Methods to Estimate Through Trips

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CE566
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The Need

- Through trips are important to make decisions concerning bypasses and truck re-routing.
- The most common method to synthesize a through trip table is by conducting a vehicle license plate survey.
- Smaller communities cannot afford to conduct such surveys.
Modlin’s Method

- NCHRP365, Chapter 5
- Allows user to obtain the through trip table using readily available information (AADT, road classification, etc.)
- Reasonable performance for communities 5,000-50,000 residents
- Easy to implement and use
La Porte Study Area
Modlin’s Method Steps

- Define study area and external stations
- Find percentage of through (external-external) trips at each origin station (Table 19)
- Determine the through trip percentage distribution (Table 20)
- Balance so that the trip percentages at each origin add up to 100% (Tables 20 and 21)
- Calculate the number of trips and balance to AADT (Tables 22 and 23)
Modlin Step 1 (5-1)

\[ Y_i = 76.76 + (11.22*I) - (25.74*PA) - (42.18*MA) + (0.00012*ADT_i) + \\
(0.59*PTKS_i) - (0.48*PPS_i) - (0.000417*POP) \]

- \( Y_i \) = percentage of the AADT at external station \( i \), that are through trips
- \( I \) = interstate (0 or 1)
- \( PA \) = principal arterial (0 or 1)
- \( MA \) = minor arterial (0 or 1)
- \( ADT_i \) = average daily traffic at external station \( i \)
- \( PTKS_i \) = percentage of trucks excluding vans and pickups at external station \( i \)
- \( PPS_i \) = percentage of vans and pickups at external station \( i \)
- \( POP \) = population inside the cordon area
Modlin Step 2 (5-2 to 5-4)

- If the destination station is located on an Interstate:

\[ Y_{ij} = -2.70 + (0.21 \times \text{PTTDES}_j) + (67.86 \times \text{RTECON}_{ij}) \]

- Principal Arterial:

\[ Y_{ij} = -7.40 + (0.55 \times \text{PTTDES}_j) + (24.68 \times \text{RTECON}_{ij}) + 45.62 \times (\frac{\text{ADT}_j}{\Sigma \text{ADT}_j}) \]

- Minor Arterial:

\[ Y_{ij} = -0.63 + (30.04 \times \text{RTECON}_{ij}) + 86.68 \times (\frac{\text{ADT}_j}{\Sigma \text{ADT}_j}) \]

- \( \text{PTTDES}_j \) = % through trips at station j
- \( \text{RTECON}_{ij} \) = route continuity between i and j
- \( \text{ADT}_j \) = AADT at station j
Problems with Modlin

- Modlin’s method often overpredicts through trips (as in the cases of La Porte and Greenfield).
- There’s no statistical reason to use linear regression.
  - The through trip percentages don’t add up to 100%.
- RTECON$_{ij}$ is a subjective factor.
- Percentage of pickup trucks and vans is not easy to obtain.
Other E-E Estimation Tools

- Anderson’s model
  - Attempts to incorporate the impact of nearby major center

- Subarea analysis
  - Macrosimulation that incorporates flow patterns in larger network

- Through Route Estimation By Logit (TREBL)
  - Statistically justifiable
Through Route Estimation By Logit (TREBL)

TREBL utility functions:

- \( U_{IE} = 3.78 \)
- \( U_{EE} = (1.177 \times RTECON_{ij}) + (4.448 \times (AADT_j / \Sigma AADT_j)) \)

Then use \( P(a) = e^{U_a} / (e^{U_a} + e^{U_b} + e^{U_c} + \ldots) \), where \( P(a) = \) probability of choosing destination a, incl. I

- Usu. better than Modlin or Anderson
- Good substitute for Subarea
## TREBL results for LaPorte

**TABLE 8  LaPorte EE and EI Trip Percentages using TREBL Model**

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Johnson</td>
<td>78.72%</td>
<td>3.65%</td>
<td>2.71%</td>
<td>4.14%</td>
<td>2.42%</td>
<td>3.70%</td>
<td>1.56%</td>
<td>3.10%</td>
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<tr>
<td>US-35 N</td>
<td>2.90%</td>
<td>73.14%</td>
<td>2.51%</td>
<td>3.82%</td>
<td>2.24%</td>
<td>11.09%</td>
<td>1.44%</td>
<td>2.86%</td>
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<tr>
<td>SR-39 N</td>
<td>3.18%</td>
<td>3.70%</td>
<td>74.57%</td>
<td>4.21%</td>
<td>2.44%</td>
<td>3.75%</td>
<td>5.01%</td>
<td>3.14%</td>
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<tr>
<td>SR-2 W</td>
<td>2.89%</td>
<td>3.35%</td>
<td>2.50%</td>
<td>74.91%</td>
<td>2.23%</td>
<td>3.40%</td>
<td>1.44%</td>
<td>9.26%</td>
</tr>
<tr>
<td>SR-4 E</td>
<td>3.39%</td>
<td>3.94%</td>
<td>2.91%</td>
<td>4.48%</td>
<td>76.31%</td>
<td>4.00%</td>
<td>1.63%</td>
<td>3.34%</td>
</tr>
<tr>
<td>US-35 S</td>
<td>2.90%</td>
<td>10.92%</td>
<td>2.50%</td>
<td>3.82%</td>
<td>2.24%</td>
<td>73.36%</td>
<td>1.44%</td>
<td>2.82%</td>
</tr>
<tr>
<td>SR-39 S</td>
<td>4.04%</td>
<td>4.70%</td>
<td>11.08%</td>
<td>5.37%</td>
<td>3.02%</td>
<td>4.77%</td>
<td>63.08%</td>
<td>3.94%</td>
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<tr>
<td>SR-2 E</td>
<td>2.96%</td>
<td>3.44%</td>
<td>2.55%</td>
<td>12.67%</td>
<td>2.28%</td>
<td>3.44%</td>
<td>1.45%</td>
<td>71.22%</td>
</tr>
</tbody>
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