Introduction to the New Module of Multimodal Travel (VETravelDemand)

VisionEval Review Team Meeting #2

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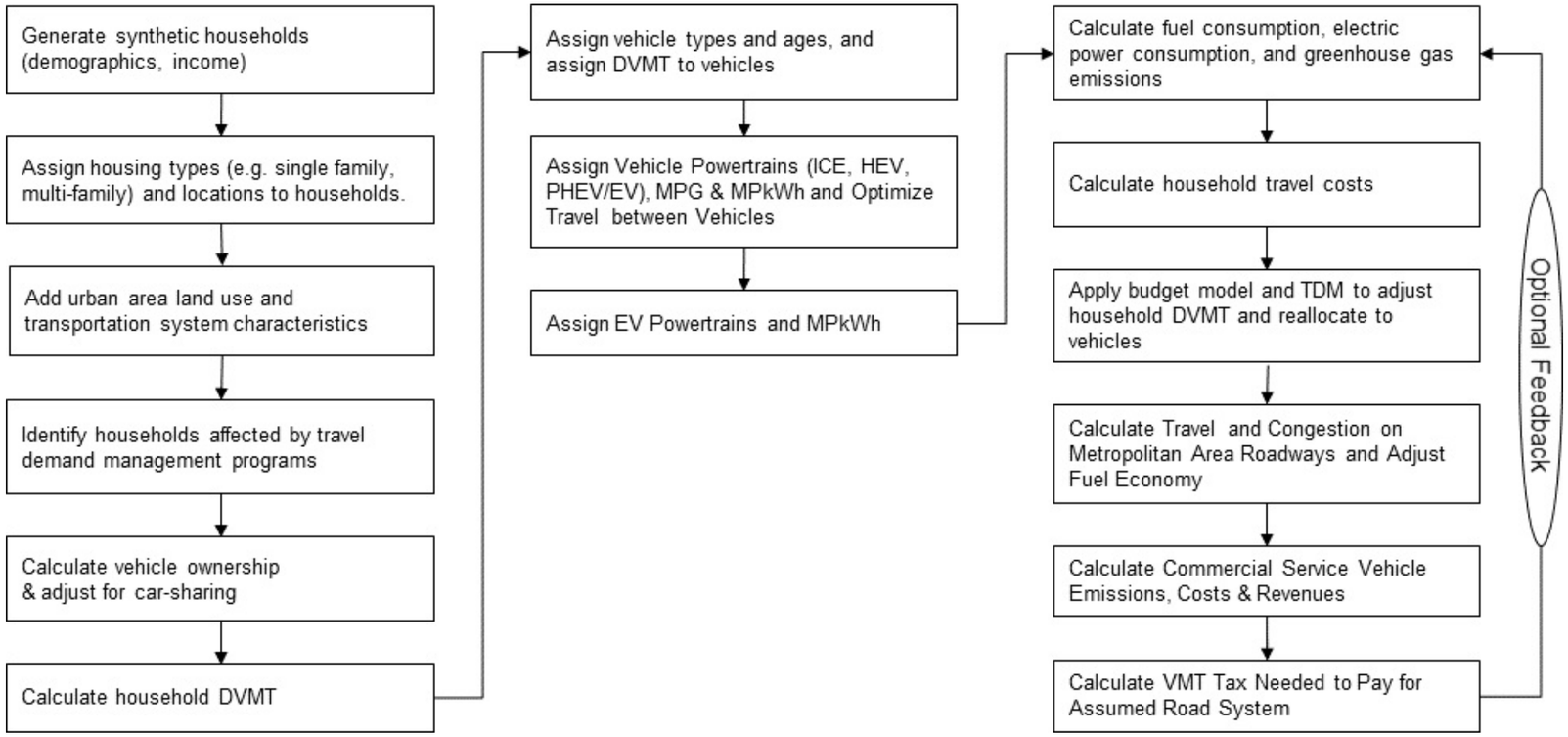
Outline

- Why the new module?
- Travel outcomes considered
- Model structure
- Data for model estimation
- Model specification

Why the new module?

> A deeper understanding of how mode choices and mode share may be impacted by policy and investment decisions
>
> Research the key drivers of multi-modal analysis, as they relate to individual households, annual household travel, household budgets and price sensitivity. The research will explore travel survey (household and transit) and consumer expenditure data. The general research findings will support planning questions on these topics, and will bolster ODOT, region, and local analysis capabilities specifically by implementing a module that can be plugged into existing tools (RSPM)

RSPM Design


Generate synthetic households (demographics, income)
Assign housing types (e.g. single family, multi-family) and locations to households.
Add urban area land use and transportation system characteristics
Identify households affected by travel demand management programs
Calculate vehicle ownership & adjust for car-sharing
Calculate household DVMT
Assign vehicle types and ages, and assign DVMT to vehicles
Assign Vehicle Powertrains (ICE, HEV, PHEV/EV), MPG & MPkWh and Optimize Travel between Vehicles
Assign EV Powertrains and MPkWh
Calculate fuel consumption, electric power consumption, and greenhouse gas emissions
Calculate household travel costs
Apply budget model and TDM to adjust household DVMT and reallocate to vehicles
Calculate Travel and Congestion on Metropolitan Area Roadways and Adjust Fuel Economy
Calculate Commercial Service Vehicle Emissions, Costs & Revenues
Calculate VMT Tax Needed to Pay for Assumed Road System
Optional Feedback

Objectives

- Development models for multimodal travel: Driving, Transit, Bike, Walk
- At a minimum, update RSPM household VMT module with latest data
- Implement the new models for RSPM (original plan)

Travel outcome considered

- Household VMT
  - Daily VMT
  - Annual average daily VMT
- PMT for Transit, Bike, and Walk (PMT model)
- Trip frequency and average trip length for Transit, Bike, and Walk (TFL model)

Model structure

- 2-step models:
  1. binomial logistic regression of zero VMT/PMT
  2. power-transformed/semi-log regression model of non-zero VMT/PMT
- hurdle model and zero-inflated negative binomial:
  - Transit, Bike, and Walk trip frequency
- Tobit model
  - VMT/PMT, average trip length

Data for model estimation

- 2009 National Household Travel Survey (NHTS) with confidential residence block group information
- EPA Smart Location Database: nationwide built environment/urban form at the block group level
- HMPS: UZA-level roadway characteristics
- NTD: UZA-level transit supply

Variables - 1

- Variable "cheatsheet" (credit Tara Weidner)
- Household social-economic status:
  - HHSize, life cycle, #workers, income, drivers, vehicles per driver, # children, # retirees, dwelling type
- Regionwide variables:
  - Transportation system supply: freeway lane miles per capita, arterial lane miles per capita, transit revenue miles per capita
  - Size (area, population, employment), density

Variables - 2

- 5D built environment measures (home location):
  - Density: du/acre (D1A), population/acre (D1B), employment/acre (D1C), activity (pop+emp)/acre (D1D)
  - Diversity: Emp & HH entropy (D2A_EPHHM)
  - Design: Lane mile ped-oriented density/sqmi (D3apo), Intersection density-4+ leg multi-modal/sqmi (D3bmm4), Intersection density-4+ leg ped-oriented/sqmi (D3bpo4)
  - Transit: %CBG employment within 1⁄2 mile of fixed- guideway transit stop (D4b050), PM Peak transit svc hrly freq within 1/4 mile of block group boundary (D4c)
  - Accessibility: Emp within 45 minutes auto (D5ar), Ratio Emp Auto Accessibility vs Total MSA (D5cr), Harmonic mean of Emp within 2 miles and Pop within 5 miles (ACCESS), Emp within 5 mile of blockgroup centroid (EMPTOT_5)