Using Data to Understand Our New Transportation Reality

Presented by

Laura Schewel, StreetLight
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Urbanism Next – May 2020
StreetLight InSight® is an interactive transportation data platform

- It’s not a model, a report or a static heatmap.
- It’s your self-serve desktop software with on-demand access to accurate mobility metrics.
How we get there:
(Privacy forward) Big Data + Data Science

Every month, we process over 100 billion anonymized location records from **smart phones** and **GPS navigation devices** in cars and trucks.

**Route Science®** transforms them into **contextualized**, normalized and aggregated travel patterns.

**MOBILE DEVICE DATA**
from ~28% of U.S. and Canadian adults

Example, San Bernardino, CA
Oct 8, 2017 24-hr snapshot

**CONTEXT**

- Parcel Data
- Digital Road Network Data
- U.S. Census
US VMT Dropped Dramatically From March 1 to May 1

Change in VMT Relative to Baseline
United States

So What?
Fall Off Was Not the Same Everywhere
Fall Off Was Not the Same Everywhere
Rural VMT Fell More than Urban

Change in VMT Relative to Baseline
Urban & Rural Counties

Why?

- Income
- Urban form / accessibility
- Lack of delivery options
- Culture
- Mix of jobs
Urban v. Rural is not consistent State by State

- Alabama
- Arizona
- Arkansas
- California
- Colorado
- Connecticut
- Delaware
- District of Columbia
- Florida
- Georgia
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Kentucky
- Louisiana
- Maine
- Maryland
- Massachusetts
- Michigan
- Minnesota
- Mississippi
- Missouri
- Montana
- Nebraska
- Nevada
- New Hampshire
- New Jersey
- New Mexico
- New York
- North Carolina
- North Dakota
- Ohio
- Oklahoma
- Oregon
- Pennsylvania
- Rhode Island
- South Carolina
- South Dakota
- Tennessee
- Texas
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming
Two Examples

- Oregon
- Georgia
Income Definitely Matters (Especially in Urban Areas)

Urban Counties - Income and VMT Reduction

\[ y = -1.1645x + 5.9882 \]
\[ R^2 = 0.4602 \]

Rural Counties - Income and VMT Reduction

\[ y = -0.9935x + 5.3603 \]
\[ R^2 = 0.1571 \]
Population Density Matters (Especially in Urban Areas)

Population Density and VMT - Urban Counties

\[ y = -0.0762x + 0.4218 \]
\[ R^2 = 0.3181 \]

Population Density and VMT - Rural Counties

\[ y = -0.0392x + 0.6349 \]
\[ R^2 = 0.0323 \]
## Job Mix Matters

BEA Compensation of Employees by Industry (SQINC6N) Share of Industry vs. VMT Change

<table>
<thead>
<tr>
<th>Strong Negative – More of these jobs means MORE VMT fall off</th>
<th>Strong Positive – More of these jobs means LESS VMT fall off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational services</td>
<td>Transportation and warehousing</td>
</tr>
<tr>
<td>Professional, scientific, and technical services</td>
<td>Utilities</td>
</tr>
<tr>
<td>Finance and insurance</td>
<td>Construction</td>
</tr>
<tr>
<td>Information</td>
<td>Government - State and local</td>
</tr>
<tr>
<td>Government - Federal civilian</td>
<td>Nondurable goods manufacturing</td>
</tr>
<tr>
<td>Arts, entertainment, and recreation</td>
<td>Mining, quarrying, and oil and gas extraction</td>
</tr>
<tr>
<td></td>
<td>Retail trade</td>
</tr>
<tr>
<td></td>
<td>Forestry, fishing, and related activities</td>
</tr>
<tr>
<td></td>
<td>Farm compensation</td>
</tr>
<tr>
<td></td>
<td>Military</td>
</tr>
</tbody>
</table>
E-Commerce / Delivery Impact Varies
(Collaborative Study with BCG)

# of daily trips to/from warehouses (thousands)

- **USPS**
  - Feb: 16.6
  - Mar 1–7: 18.1
  - Mar 8–14: 17.1
  - Mar 15–21: 17.6
  - Mar 22–28: 21.4
  - Mar 29–31: 20.8

- **UPS**
  - Feb: 17.8
  - Mar 1–7: 20.3
  - Mar 8–14: 20.0
  - Mar 15–21: 18.4
  - Mar 22–28: 17.6
  - Mar 29–31: 14.6

- **FedEx**
  - Feb: 27.4
  - Mar 1–7: 30.5
  - Mar 8–14: 29.9
  - Mar 15–21: 26.4
  - Mar 22–28: 26.8
  - Mar 29–31: 21.8

- **Percentage Changes**
  - **USPS**
    - +9.1%
    - +15.0%
    - +13.9%
    - -27.8%
  - **UPS**
    - +11.2%
    - -28.6%
How can all this data help us come back better than we were before?

What will revenues be?

Where should we preserve some of the “negamiles” of telework?

What’s the balance of eCommerce and retail spaces?

What is a city with less tourism?

Where should we preserve the “cheap” infrastructure of road closures?

How do we return to shared vehicles (buses, trains, scooters, etc.)?

Local, granular data for local decisions
How can all this data help us come back better than we were before?

We need to:
1. Revise our notion of “long range” planning and
2. Throw out the habit 3-, 5-, 10-year data collection cycles
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Population Projections

U.S. POPULATION PROJECTIONS BY IMMIGRATION SCENARIO (2017-2060)

Population Growth Slowing

Source: US Census Bureau
Pre-COVID-19 Travel Market Trends

TRENDS IN PERSON TRIPS BY PURPOSE (1990 TO 2017)

Source: Nancy McGuckin and Anthony Fucci, Summary of Travel Trends Findings from the 2017 NHTS
Travel Demand Model Limitations

Model View of Activity/Travel

Actual View of Activity/Travel

- Fitness
- Netflix/Hulu
- e-Work/Educ./Med.
- Food Delivery
- Amazon
Travel Pattern Changes..

Shopping Location

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shopping Location</td>
<td>Delivery Location</td>
</tr>
<tr>
<td>26%</td>
<td>39%</td>
</tr>
<tr>
<td>74%</td>
<td>61%</td>
</tr>
</tbody>
</table>

INCREASED ONLINE SHOPPING AND REDUCED IN-STORE SHOPPING

Daily Delivery Intensity

Map showing increased delivery intensity in urban areas.
Pre-COVID-19 Transportation Problems

STATE HIGHWAY CONGESTION INCREASING IN RECENT YEARS

Vehicle Hours of Delay (in Millions)

Source: https://lao.ca.gov/Publications/Report/3860
Problem or Symptom?

CARS ARE MOVING TOO SLOW AND TRAVEL TIMES ARE UNRELIABLE
Wrong Problem Definitions?

CONGESTION OCCURS BECAUSE OF POOR SEAT UTILIZATION CAUSED BY MISPRICING TRAVEL

Business 80 – Sacramento, CA 2019 Peak Hour, Peak Direction Seat Utilization
Expectations Missed?

HOV LANE EXPANSION VS CARPOOL MODE SHARE

[Graph showing the comparison between HOV lane expansion and carpool mode share from 1990 to 2020.]
A Pandemic Reset...
A Sense of Urgency...

Source: https://www.tomtom.com/en_gb/traffic-index/wuhan-traffic/
New Problems...

What Defines a Transportation Problem in the New Normal?

- How to operate transit to maximize revenue from ridership?
- How to fund transit so that it is free for essential workers?
- How to manage personal health risk in transit vehicles?
- How to manage roadway demand to improve travel time performance, reduce collisions, & minimize emissions?
- How much roadway space to allocate to active modes?
- How much roadway or parking space to allocate to revenue generating uses?
- How to incorporate personal health risk in travel forecasting models?
- How to ‘flatten demand curves’ for travel on facilities with limited supply?
Flattening the Congestion Curve

Typical Speeds

COVID-19 Speeds
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Storm Renders Compass Useless
Flattening the Curve Through Space and Time
Our Experiences Can be Vastly Different
Distributions of Responses

Illustration: https://blog.minitab.com/blog/statistics-in-the-field/a-field-guide-to-statistical-distributions
Trends Like Waves

Illustration: Wave Wisdom, Boat US

- **Gathering**
- **Accelerating**
- **Breaking**

- 6' Height of breaking wave
- 42' Length

Deep Water Waves
Waves Pushed Upward
Wave Breaks
Surf
Breaking Waves

Illustration: boredpanda.com/wave-photography-ray-collins/
Breaking Waves

• Labor force participation
• GDP/Real income per capita
• Reduced household formation/increases in intergenerational households
• Telework, like now
• Schools out
• Online grocery arrives

• Restaurants shift to take-out/delivery if they can
• Local/state revenues crater
• Low auto operating costs (as a function of low oil/gas prices, rather than available credit)
• Cheap gas
Accelerating Waves

Illustration: boredpanda.com/wave-photography-ray-collins/
Accelerating Waves

• Telework is (probably) in your future
• The restaurant industry shrinks/consolidates
• Retail moves online and comes to you (rather than you going to it)
• Telehealth expands
• Gig work increases

• The Big (companies) get bigger
• Publishing and local news recede
• From (movie) theaters to streaming
• We’re all Zooming
• Hybrid retail uses, particularly with commercial real estate in trouble
• Local/state budget cuts
Gathering Waves

Illustration: boredpanda.com/wave-photography-ray-collins/
Gathering Waves

• Shifting home preferences?
• Less time in the office, so less office?
• Commercial real estate in a bind?
• Declustering as strategy?
• Rural/suburban tech diaspora?
• Are we all still ‘sharing’?

• Are we ready for remote learning? Accreditation? MOOC?
• Increased investment in robotics and automation
• What of business and tourism travel?
• Reordered manufacturing hubs, supply chains
Responses Require Fast and Slow Thinking

The Tortoise and the Hare, Francis Barlow, Royal Academy of Arts London
Fast Responses

• Federal Reserve, Congressional, State and Local responses
• Private and non-profit sectors filling gaps, stepping up
• Public acceptance of shelter in place orders
• Tenant protections

• Cities/transportation agencies
  o Changing transit on the fly
  o Street closures
  o Repurposing curb
  o Repurposing parking
Slow Responses

- Rethinking the system to keep the ‘gains’
- Standing public transit back up
- Taking steps to reduce inequality
- Sustaining ingenuity
Looking Forward

• #1 We’re not going back
• #2 This is a warning
• #3 Don’t get lost in the future
• #4 The world is what we make of it