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# New Methods in Transportation Planning

## Today's Agenda

- Review of Transportation Planning Process
- Review of 4-Step Travel Demand Model
- Discussion of changing travel patterns
- New Methods for Travel Demand Forecasting

## **Transportation Planning**

- Purpose is to generate information for decisionmakers
- Planning is the PROCESS of answering:
  - Where are we now?
  - Where do we want to go?
  - What will guide us?
  - How will we get there?

Source: Meyer and Miller, "Urban Transportation Planning"

## **Transportation Planning Process**

- Establishing α vision
- Understanding decisions to be made
- <u>Assessing</u> opportunities and limitations
- Identifying consequences of alternatives
- Relating alternatives to goals and objectives
- Presenting information to decision-makers
- Helping develop investment program

Source: Meyer and Miller, "Urban Transportation Planning"

# Transportation Planning ≠ Travel Demand Forecasting

## **Transportation Planning Process**



## **Transportation Planning Process**



## 4 Step Model



## New Era $\rightarrow$ New Methods

- Sustainability
- Performance Measurement
- Growth Management
- Multi-modal Planning
- Travel Demand Forecasting

#### New Era $\rightarrow$ New Methods

- The 4-step Model has been used by almost every MPO in the nation for 50 years
- Are there failings in the 4-step Model?

## **Exercise in Trip Chaining**

Draw a picture of how you traveled yesterday



## Travel in 1950's





## Travel in 1950's





#### A typical Wednesday for my family



#### A typical Wednesday for my family



## **Problems with the 4 Step Model**

- Trip chaining
- No time-of-day component
- Aggregation
- No lifestyle and mobility effects
- Limited behavioral responses
- Not responsive to policy issues
  - TDM, pricing, parking, walkability

Source: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/amos/

## **Activity-based approach**

- Travel is a demand that arises through the need or desire to take part in an activity
- Decision-process underlying travel behavior
- Dependencies among activities and among people  $\rightarrow$  also among trips

Source: http://tmip.fhwa.dot.gov/resources/clearinghouse/docs/amos/



## **Columbus Travel Demand Model**



#### **1.** Household / Population Synthesis

- Generates list of HH and population for entire area
- Output = record for every person in the area (1.5 million)
- Contains:
  - household they belong to
  - household size (1, 2, 3, 4 or 5+)
  - household income level (high, medium or low)
  - type of worker or person (full-time worker, student, etc)

## 2. Auto Ownership Model

- Determines # vehicles available by HH
  Based on:
  - household size and composition
  - income group
  - density-based area type
  - transit accessibility of TAZ
  - ratio of cars to workers
- Also runs Parking Model

# 3. Daily Activity Pattern Model

- Determines the daily activity for each person
   Includes:
  - mandatory activities (work, university or school),
  - non-mandatory activities (shopping, etc)
  - no activities
- Up to 3 mandatory tours THEN available time for other travel opportunities

#### 4. Ordered Tour Production / Joint Travel Model

- Determines joint travel amongst household members
- Hierarchy:
  - Child aged o-5
  - School child aged 6-15
  - School child of driving age (16-17)
  - University student
  - Full-time working adult
  - Part-time working adult
  - Non-working adult
- Processed as a single unit

## **Columbus Travel Demand Model**



## 7. Time of Day Choice Model

- Based on a time windows concept:
- Early Morning (4:00 AM 6:30 AM)
- AM Peak (6:30 AM 9:30 AM)
- Midday (9:30 AM 3:30 PM)
- PM Peak (3:30 PM 6:30 PM)
- Evening / Night (6:30 PM 4:00 AM)
- Micro-simulation approach schedules tour and updates available time window

#### 9. Stops and Trip Mode Choice Model

- Determines if stops are made and location
- Sets exact mode for each segment
- Allows one each:
  - in-bound stops
  - out-bound stops
  - sub-tours at destination
- Modes available dependent on primary tour mode

## **Columbus Travel Demand Model**



# Why learning 4-step model?

- Still used by most MPO's
  - Time
  - Money
  - Computing Power
- Model components based on same ideas
  - Destination", "Mode Choice" and "Assignment"
  - Logit models, incremental or equilibrium assignment

## Summary

 Transportation Planning is a process
 Goals & Objectives → Problems → Alternatives → Evaluation → Inform Decision-Makers

- Travel has changed over last 60 years
  New methods needed to respond
  - Activity-based modeling

## Thoughts to ponder

- Transportation has changed immensely in 60 years since introduction of 4-step model
- Planners typical plan for a 25-year horizon
- What do you think transportation will be like in 25 years?