

# Travel Demand Modeling

---

- Transportation planning requires:
  - Evaluation of current travel patterns
  - Forecasting future travel trends
  - Evaluation of future infrastructure and transportation service needs
- Travel Demand Modeling is a 4-step process:
  - Trip Generation (how many trips?) \*
  - Trip Distribution (where do you want to go?) \*
  - Mode Choice (how do you want to get there?)
  - Trip Assignment (which route?)

# Trip Generation

---

- 2 Types of Uses:
  - Transportation planning process that involves large parts (zones) of urban areas.
    - Goal: forecast the number of trips that will begin from or end in each travel-analysis zone (TAZ)
  - Planning/Forecasting based on trips made to a particular land use site.
    - Goal: determine impact of development, land use changes, etc.

# Trip Generation

---

- For transportation planning, zonal trips are estimated for a variety of trip purposes:
  - Work trips
  - School trips
  - Shopping trips
  - Social or recreational trips
- Models may be zonal or household-based
  - Zonal – area is divided into smaller units (zone) and an estimate of trips generated in each zone is obtained
  - Household – disaggregate model; zones are decomposed into smaller units based on households with similar characteristics

# Trip Generation

---

- Trip production – trip end connected with a residential land use in a zone
- Trip attraction – trip end connected to a non-residential land use in a zone
- Pass-by trip – trips are attracted from existing traffic on adjacent streets (this traffic does not represent additional traffic to the street network) Examples: banks, service stations, convenience stores
- Link-diverted trips – trips are produced from the traffic on roadways within the vicinity of the generator, and require a diversion; new traffic will be added to the streets adjacent to the site

# Trip Generation

---

- Regression models are typically used to estimate trip generation (minimize the number of independent variables)
- Typical model used to estimate trips originating in a typical household for a given residential area:

$$T = a_0 + a_1X_1 + a_2X_2 + \dots a_nX_n$$

Where:

$X_i$  is a factor that explains the level of trip-making (i.e. car ownership, family income, log of net residential density, family size, dwelling units/acre, age of residents, etc.)

$a_i$  is the coefficient that converts  $X$  to number of trips generated

# Trip Generation – Example

---

- A large residential area has 1500 households with an average household income of \$15,000, an average household size of 5.2, and, on average, 1.2 working members. Using the model described in Example 8.2, (assuming it was estimated using zonal averages instead of individual households), predict the change in the number of peak-hour social/recreational trips if employment in the area increases by 20% and household income by 10%. (Problem 8.3)

# Trip Generation

---

- ITE Trip Generation Report- compilation of trip generation studies done by consultants, government agencies, and ITE student chapters across the United States
- Includes:
  - Number of studies
  - Time of day/day of week collected
  - Directional distribution
  - Trip generation per 1000 sq. ft.
  - Regression equation

# Trip Generation - Example

## Supermarket (850)

Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area  
On a: Weekday,  
P.M. Peak Hour of Generator

Number of Studies: 9  
Average 1000 Sq. Feet GFA: 31  
Directional Distribution: 53% entering, 47% exiting

### Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
12.02	6.50 - 20.00	4.75

### Data Plot and Equation

