Travel Behavior Over Time:
Walking, Cycling, and Transit from 2000 to 2010

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Walking, biking, and transit have increased in popularity.

But our understanding of these trends has been limited by data availability.

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Travel Behavior Over Time
Research Objectives

- How has use of “alternate” transportation modes changed over the past decade?
- How does nonmotorized transportation use vary over season, geography, demographics, and purpose?
- How do walking and cycling differ?
Travel Behavior Inventories in the Minneapolis-St. Paul Metropolitan Region corresponding to 2000 and 2010 census

- Approximately 1% sample of region
- 24-hour travel diary for all household members
- Weekdays only
Datasets

Notable differences between 2000 and 2010 surveys

<table>
<thead>
<tr>
<th>Design Element</th>
<th>2000 TBI</th>
<th>2010 TBI</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administered</td>
<td>5 months</td>
<td>15 months</td>
<td>April - August subsample</td>
</tr>
<tr>
<td>Trip definition</td>
<td>Single-mode segment</td>
<td>Multimodal trip</td>
<td>Restructure 2000 data to identify primary mode</td>
</tr>
<tr>
<td>Geographic Scope</td>
<td>20 counties</td>
<td>19 counties</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Datasets

### Matched sample characteristics

<table>
<thead>
<tr>
<th></th>
<th>2000 All</th>
<th>2010 All</th>
<th>2010 Matched</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>6,219</td>
<td>14,055</td>
<td>7,491</td>
</tr>
<tr>
<td>Individuals</td>
<td>14,671</td>
<td>30,286</td>
<td>15,756</td>
</tr>
</tbody>
</table>
Methodology

- Descriptive statistics
- T-tests and $\chi^2$ tests on 2000 and 2010 (matched) datasets
- Binary logistic regression modeling (with inconclusive results)
- Where necessary: sampled 1 person or trip per household from 2000 and 2010 (matched) datasets
Geographic Context

[Map showing mode share by geography for 2001 and 2010, with categories for walking and bicycling.]

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ACS/Census underestimates non-auto commuting relative to TBI

### Year-round Non-Auto Commute Share

- **Minneapolis**
  - 2001 Census: 24.4%
  - 2010 ACS: 28.4%
  - 2010 TBI: 26.2%

- **St. Paul**
  - 2001 Census: 16%
  - 2010 ACS: 15%
  - 2010 TBI: 18%

- **Suburbs**
  - 2001 Census: 5%
  - 2010 ACS: 6%
  - 2010 TBI: 4%

- **Ring Counties**
  - 2001 Census: 5%
  - 2010 ACS: 5%
  - 2010 TBI: 4%

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*Travel Behavior Over Time*
Despite seasonal variation, biking and walking have increased.
Walking and biking have increased across age groups

![Chart showing increased walking and biking across age groups between 2000 and 2010.](chart.png)
Gender gap: Persistent participation gap (with exceptions)

Figure: Participation by Gender

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Increasing gender gap in bike commuting

Figure: Participation in Bike Commuting by Gender

No significant gender gap

Significant at p<0.01
Gender gap not apparent among *cyclists*

Figure: Trip rate
Average trip distance is increasing

Figure: Share of Trips by Distance Threshold
Trip purpose has shifted disproportionately to commuting

Figure: Distribution of Trips By Purpose
Conclusions

- Increased use of cycling, walking, and transit
- Nonmotorized transport varies seasonally
- Walk and bike trips differ by purpose, distance, and demographics of the traveler
A note about infrastructure

- Substantial increases in dedicated infrastructure
- Bike lanes no longer predict bicycling
- Consistent, robust spatial data is desperately needed
Limitations and Further Study

- Survey issues and inconsistencies between years - E.g., commute definition, household members traveling together
- Built environment effects and infrastructure - Not enough historical data
- Small mode share issues
- Causality??
The authors would like to acknowledge and thank the Minnesota Department of Transportation, the Metropolitan Council, and the Center for Transportation Studies at the University of Minnesota for financial and technical support. Mr. Jonathan Ehrlich of the Metropolitan Council provided useful commentary on our research but bears no responsibilities for its limitations.
...but the gender gap has persisted

Figure: NHTS Bicycle Mode Share

(a) All Trip Purposes

(b) Commuting
Walking, biking, and transit have increased in popularity in the 19/20 County Twin Cities Metro Region.

- **Walk:** 4.5% in 2000, 6.6% in 2010
- **Bike:** 1.4% in 2000, 2.2% in 2010
- **Transit:** 1.3% in 2000, 2.1% in 2010
Walking, biking, and transit have increased in popularity.

**Summer Mode Share**
- 0 to 1%
- 1 to 2%
- 2 to 3%
- 3 to 4%
- 4 to 5%
- 5 to 10%
- 10 to 15%
- 15 to 20%
- Not surveyed in 2010

Spatial boundaries from: [http://www.census.gov/geo/maps-data/data/tiger-line.html](http://www.census.gov/geo/maps-data/data/tiger-line.html)

UTM NAD 1983 Zone 15N

**All Apr-Aug Trips**

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### Non-Auto Mode Share

<table>
<thead>
<tr>
<th>Location</th>
<th>2000 Summer</th>
<th>2010 Summer</th>
<th>2010 Year-round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minneapolis</td>
<td>21.6%</td>
<td>29.4%</td>
<td>28.8%</td>
</tr>
<tr>
<td>St. Paul</td>
<td>14%</td>
<td>21%</td>
<td>20%</td>
</tr>
<tr>
<td>Suburbs</td>
<td>7%</td>
<td>10%</td>
<td>9%</td>
</tr>
<tr>
<td>Ring Counties</td>
<td>7%</td>
<td>7%</td>
<td>9%</td>
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