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Opportunities and Challenges for the Three Transportation Revolutions

DRAFT VERSION - July 16, 2020

Dr. Giovanni Circella

Director, 3 Revolutions Future Mobility Program, ITS Davis
gcircella@ucdavis.edu
"People won’t have as many vehicles because they’ll share one and own one."

Jim Hackett, Ford CEO

https://islandpress.org/books/three-revolutions
### Future Mobility: “Heaven” or “Hell”? 

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Cars are all electric</td>
<td>✓ Increased congestion</td>
</tr>
<tr>
<td>✓ Energy mix is clean</td>
<td>✓ Electricity produced with coal</td>
</tr>
<tr>
<td>✓ Increased capacity of transportation</td>
<td>✓ Increased travel demand</td>
</tr>
<tr>
<td>✓ Better livability in cities</td>
<td>✓ More car-dependence of society</td>
</tr>
<tr>
<td>✓ Integration with public transit</td>
<td>✓ Reduced role of transit</td>
</tr>
<tr>
<td>✓ Everybody shares intelligent vehicles</td>
<td>✓ “Ghost” vehicles traveling on streets</td>
</tr>
</tbody>
</table>

The future will largely be shaped by the policies that are developed today...
Shared mobility, electrification and autonomous vehicles are bringing big changes in:

- Transportation supply
- Transportation demand

Need for rigorous research and impartial policy analysis to understand the impacts of these revolutions, and guide industry investments and government decision-making.
Research Questions

What are the impacts on vehicle ownership and travel behavior?

Car Ownership vs. Shared Mobility?

What Replaces What?
Uber/Lyft ridership has been growing quickly (before the pandemic...)

2018 Ridership (estimates):
- Local bus 4.7 billion
- Urban rail 4.2 billion
- Taxi/TNC 3.8 billion

(Annual rate)

Only 10% of U.S. residents (aged 16+) reported to have used ridehailing in the past 30 days.

Almost 50% of American ridehailing users live in five states: California (20%), New York (9.2%), Florida (7.2%), Texas (6.4%), Illinois (5.9%).

**Source:** Hongwei Dong, using 2017 NHTS data
Ridehailing is still a predominantly *urban* phenomenon

Source: Hongwei Dong, using 2017 NHTS data
Who uses these new mobility services?
California Panel Study of Emerging Transportation Trends

- Statewide longitudinal study with rotating panel
- 2015 survey: Millennials (18-34) and Generation X (35-50)
- 2018 survey: All age groups
- Quota sampling by geographic region and neighborhood type
- Focus on changing lifestyles, adoption of shared mobility and attitudes towards AVs
- More info at: https://3rev.ucdavis.edu/california-panel
New Study: “The Pulse of the Nation (and the World) on 3R”

New annual data collection

2019 cities:
- San Francisco
- Los Angeles
- Sacramento
- Washington DC
- Boston
- Seattle
- Salt Lake City
- Kansas City

Southern US cities:
- Atlanta
- Austin
- Phoenix
- Tampa

WRI cities:
- Mexico City (Mexico)
- Sao Paulo (Brazil)
- Mumbai (India)
- Beijing (China)
Apps Used on Smartphone

- Uber: 47.3%
- Lyft: 37.0%
- Zipcar: 3.0%
- Turo: 1.9%
- Getaround: 2.1%
- Other Carsharing: 1.4%
- Jump: 4.6%
- Lime: 7.1%
- Bird: 5.8%
- Other Bike Sharing: 1.8%
- Airbnb: 15.4%
- Amazon: 6.6%
Apps Used on Smartphone

- Uber: 47.3%
- Lyft: 37.0%
- Zipcar: 3.0%
- Turo: 1.9%
- Getaround: 2.1%
- Other Carsharing: 1.4%
- Jump: 4.6%
- Lime: 7.1%
- Bird: 5.8%
- Other Bikesharing: 1.8%
- Airbnb: 15.4%
- Amazon: 66.8%
“Not all users behave the same way”

Latent-class adoption model to investigate differences in the use of ridehailing:

**Adoption Rate: 47%**
- Higher-educated independent millennials who live in more central areas and in households without kids
- The adoption rate significantly increases as the rates of technology adoption and frequency of long-distance leisure travel by plane increase.

**Adoption Rate: 27%**
- Most affluent individuals, predominantly dependent millennials or older Gen Xers, who live with their families.
- Technology adoption rate, household income, and frequency of non-car business long-distance trips affect the adoption.

**Adoption Rate: 5%**
- Least affluent and less educated individuals, who live in rural neighborhoods and do not work nor study.
- Adoption rate is affected by the characteristics of the built environment, including transit accessibility and land-use mix.

How does the use of ridehailing affect the use of other modes?

...what replaces what?
Impacts of Uber/Lyft on Use of Other Travel Modes

Latent-class analysis to investigate the impacts of ridehailing on other travel modes:

Urban Travelers
- Urban dwellers
- Walkable neighborhoods with good transit access
- Cost and time sensitive
- Least affluent
- Younger/independent Millennials
- Frequent commuters
- Multimodal travelers
- Most frequent users of Uber/Lyft

Class 1 (size=53%)

Car Users
- Suburban Dwellers
- Car-oriented neighborhoods with poor transit access
- High number of vehicles per household drivers
- Frequent commuters
- Monomodal with high VMT
- Pro-suburban
- Materialistic/must own car
- Frequent air travelers
- Medium Uber/Lyft frequency

Class 2 (size=37%)

Transit and TNC
- Suburban Dwellers
- Low transit and walk accessibility
- Not cost and time sensitive
- Older Gen Xers
- Want to come back to urban area
- Non-frequent commuters
- Multimodal when possible
- Like biking
- Pro-environment
- Low frequency users

Class 3 (size=10%)

For more details:
“Not all on-demand mobility services are created equal”...

Impact of ridehailing on use of other modes - “What Would You Have Done if Ridehailing Was Not Available?”

For more details:
“Not all on-demand mobility services are created equal”...

Who does that?
- Higher and medium income
- Higher-vehicle-owning HHs
- Households with kid(s)
- Lower-income individuals
- Students and workers
- Multimodal (users of public transit and active modes)
- Lower-income individuals
- Zero-vehicle households
- Workers
- Higher-income individuals
- Older generations
- Lower-income individuals
- Unemployed
- Zero-vehicle households

And for what type of trips?
- Longer trips
- Trips without company
- Shopping and social trips
- Trips during the daytime
- Very short trips
- Trips to/from Airports
- Trips with others
- Medium distance

Impact of ridehailing on use of other modes - “What Would You Have Done if Ridehailing Was Not Available?”

- Drive alone: 28.6% (Ridehailing), 28.5% (Shared ridehailing)
- Carpool: 14.8% (Ridehailing), 16.2% (Shared ridehailing)
- Public bus: 7.3% (Ridehailing), 13.5% (Shared ridehailing)
- Light rail/tram/subway: 4.5% (Ridehailing), 7.5% (Shared ridehailing)
- Commuter rail: 0.7% (Ridehailing), 0.8% (Shared ridehailing)
- Bike or walk: 4.1% (Ridehailing), 7.5% (Shared ridehailing)
- Taxi: 5.0% (Ridehailing), 15.0% (Shared ridehailing)
- Other: 5.0% (Ridehailing), 4.9% (Shared ridehailing)

I would not have made this trip
- 7.0% (Ridehailing), 6.0% (Shared ridehailing)
How are shared mobility options changing travel behaviors?
What would have happened if these emerging transportation services had not been available for the last trip?

### bikesharing
- Trip at other time and/or with other destination: 17.7%
- Would have not made the trip: 23.1%
- Trip at same time with same destination: 59.2%

### e-scooters
- Trip at other time and/or with other destination: 13.9%
- Would have not made the trip: 24.2%
- Trip at same time with same destination: 58.9%

### ridehailing
- Trip at other time and/or with other destination: 8.3%
- Would have not made the trip: 27.3%
- Trip at same time with same destination: 67.6%

### shared ridehailing
- Trip at other time and/or with other destination: 13.9%
- Would have not made the trip: 27.3%
- Trip at same time with same destination: 58.9%
What would have happened if these emerging transportation services had not been available for the last trip?

- **Bikesharing**: Of those who would have used bikesharing, 23.1% would not have made the trip. For those who used bikesharing, 17.7% said they would have made the trip at a different time or destination.

- **E-scooters**: For those who would have used E-scooters, 13.9% would not have made the trip. Of those who used E-scooters, 58.9% said they would have made the trip at the same time with the same destination.

- **Ridehailing**: Of those who would have used ridehailing, 8.3% would not have made the trip. For those who used ridehailing, 67.6% said they would have made the trip at the same time with the same destination.

- **Shared Ridehailing**: Of those who would have used shared ridehailing, 13.9% would not have made the trip. For those who used shared ridehailing, 58.9% said they would have made the trip at the same time with the same destination.

How would you have made your trip if [this shared mobility service] were not available?

The image shows a bar chart with the following options:

- **Walk**
- **Bikesharing/E-scooter Shared**
- **Personal Bike/E-scooters**
- **Ridehailing**
- **Public Transit**
- **Car**

The data is divided into two categories: **Bikesharing (n=373)** and **E-scooters (n=411)**. The percentages for each option are as follows:

- **Walk**: 0%
- **Bikesharing/E-scooter Shared**: 10.0%
- **Personal Bike/E-scooters**: 10.0%
- **Ridehailing**: 20.0%
- **Public Transit**: 25.0%
- **Car**: 45.0%

The chart also shows options for other shared mobility services:

- **Bikesharing (n=373)**
- **E-scooters (n=411)**
- **Walk**: 0%
- **Bike/E-scooter**: 35.0%
- **Taxi**: 30.0%
- **Train**: 25.0%
- **Bus**: 20.0%
- **Car**: 50.0%

The data is further divided into:

- **Trip at other time and/or with other destination**: 17.7%
- **Trip at same time with same destination**: 58.9%
- **Would have not made the trip**: 24.2%

- **Ridehailing (1267)**
- **Trip at other time and/or with other destination**: 13.9%
- **Trip at same time with same destination**: 67.6%
- **Would have not made the trip**: 27.3%

- **Shared Ridehailing (n=313)**
- **Trip at other time and/or with other destination**: 13.9%
- **Trip at same time with same destination**: 58.9%
- **Would have not made the trip**: 27.3%

The data is sourced from UC Davis Institute of Transportation Studies.
• Under what conditions would individuals prefer to access a vehicle as needed rather than owning one?

• How will MaaS (Mobility as a Service) change future mobility?

• To date, only a minority seems interested in not owning a vehicle and access a suite of mobility services when needed...
How Will Mobility as a Service (MaaS) Change Mobility?

**Mobility Service Providers**
- Transport Operators
- Mobility Supportive Services

**MaaS Operator**
- Multiservice Journey Planner
- Real Time Information
- Booking
- Payment
- Getting on board / Ticket
- User Account

**Info & Planning Integration**

**Payment & Ticketing Integration**

**Users**

Source: Matyas, 2018
Mobility as a Service

- Option to access bundle of transportation services:
  - Includes certain use of various travel modes (public vs. private; motorized vs. non-motorized)
  - Can be personalized for each user (i.e. Netflix of transportation)
  - A great tool for travel demand management and behavioral nudge

- Interest in adopting the MaaS model vs. changing private vehicle ownership

Source: Kamargiani et al., 2017
Next Steps…

• Longitudinal analysis of changes in vehicle ownership associated with adoption of shared mobility

• **Mobility as a Service (MaaS)** likely to affect future car ownership
  – Under what conditions individuals prefer to access a vehicle when needed rather than owning one?
  – To date, only a minority (mainly in urban areas) seems interested in not owning a vehicle and accessing a suite of mobility services when needed

• New study examining willingness to join MaaS

• New study focusing on airport access (with US DOE/NREL)
Support to Clean Miles Standards Policy Making

Identify and quantify **barriers and opportunities** for TNC drivers and Riders to:

1. Increase pooling and occupancy in TNC vehicles;
2. Electrify the vehicles used to provide Lyft and Uber ridehailing services;
3. Decrease deadheading;
4. Connect to public transit; and
5. Connect to/promote active transportation.

**Senate Bill (SB) 1014 Background**

SB 1014 requires CARB and CPUC to adopt and implement a greenhouse gas (GHG) reduction program for transportation network companies (TNCs).

- **Jan 2020**: CARB establishes base year emissions
- **Jan 2021**: CARB adopts annual targets
- **2023**: CPUC begins program implementation
Support to CMS Policy Making - Data Sources

(UCD) 2018 California mobility panel survey
~3,700 respondents from California

(UCD) 2019 “8 US cities” 3R survey
~3,300 respondents from Boston, Kansas City, Los Angeles, Sacramento, Salt Lake City, San Francisco, Seattle, Washington DC

(SANDAG + Other MPOs) 2019 CA Transportation Study
57,000 person-days of transportation data with an app-enabled seven-day travel diary
GPS tracking data of 70 TNC drivers in SANDAG region
- requesting data

(SACOG) 2018 SACOG Regional Household Travel Survey
- requesting data

(UCD) Resources from other TNC studies
- joint analysis
Electrification of Ridehailing

- Driving patterns of TNC drivers in most cases compatible with performance of EVs
- Costs favor use of PHEVs, but competitiveness of EVs growing
- Impacts on charging infrastructure
- New project focusing on electrification of TNC fleets in California
- Support to policy making

Source: Jenn (2019)
Electrification of Ridehailing

- Driving patterns of TNC drivers in most cases compatible with performance of EVs
- Costs favor use of PHEVs, but competitiveness of EVs growing
- Impacts on charging infrastructure
- New project focusing on electrification of TNC fleets in California
- Support to policy making

Source: Jenn (2019)
Vehicle Automation
# Vehicle Automation

<table>
<thead>
<tr>
<th>SAE Level</th>
<th>SAE Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No Automation</td>
<td>The human driver controls all aspects of driving always. The vehicle may have warning systems.</td>
</tr>
<tr>
<td>1</td>
<td>Driver Assistance</td>
<td>The vehicle may be able to control steering or acceleration/deceleration using information from the external environment. The human driver performs all driving tasks.</td>
</tr>
<tr>
<td>2</td>
<td>Partial Automation</td>
<td>The vehicle may be able to control both steering and acceleration/deceleration using information from the external environment. The human driver performs all driving tasks.</td>
</tr>
<tr>
<td>3</td>
<td>Conditional Automation</td>
<td>The vehicle can control all driving tasks (steering, acceleration/deceleration) and monitors the environment. A human driver may need to respond to a request to take over the vehicle and acts as the back-up system.</td>
</tr>
<tr>
<td>4</td>
<td>High Automation</td>
<td>The vehicle can control all driving tasks (steering, acceleration/deceleration) and monitors the environment. The vehicle may request a human to intervene though intervention is not necessary.</td>
</tr>
<tr>
<td>5</td>
<td>Full Automation</td>
<td>The vehicle can control all driving tasks (steering, acceleration/deceleration) and monitors the environment. The human could choose the manage the vehicle if they desire.</td>
</tr>
</tbody>
</table>

Source: Adapted form SAE (2016)
How will fully autonomous vehicles impact travel and activity behavior?

**Future of Interest:**
a fully autonomous vehicle

**Simulation of Future:**
a personal driver

For more details:
Emission Impacts of Connected and Automated Vehicle Deployment

- Evaluate future scenarios of C/AV deployment
- Investigate ranges of potential VMT, GHG, and criteria pollutant emission impacts
- Project builds on knowledge from leading research in the field
What can be modeled?

Source: Milakis, van Arem, van Wee 2017
## Behavioral Factors to be Considered

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Response to CAV deployment</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Demand</td>
<td>Trip Making Rates</td>
<td>• Remain unchanged. • Increase.</td>
<td>• Total number of trips.</td>
</tr>
<tr>
<td></td>
<td>Vehicle ownership</td>
<td>• Remains unchanged. • Decreases. • Increases.</td>
<td>• Modal split • Trip making rates</td>
</tr>
<tr>
<td></td>
<td>Residential Choice</td>
<td>• Remain unchanged. • Increased sprawl.</td>
<td>• Location of home-based-trip origins.</td>
</tr>
<tr>
<td></td>
<td>Activity Location Choice</td>
<td>• Remains Unchanged. • Less sensitive to travel time.</td>
<td>• Location of trip destinations.</td>
</tr>
<tr>
<td></td>
<td>Modal Split</td>
<td>• Remains unchanged. • Increased use of ridesourcing (Part II)</td>
<td>• Trips by mode. • Number of vehicles on the road.</td>
</tr>
<tr>
<td>Traffic Assignment</td>
<td>Route selection paradigms for CAVs</td>
<td>• Remains unchanged. • User optimal w/ real-time and/or historical information. • System optimal or other.</td>
<td>• Path choice &amp; resulting travel times. • Modal split (indirectly).</td>
</tr>
</tbody>
</table>

Source: Kuhr et al. (2017)
## Technical Factors to be Considered

<table>
<thead>
<tr>
<th>Category</th>
<th>Factor</th>
<th>Possible Assumptions</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System Performance</strong></td>
<td>Vehicle fleet characteristics</td>
<td>• Remains unchanged.</td>
<td>• Arterial and freeway performance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decrease in vehicle size.</td>
<td>• Residential location choice (Indirect).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Increase in vehicle size.</td>
<td></td>
</tr>
<tr>
<td><strong>System Performance</strong></td>
<td>Automation</td>
<td>• Optimistic adoption rate for personal vehicles (Part II).</td>
<td>• Headways.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pessimistic adoption rate for personal vehicles (Part II).</td>
<td>• Traffic control strategies.</td>
</tr>
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<td></td>
<td></td>
<td>• Automation of transit fleet.</td>
<td>• Safety.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Automation of freight fleet.</td>
<td>• Indirect: Arterial and highway performance.</td>
</tr>
<tr>
<td><strong>System Performance</strong></td>
<td>Communications</td>
<td>• Technology adoption. timeline dictated by DSRC deployment.</td>
<td>• Indirect: Modal Split</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Technology adoption timeline accelerated through cellular technologies.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• V2V.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• V2V+V2I.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• V2X+Backhaul (enabling centralized data collection and traffic management).</td>
<td></td>
</tr>
</tbody>
</table>

Source: Kuhr et al. (2017)
Uncertainties in AV Impacts

- Land use
- Travel demand
- Trip length
- Auto ownership
- Mode choice

- Parking
- Auto occupancy
- In-vehicle travel time
- Zero-occupancy vehicle
How to Model Mode Choice?
Long-distance Travel
Potential Changes in Long-Distance Travel

- Smaller airports might be affected by AV, and may even shut down
- AVs might cause congestion in airport area
- Group size need to be considered in travel demand models
- Dead-head trips might be worse due to the use of AV on long distances
- Intercity automated buses might be a way out
- Induced demand could cause more air trips
- Potential for scheduled AV service
- Roadway congestion is creating market for air travel
- AV can be considered as feeder service
Strategies to Support VMT and GHG Containment Goals:

1. Deploy driverless vehicles as shared use vehicles, rather than privately owned
2. Ensure widespread carpooling
3. Deploy driverless vehicles with zero tailpipe emissions
4. Take advantage of opportunities to introduce pricing
5. Increase line haul transit use rather than replacing it
6. Ensure driverless vehicles are not larger or more energy consumptive
7. Program vehicle behavior to improve livability, safety and comfort on surface streets
“Not all vehicles are created equal”: AVs will differ from today’s vehicles...

...What factors can encourage travelers to share rides with strangers?

Source: Beth Ferguson and Angela Sanguinetti (2018)
How are micromobility services changing travel behaviors?
From *Bike Share* to *Shared Micromobility*

![Graph showing the growth of shared micromobility trips from 2010 to 2018.](image)

- **Scooter share**
- **Dockless bike share**
- **Station-based bike share**

*Source: NACTO*
Shared Micromobility across the U.S. in 2018

Source: NACTO
E-scooter Trips – Impacts on Other Modes

Alternative mode

- Drive private vehicle, alone: 12%
- Drive private vehicle, with others: 5%
- Ride in private vehicle, with others: 1%
- Use Uber/Lyft: 15%
- Use my own bike or scooter: 3%
- Walk: 55%

I would not have made this trip: 7%
### Impacts of E-scooter Trips – by Trip Length

<table>
<thead>
<tr>
<th>Alternative mode</th>
<th>Less than a mile</th>
<th>1-2 miles</th>
<th>3-4 miles</th>
<th>5 miles or more</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive private vehicle, alone</td>
<td>8</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Drive private vehicle, with others</td>
<td>3</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Ride in private vehicle, with others</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ride the light rail</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use Uber/Lyft</td>
<td>3</td>
<td>7</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Use my own bike or scooter</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk</td>
<td>13</td>
<td>27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would not have made this trip</td>
<td>2</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E-scooters largely similar in speed to bicycles...

Can share bike lane infrastructure!

Source: Pernia, Lu, and Birriel (2000); FHWA (2004); Fang and Handy (2017); Fang (2018)
ATL NOVEMBER NEWSLETTER

ATLien - 20 Miles of Bike Lanes are Coming!
Thanks in part to the massive adoption of micromobility (like Lime’s escooters), Mayor Keisha Lance Bottoms announced a plan to rapidly build and implement over 20 miles of additional bike lanes in the City of Atlanta over the next 2 years! Consider sending the administration a thank you email by clicking here or tweeting @keishabottoms.

TARGET NETWORK FOR SAFER MULTI-MODAL STREETS
2019-2021

The Action Plan for Safer Streets aims to:
- Connect SW Atlanta to Westside Trail and MARTA
- Provide north-south connections between Midtown, Downtown, and West End
- Bridge the gap between Grant Park and West End
- Expand access to MARTA stations, city parks, and schools by providing first/last mile connections
- Reduce risk as 100% of routes are on the city’s high-injury network or near schools
Big disruption caused by the COVID-19 pandemic with...

...need for social distancing

...impacts on employment and travel

...adoption of ICT-based remote working and e-shopping
Impacts of COVID-19 Pandemic on Mobility

Investigate the temporary and longer-term impacts of the pandemic on:

1. The use of technology
2. Lifestyles and household organization
3. Employment and activities
4. (E)-shopping patterns
5. Travel choices and vehicle ownership
6. Use of new mobility services
7. Expectations for future travel

postcovid19mobility.ucdavis.edu
COVID-19 Pandemic has already heavily affected transportation

Countries affected by the pandemic have experienced:

- Steep decline in air travel
- Reduction in all ground transportation during lockdown
- Steep decline in use of public transit
- Sharp reductions in use of shared mobility
- Uber/Lyft suspended pooled rides to prevent COVID-19 transmission
- Temporary (at least) reductions in VMT and GHG emissions
- Adoption of teleworking promoted whenever possible
- Economic recession causing devastating impacts on employment
- Mid-term reductions in gas tax revenues and funding for transportation
- Evidence after reopening points to increased car travel
- Likely changes in transportation supply and business models

Source: MOBIS-COVID19 Study (IVT, ETH Zurich and WWZ, University of Basel), https://ivtmobis.ethz.ch/mobis/covid19/

ITS Davis blog on impacts of pandemic on transportation:
UC Davis Study of COVID-19 Pandemic Impacts on Mobility

2018 California mobility panel survey:
~3,400 respondents from California

2019 “8 US cities” 3R survey:
~3,300 respondents from Boston, Kansas City, Los Angeles, Sacramento, Salt Lake City, San Francisco, Seattle, Washington DC

- Combination of quantitative (online surveys) + qualitative (in-depth phone interviews) research
- Resampling of respondents from 2018-2019 surveys
- Unique longitudinal study to investigate the impacts of the pandemic
- Recruitment of additional participants in same 8 regions from 2019 + new regions in this data collection:
  - Atlanta, Denver, Detroit, Tampa, New York, San Diego (USA)
  - Canada: Toronto and Vancouver (Canada)
- Additional data collection with convenience sample with respondents recruited through various channels
- Investigation of temporary vs. the longer-term impacts of the pandemic
COVID-19 MOBILITY STUDY

Previous 2018-2019 data
Information on many topics, e.g.
- Household organization
- Telecommuting patterns
- E-shopping behaviors
- Travel patterns
- Vehicle ownership
- Emerging delivery services
- Personal attitudes and preferences
- Shared mobility adoption
- Propensity towards AVs

2020 COVID-19 Data
Data collection on:
- Impacts of the COVID-19 on Lifestyles
- Employment and Activities
- Household Organization and Child Care
- E-shopping Behaviors
- Emerging delivery services
- Current Travel Patterns
- Vehicle Ownership
- Shared mobility adoption
- Personal attitudes and preferences

Post-COVID-19 Data
To be collected in Fall 2020 and/or Spring 2021
Interest in evolution of changes over time
Integration with passively-collected (i.e. cell phone) data
Cooperation with other researchers in the US and Europe for comparative analyses
Task 2: COVID-19 Data Collection and Analysis

2020 COVID-19 Data

Data collection on:
- Impacts of the COVID-19 on Lifestyles
- Employment and Activities
- Household Organization and Child Care
- E-shopping Behaviors
- Emerging delivery services
- Current Travel Patterns
- Vehicle Ownership
- Shared mobility adoption
- Personal attitudes and preferences

Survey respondents, as of July 7, 2020
Changes in Attitudes Towards Vehicle Ownership

I am willing to live without owning a car if I have good access to viable alternatives such as carsharing and ridehailing.

8-Cities Survey (2019-2020)

COVID-19 Survey (2020)

I am willing to live without owning a car if I have good access to viable alternatives such as carsharing and ridehailing.

Agree  Neither agree nor disagree  Disagree
I am fine with not owning a car, as long as I can use/rent one any time I need it.

A relatively small percentage of respondents also reported an intention to increase their number of vehicles in the household during the next six months.

No conclusions can be drawn (yet) on the degree to which such attitudes might turn into actual behaviors.
New website to share information on UC Davis COVID-19 Mobility Study: postcovid19mobility.ucdavis.edu
Policy Implications

• Need to focus on human beings and not cars

• Future of mobility will depend on how the market is regulated and priced, e.g. by time of day, location, to reduce congestion, promote sharing, improve equity, promote alternative fuels

• TNC drivers’ activity already compatible with EV range and performance (but need to remove barriers!)

• Need for behavioral nudge to support shift towards increased sustainability

• Land use will be a key factor to promote more sustainable choices

• Potential of MaaS to modify relationships with private vehicle ownership

• Micromobility provides critical mass for bicycling infrastructure
Behavioral Studies, Surveys and Experiments

California Panel Study of Emerging Transportation Trends

This research will expand the current statewide panel study to investigate emerging trends in travel behavior, vehicle ownership, adoption of shared mobility and propensities towards the use of AVs.

Travel Demand Modeling and Simulation Projects

Modeling Emissions Impacts of Automated Vehicle (AV) Deployment in California under Various Ownership Models

This project evaluates potential future scenarios of AV deployment in California under various ownership models.

Environmental, Economic, Equity Impacts and Policy Analysis

3 Revolutions and Smart Cities: Exploring Future Potentials and Impacts on the Energy System

This research explores the impacts of the changes in the mobility ecosystem and travel demand provided by future potentials of a smarter city and a cleaner energy system.
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