Measuring Accessibility

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1. Overview
What is Accessibility?

• Accessibility measures the **ease of reaching valued destinations**

• Accessibility is about **opportunities**

• “Can reach 100,000 jobs within 30 minutes”

• 10% increase in jobs within 30 minutes -> 2.3% increase in home value (Iacono & Levinson, 2011)

• 100,000 increase in jobs within 30 minutes -> 1.92 times as likely to commute using transit (Owen & Levinson, 2014)
Washington
Washington-Arlington-Alexandria, DC-VA-MD-WV

Jobs within 30 minutes
(Driving, AM peak)
- 0 - 1,000
- 1,000 - 2,500
- 2,500 - 5,000
- 5,000 - 7,500
- 7,500 - 10,000
- 10,000 - 25,000
- 25,000 - 50,000
- 50,000 - 75,000
- 75,000 - 100,000
- 100,000 - 250,000
- 250,000 - 500,000
- 500,000 - 750,000
- 750,000 - 1,000,000
- 1,000,000 - 2,500,000
- 2,500,000 - 5,000,000
- 5,000,000 - 7,500,000
- 7,500,000 - 10,000,000
- 10,000,000 +

State border
CBSA boundary
Minneapolis
Minneapolis-St. Paul-Bloomington, MN-WI

Jobs within 30 minutes by transit, averaged 7 – 9 AM
- 0 – 1,000
- 1,000 – 2,500
- 2,500 – 5,000
- 5,000 – 7,500
- 7,500 – 10,000
- 10,000 – 25,000
- 25,000 – 50,000
- 50,000 – 75,000
- 75,000 – 100,000
- 100,000 – 250,000
- 250,000 – 500,000
- 500,000 – 750,000
- 750,000 – 1,000,000
- 1,000,000 +
National Accessibility Evaluation

• Motivations
  – Accessibility measures transportation’s fundamental purpose: providing access to destinations
  – Move accessibility from theory to practice

• Goals
  – Block-level, multi-modal job accessibility dataset with national coverage
  – Consistent methods and data sources
  – Access Across America series of reports, updated annually

• Sponsors
  – 11 State DOTs: AR, CA, DC, FL, IA, MD, MN, NC, VA, WA, WI
  – Federal Highway Administration
  – Open to new partners, other organization types
2. Methodology
Data Sources

• Needs:
  – National coverage
  – Consistency across political boundaries
  – High spatial resolution
  – Three domains:
    • Jobs
    • Transit networks & speeds
    • Road networks & speeds
Data Sources

- Jobs: LEHD Origin-Destination Employment Statistics (LODES)
  - Destinations: workplace area characteristics (WAC)
Data Sources

• Transit networks & speeds: GTFS schedule datasets
  – Published by individual transit operators
  – Scheduled travel times
Data Sources

• Road networks & speeds: TomTom MultiNet & Speed Profiles
  – Commercially licensed data
  – Based on aggregated GPS data
Data Sources

- Jobs – block-level estimates from US Census
- Roads and speeds – licensed commercial data
- Pedestrian & biking paths – OpenStreetMap
- Transit – GTFS schedules from transit operators
Data Processing
Calculating accessibility for 11.2 million blocks
1. Divide US into ~4,700 zones of ~5,000 blocks
2. Build networks for each zone
3. Process zones in parallel with cloud computing
Transit: Multiple departure times to reflect service frequency
• For each block:
  – Data for 6 time thresholds (10, 20, ..., 60)
    • 24 auto accessibility (hourly)
    • 120 transit accessibility (7am – 9am)

• Total: 9.6 billion data points
Minneapolis
Minneapolis-St. Paul-Bloomington, MN-WI

Jobs within 30 minutes by transit, averaged 7 – 9 AM

- 0 – 1,000
- 1,000 – 2,500
- 2,500 – 5,000
- 5,000 – 7,500
- 7,500 – 10,000
- 10,000 – 25,000
- 25,000 – 50,000
- 50,000 – 75,000
- 75,000 – 100,000
- 100,000 – 250,000
- 250,000 – 500,000
- 500,000 – 750,000
- 750,000 – 1,000,000
- 1,000,000 +
3. Reporting Accessibility
A typical Twin Cities resident can reach...

- 17,000 jobs by transit
- 1 million jobs by auto

...within 30 minutes during the AM peak period
Aggregating Accessibility

• Block-level data is locational metric
• To aggregate, weight by population experiencing local accessibility
• Weights: LODES residence area characteristics (RAC)
### 2015 Accessibility Rankings

#### Transit

1. New York  
2. San Francisco  
3. Chicago  
4. Washington  
5. Los Angeles  
6. Boston  
7. Philadelphia  
8. Seattle  
9. San Jose  
10. Denver  
11. Portland  
12. Minneapolis–Saint Paul  
13. Milwaukee  
14. Baltimore  
15. Salt Lake City

#### Auto

1. New York  
2. Los Angeles  
3. Chicago  
4. Dallas  
5. San Jose  
6. San Francisco  
7. Washington  
8. Houston  
9. Boston  
10. Philadelphia  
11. Miami  
12. Minneapolis–Saint Paul  
13. Phoenix  
14. Detroit  
15. Denver
## 2015 Accessibility by County

<table>
<thead>
<tr>
<th>County</th>
<th>Transit (30 mins)</th>
<th>Auto (30 mins)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anoka</td>
<td>3,844</td>
<td>833,626</td>
</tr>
<tr>
<td>Carver</td>
<td>1,284</td>
<td>605,836</td>
</tr>
<tr>
<td>Dakota</td>
<td>3,612</td>
<td>1,013,689</td>
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<tr>
<td>Hennepin</td>
<td>34,481</td>
<td>1,317,967</td>
</tr>
<tr>
<td>Ramsey</td>
<td>27,010</td>
<td>1,321,602</td>
</tr>
<tr>
<td>Scott</td>
<td>1,273</td>
<td>659,036</td>
</tr>
<tr>
<td>Washington</td>
<td>1,533</td>
<td>748,138</td>
</tr>
<tr>
<td><strong>Metro Average</strong></td>
<td><strong>17,043</strong></td>
<td><strong>1,023,854</strong></td>
</tr>
</tbody>
</table>
4. Policy Implications
Policy Implications – Research

• Accessibility is measurable
• Data can be included in other research
• Strong links to travel behavior, property value, location choice, equity
Policy Implications – Practice

• Accessibility is measurable
• Data can be included in studies, plans, performance monitoring
• Reflects & responds to both transportation & land use
• What does it mean to have accessibility as a goal?
Thank you!

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