How Far Has the US Population Traveled During the Pandemic and Post-Pandemic Era?

INTRODUCTION

Background

“Previous Trend” 2. Immediate Response (IR)  “Current Trend”

<table>
<thead>
<tr>
<th>Trips Per Day</th>
<th>10,000+</th>
<th>5,000-9,999</th>
<th>1,000-4,999</th>
<th>500-999</th>
<th>250-499</th>
<th>100-249</th>
<th>50-99</th>
<th>0-49</th>
</tr>
</thead>
</table>

Figure 1: Travel Trend of All US Population (Adapted from Bureau of Transportation Statistics (BTS), 2021)

- Fewer trips and more staying at home (SAH) have become consistent trends.
- Few literature studies the changes in trips by distance - how far do people travel for their needs?
- Most studies use early 2020 as baselines - travel disparities not considered.

Research Questions

- Which distances of trips have been affected?
- How do those trips evolve over time?
- What are the geospatial patterns of those trips?

Contribution

1. Unveiling the changes in trips of ten distance ranges from 2019 to 2021.
2. Showing geospatial patterns of the changes.
3. More accurate results by comparing data of the same periods among years.

Broader Impact

- Theoretical:
  1. Understand public behavior in emergency periods & afterwards.
  2. Understand the impact of government interventions & voluntary behavior.
- Practical:
  1. Help urban planners suggest facilities & services which fit people’s needs.
  2. Help policymakers propose effective policies which benefit public well-being.
- Methodological:
  2. Combined national, state, and county level analysis in one study.

METHODOLOGY

Data

Daily travel data from mobile devices from BTS, US Dept of Transportation.
Scale: National, state, and county
Period: 03/14/2019 – 09/18/2021
Method: All modes of transportation

Method

We compare four periods as in Figure 1 and borrow the division of ten distance ranges from less than one mile to over 500 miles from BTS in Table 1.

RESULTS

1. National Level

Table 1: Percent Change of Number of Trips of Ten Distance Ranges in 2020 and 2021 (Unit: miles, ±1.6km)

<table>
<thead>
<tr>
<th>Period</th>
<th>All trips</th>
<th>Trips per capita</th>
<th>Trips per household</th>
<th>Trips per trip</th>
<th>Trips per vehicle</th>
<th>Trips per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>31.6%</td>
<td>14.7%</td>
<td>35.1%</td>
<td>6.4%</td>
<td>81.0%</td>
<td>10.1%</td>
</tr>
<tr>
<td>2020</td>
<td>31.6%</td>
<td>14.7%</td>
<td>35.1%</td>
<td>6.4%</td>
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<td>31.6%</td>
<td>14.7%</td>
<td>35.1%</td>
<td>6.4%</td>
<td>81.0%</td>
<td>10.1%</td>
</tr>
</tbody>
</table>

Figure 11: Percent Change of Number Of Trips Per Capita By Distance

2. State Level

Figure 12: Percent Change of Number Of Trips Per Capita Among States

1) CA is an remote outlier affecting national average.
2) States without SAH order show voluntary restrictions.

3. County Level

Below are exemplary comparisons between 2021 PSR and 2019 baseline:
- warm color - positive change; cold color - negative change.

Figure 13: Percent Change of Trips < 1 Miles Per Capita

More people stay at home in the South. TX shows a mixed pattern.

Figure 14: Percent Change of Trips Between 1-3 Miles Per Capita

People in the Middle regions increase trips (mainly short trips).

CONCLUSION

- 30% decrease in number of trips in 2020 and 7% decrease in 2021. People travel less except for those in the Middle regions.
- Over 30% increase in people staying home in 2020 across the country and 15% increase in 2021, mainly in the South.
- New demand emerges for medium-distance trips (50-500 miles) almost all over the country.
- Based on people’s voluntary restrictions in the states without SAH orders, and the low correlations between the state-level travel changes (i.e., overall trip numbers and people staying at home) and the orders’ features (i.e., their duration and the days between their issuance and the National Pandemic declaration), the orders do not exert significant impact on public travel.