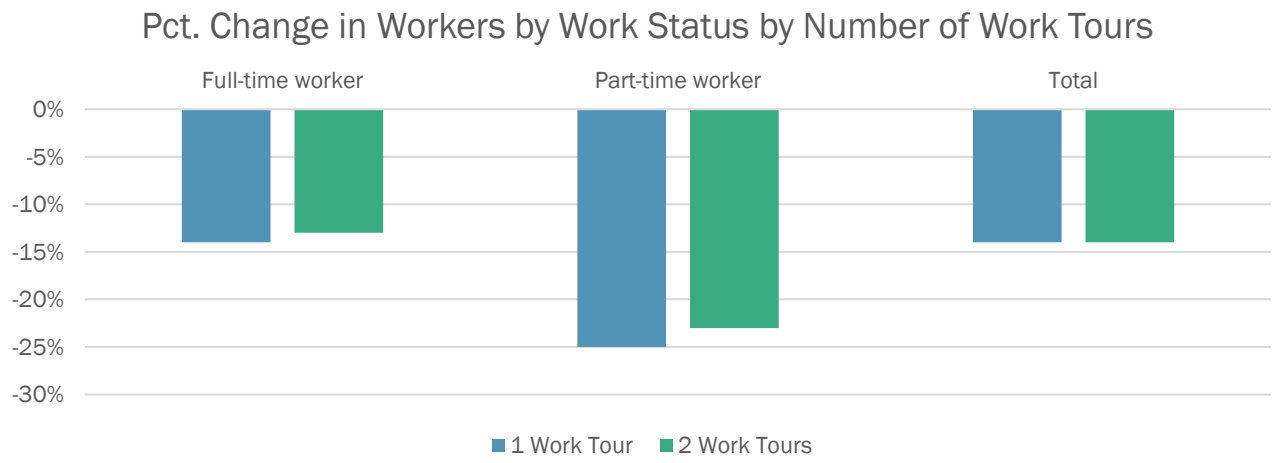
- The total number of tours decreased across all time periods, with the most significant percentage reduction observed during the NT period.
- As expected, mandatory tours decreased across all 4 TOD periods. Unexpectedly, tours for non-mandatory purposes during NT also fell.
  - Work hours of telecommuting workers are not explicitly blocked off for discretionary activities. As such, the model scheduled some discretionary activities (e.g., eat-out, shopping) for telecommuting workers during their work hours, which would have taken place in the evening hours.

Disaggregate Data (Gen3) – Daily Activity Pattern (DAP)



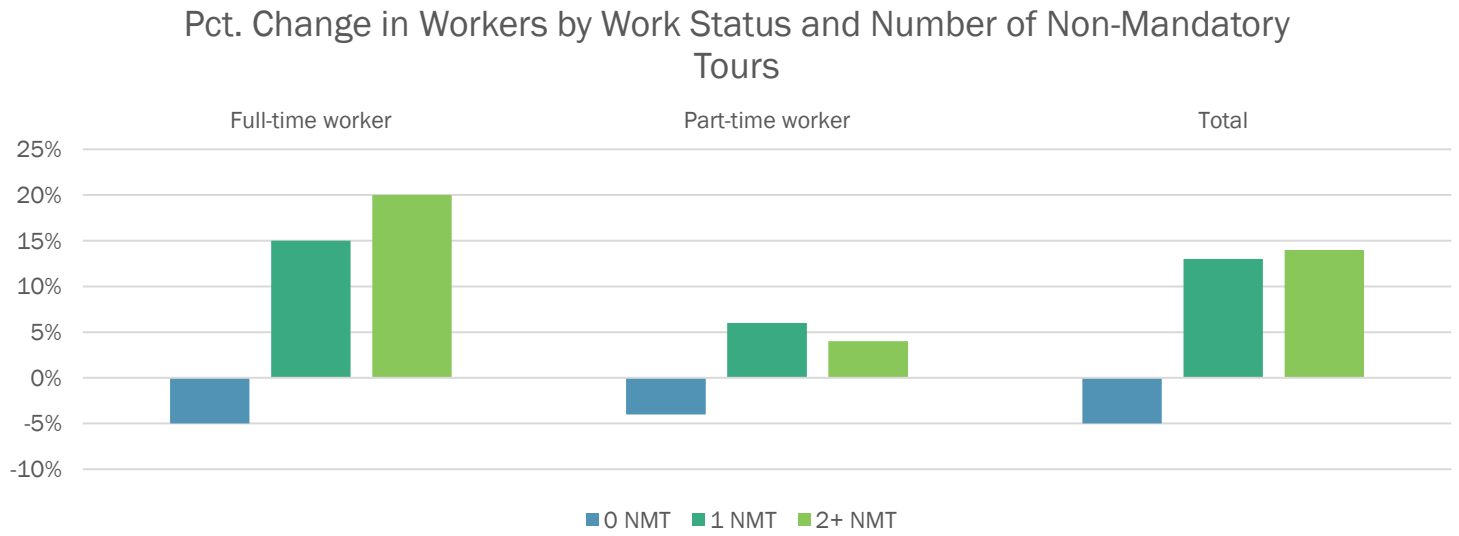
- 14% of workers shifted from a mandatory pattern to non-mandatory or home patterns, with more workers shifting towards non-mandatory compared to home.

Disaggregate Data (Gen3) – Workers by Work Status and Number of Work Tours



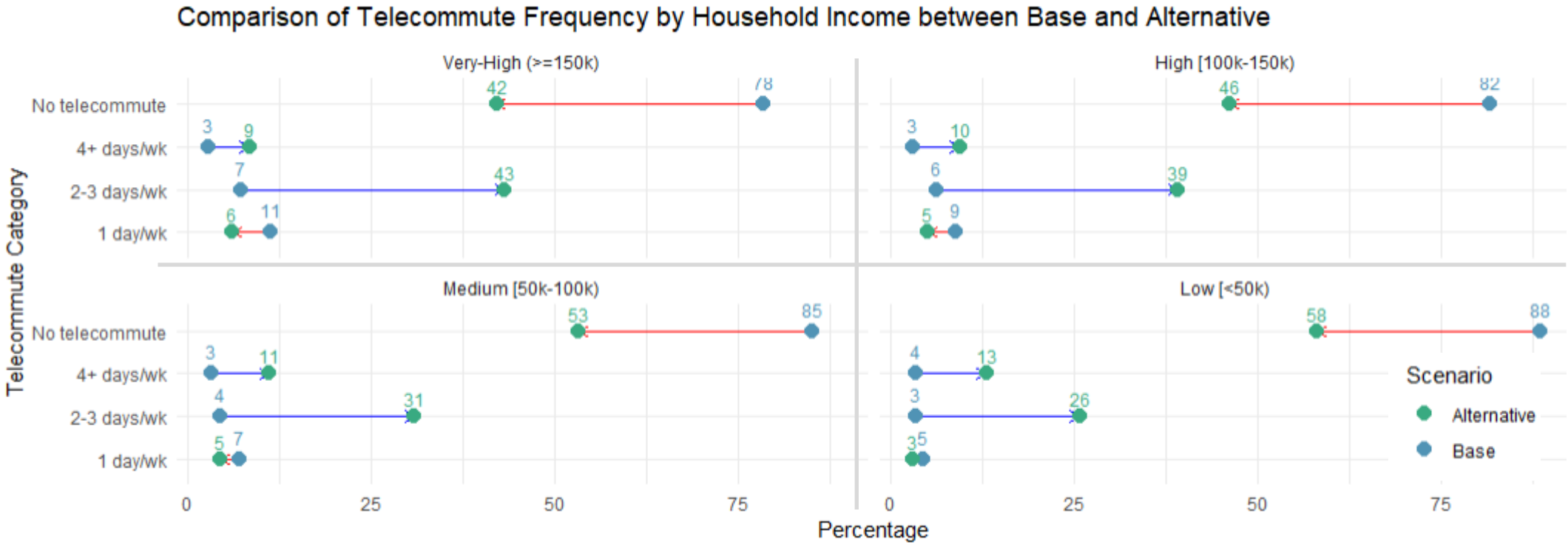
- The number of workers with at least one work tour decreased by 14%.
- The impacts of the increased telecommuting scenario were similar for workers who make one work tour and those who make two work tours.

Disaggregate Data (Gen3) - Workers by Work Status and Number of Non-Mandatory Tours



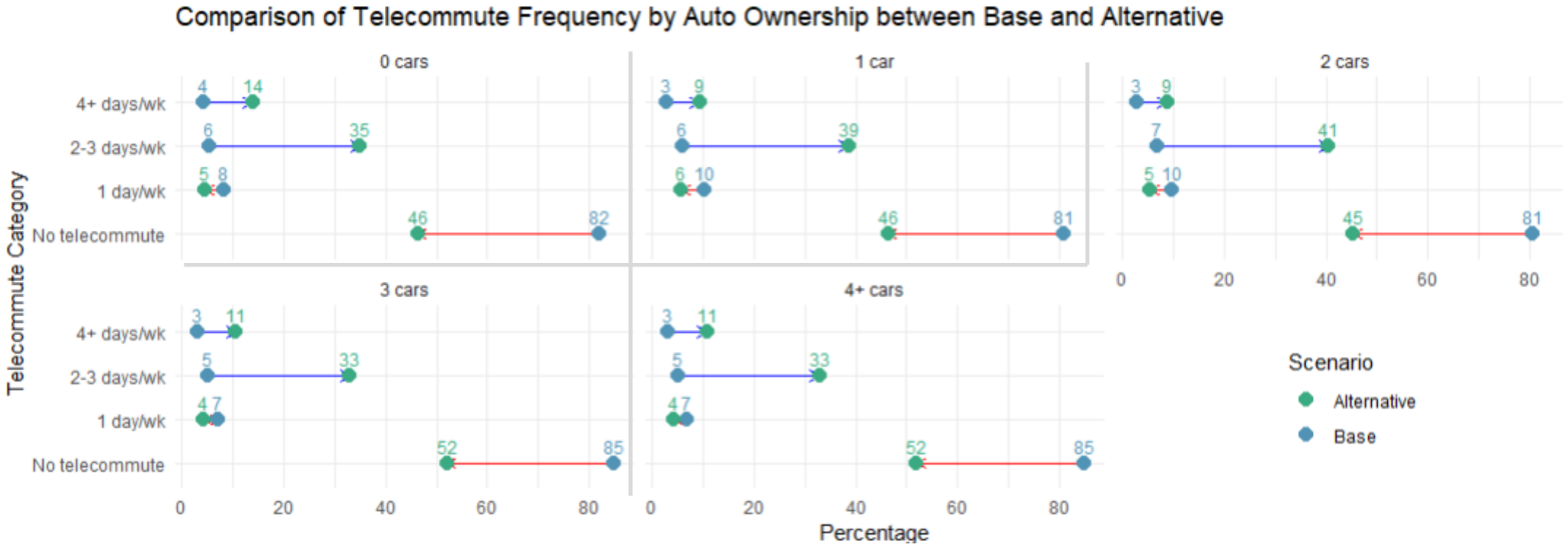
- Telecommuting workers have increased flexibility to engage in non-work activities during the day.

Disaggregate Data (Gen3) - Telecommuting Shares by Household Income Group



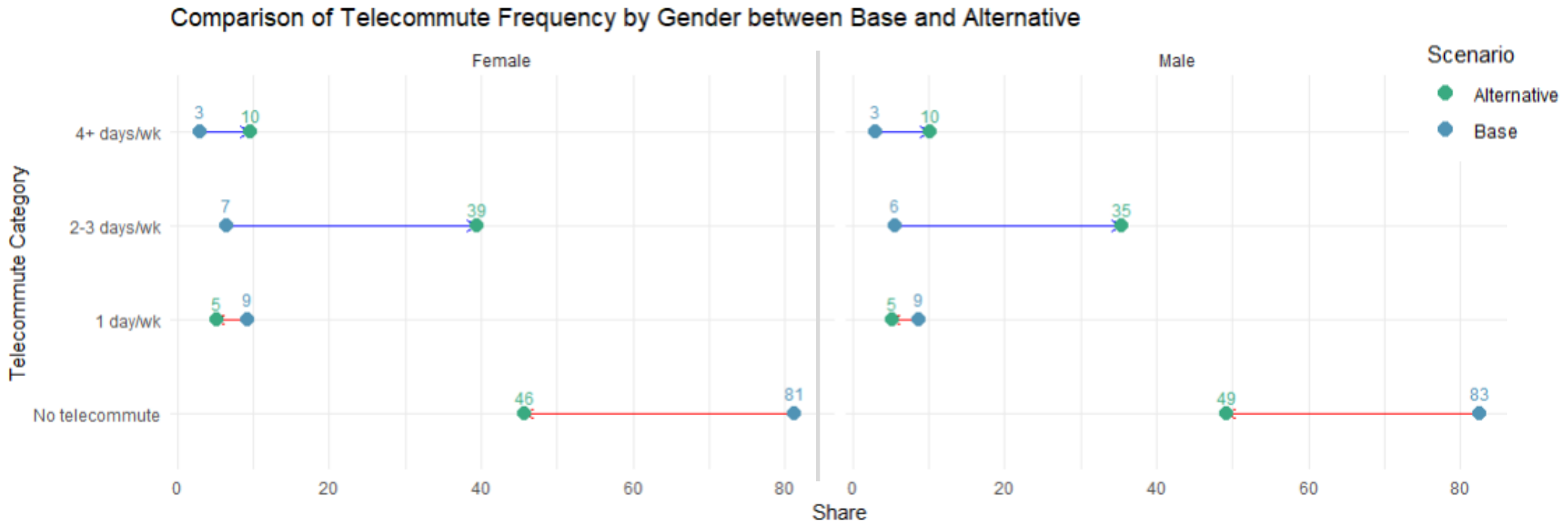
- Notable increase in telecommuting at every income level, with more pronounced changes for the 2-3 days/week telecommute category among higher-income households.

Disaggregate Data (Gen3) - Telecommuting Shares by Auto Ownership



- Telecommuting increased sharply across all auto ownership categories.
- The 2-3 days/week telecommute category saw the largest increases.

Disaggregate Data (Gen3) - Telecommuting Shares by Gender



- The differences in the impacts by gender are marginal.

Conclusions and Next Steps

- Key difference in modeling methodologies:
  - In the Gen2 Model, telecommuting is not explicitly simulated, so adjustments are subjectively applied to the trip tables or trip rate parameters based on accounting assumptions.
  - The Gen3 Model offers an advantage by using an explicit behavioral model that directly simulates how often people telecommute, capturing shifts from work to discretionary activities.
- The responses of both the Gen2 Model and the Gen3 Model were reasonable and in line with each other, with Gen3 Model generally being more sensitive to the increase in telecommute frequencies.
- The Gen2 Model predicted concentrated reductions in travel during peak periods, while the Gen3 Model showed decreases throughout the day.
- The Gen3 Model unrealistically shifted a significant number of non-mandatory tours from the NT period to the other periods. ActivitySim consortium is currently working with WSP to address this limitation.
- The Gen3 Model provides more in-depth insights for decision making and supporting more targeted policy refinement.

Acknowledgement

- Glenn Lang, who conducted test runs, summarized model outputs, and documented the work.
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