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Case Studies of Travel Demand Analysis on Transport Disadvantaged Communities

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Case Studies of Travel Demand Analysis on Transport Disadvantaged Communities

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Friday Transportation Seminar

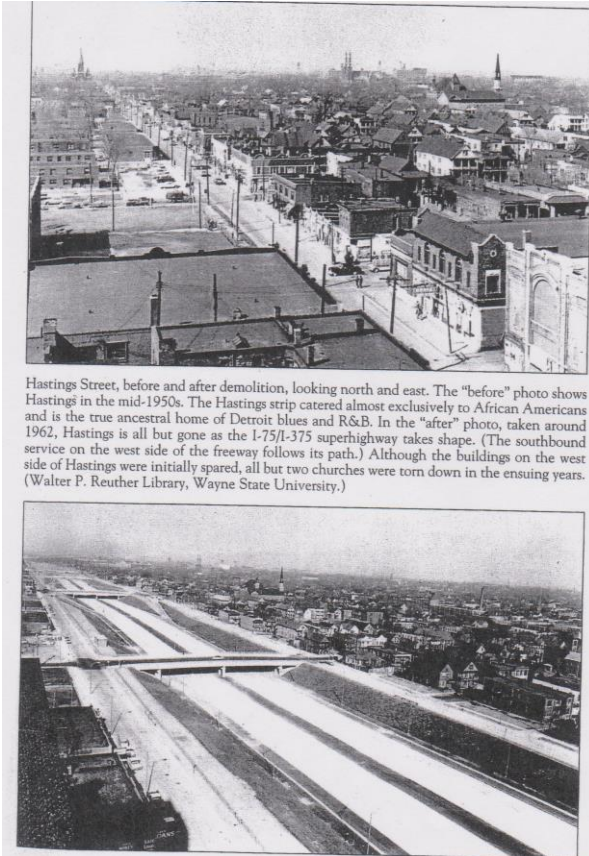
Portland State university

October 30, 2020



Black Bottom, Detroit, Early 1960's:

Demolished in early-1960's to make way for I-75, as a part of Detroit's *Urban Renewal* Commission.



Bus Riders Union vs. LACMTA, 1996:

A case was brought against the LA County Metro Transportation Authority because of inequitable transit investments.



Image: "Organizing Around Transit: At the Intersection of Environmental Justice and Class Struggle", Accessed 3/15/17

Image: Bus Riders Union Logo, <http://www.thestrategycenter.org/>, Accessed 3/15/17



Image: Hastings Street before and after urban renewal. Images and text from David Lee Poremba, *Detroit: 1860-1899 (Great Britain: Arcadia Publishing, 1998)*, Accessed 3/15/17

Smarter Transportation Technologies – Data Generators



Smarter Transportation Technologies – Data

- Trip trajectories
- Accurate travel times
- Trip origins and destinations
- Imputed travel activities

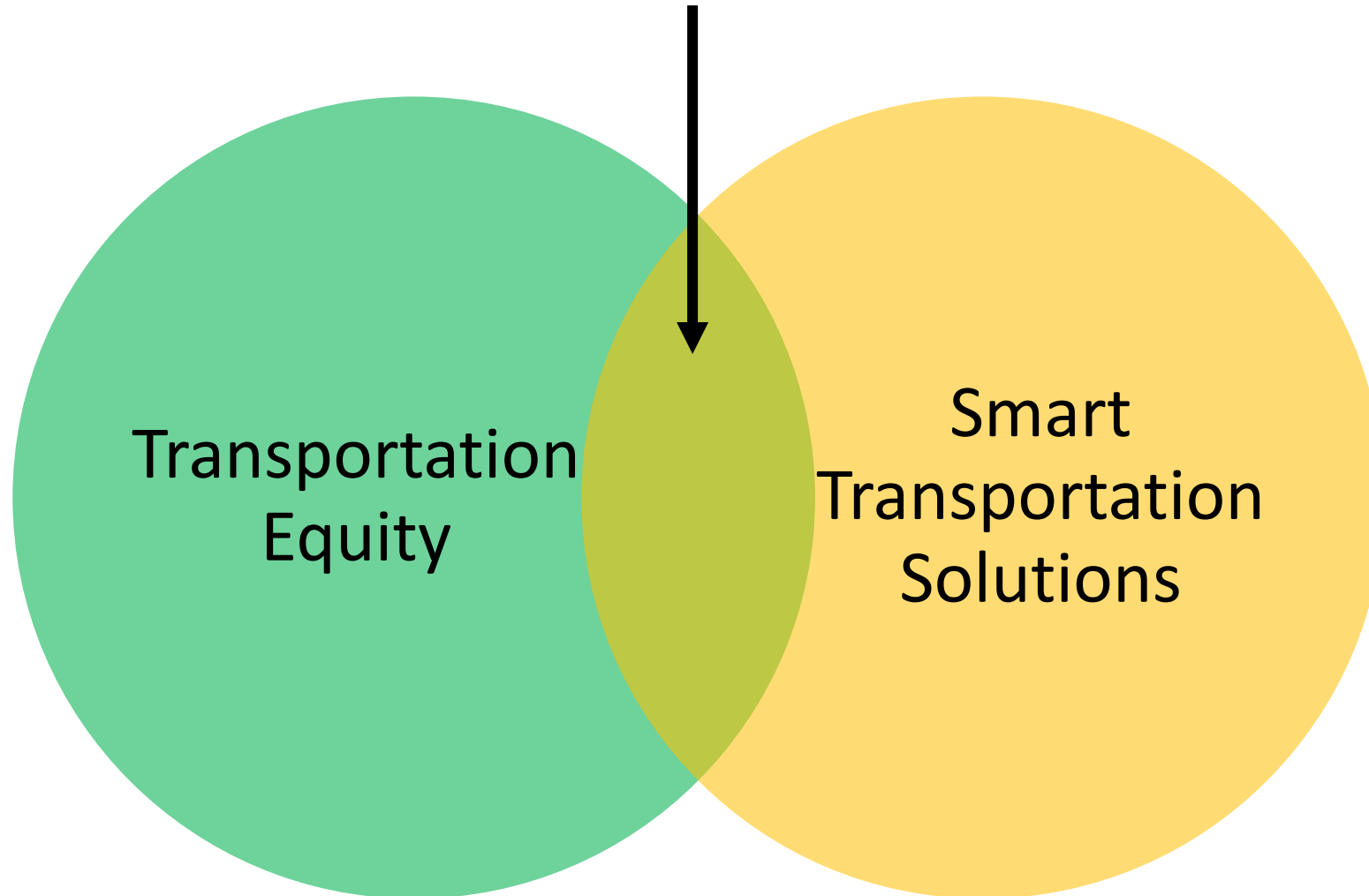
- Trip trajectories
- Accurate travel times
- Trip origins and destinations
- Trip costs

- Trip trajectories
- Accurate travel times
- Trip origins and destinations
- Trip fares

- + Real-time and prompted survey delivery (travel purpose, perceptions, etc.)



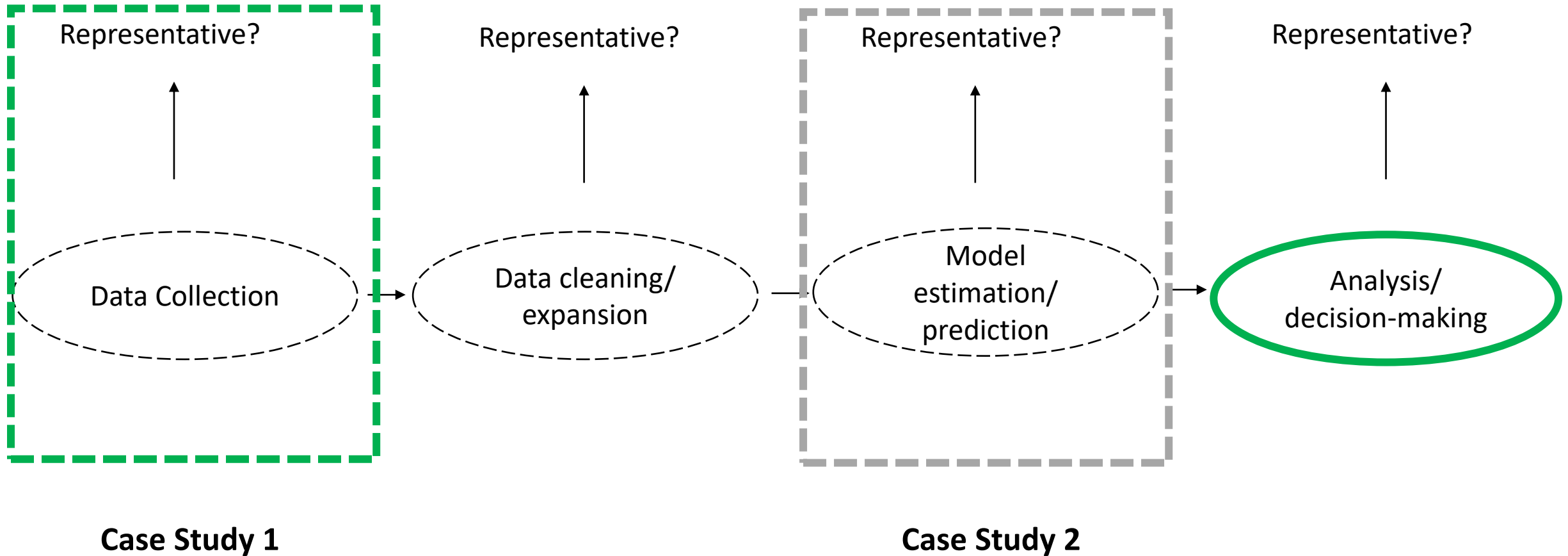
Objectives: Smarter Transportation and *accessibility* for Broader Societal Needs



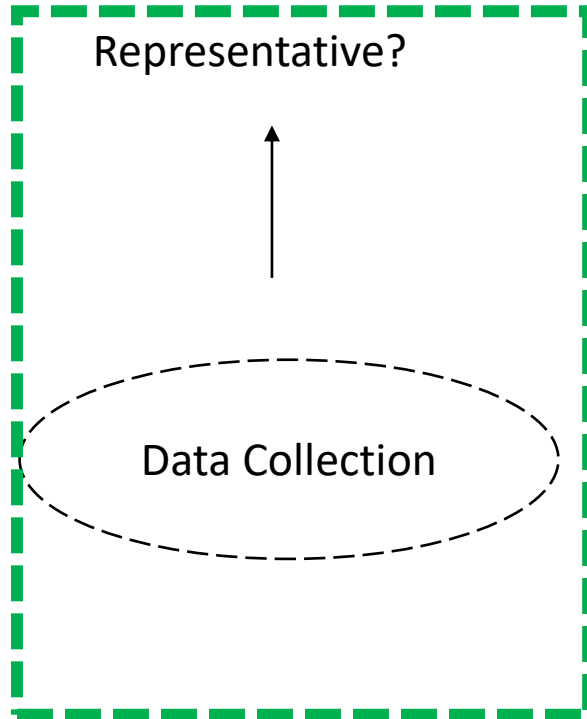
Outline

- Motivation
- **Overview of TDA Process – where does travel data fit in?**
 - What do we know about data quality?
- **Benton Harbor Travel Needs Survey**
 - Overview of Methods
 - Results
- **Detroit Microtransit Scenario Analysis**

Travel Demand Analysis



Representativeness of Travel Data?



Case Study 1

Known:

- There are known challenges with conventional travel Surveys:
 - Response biases (“unit” and “item” nonresponse)¹
 - sampling error ¹
- Solutions:
 - Increase sample size overall (i.e. using emerging big data sources)¹
 - Stratified sampling ¹
 - Increase sample anticipating non-response for certain demographics ²

Unknown:

- To what extent can “big data” sources fix known problems with conventional surveys? ³
- Relevance and ramifications of relative representativeness?
- Solutions (sampling design, data expansion methods, modeling methods, etc.)?

References:

1. Richardson, A. J., Ampt, E. S., & Meyburg, A. H. (1996). Nonresponse issues in household travel surveys. In *Conference Proceedings* (Vol. 10, pp. 79-114).
2. Bradley, M., Bergman, A., Lee, M., Greene, E., & Childress, S. (2015). Predicting and applying differential response rates in address-based sampling for a household travel survey. *Transportation Research Record*, 2526(1), 119-125.
3. Chen, C., Ma, J., Susilo, Y., Liu, Y., & Wang, M. (2016). The promises of big data and small data for travel behavior (aka human mobility) analysis. *Transportation research part C: emerging technologies*, 68, 285-299.

Examples – “relative representation” of Transport Disadvantaged Communities

2017 – NHTS HH Weights (n= 129,696)

	Min	Mean	Max
0 Veh HHs	11	1,691	22,155
1+ Veh HHs	7	872	22,153

2010 – CA HH Weights (n = 21,225) – w/GPS

	Min	Mean	Max
0 Veh HHs	44	921	3146
1+ Veh HHs	25	556	3146

	Min	Mean	Max
Low Income HHs	7	1101	22,155
Other Income HHs	7	853	21,998

	Min	Mean	Max
Low Income HHs	25	740	3146
Other Income HHs	25	520	3146

Source: Transportation Secure Data Center." (2017). National Renewable Energy Laboratory. www.nrel.gov/tsdc

Case Study 1: Benton Harbor Travel Needs Survey

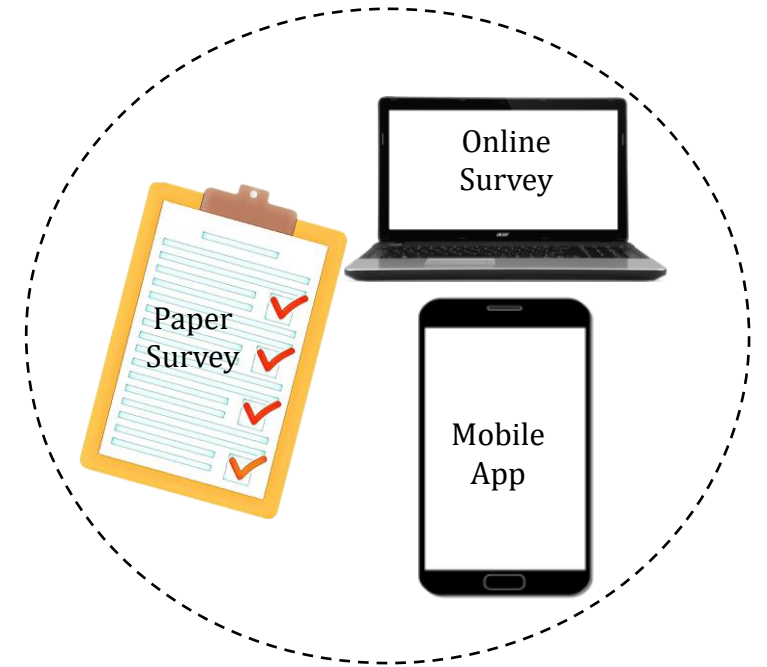


Objectives

- Recommend operator level transit improvement that can target accessibility to employment, education, healthcare, and grocery store locations
- Survey transport disadvantage groups to characterize travel behaviors and identify underserved needs



Outreach partners



Survey Modes

Case Study 1: Benton Harbor Travel Needs Survey



Methods

- We used a mix of survey modes to target hard-to-reach communities (i.e. **low income, transit dependent, elderly, and un/underemployed residents**)
- To recruit participants, we:
- Distributed fliers to Kinexus clients (and throughout the community)
 - Posted in Dial-A-Ride shuttles
 - Posted in local newspapers
 - Circulated press releases
 - Made announcements on a local radio station
 - Shared events on Facebook.

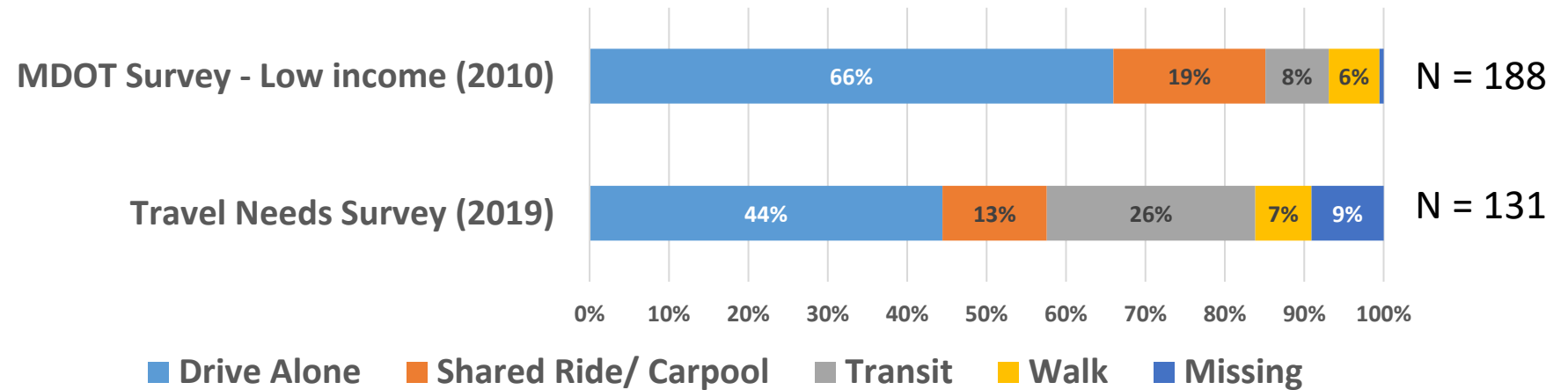
Case Study 1: Benton Harbor Travel Needs Survey



Insights

1. Even when **comparing with the most disadvantaged groups** from the conventional survey, we find significant differences:
 - Much smaller share of auto users (**44% vs. 66%**)
 - Much higher share of transit users (**26% vs. 8%**)

Mode Share Comparison



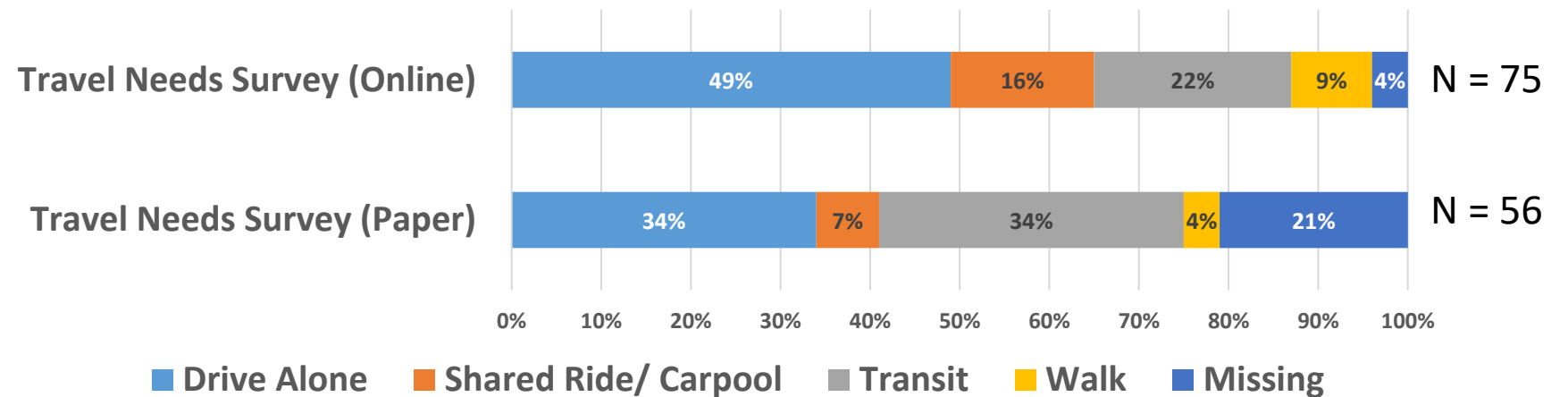
Case Study 1: Benton Harbor Travel Needs Survey



Insights

2. Paper surveys + target outreach matter
 - Participants who used paper surveys are **less likely to drive or carpool** and have highest non-response rates
 - They were also more **elderly**, and more likely to have a **disability**.

Survey Mode Comparison



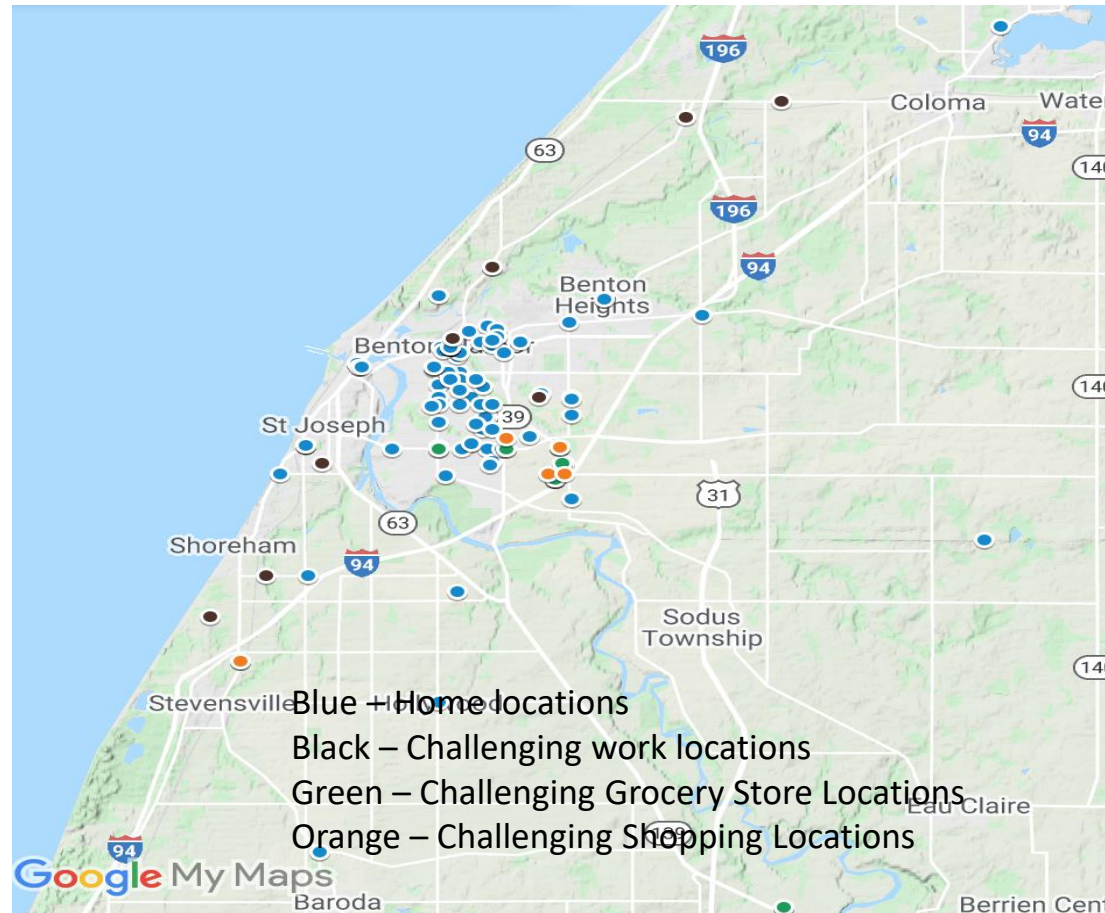
Case Study 1: Benton Harbor Travel Needs Survey



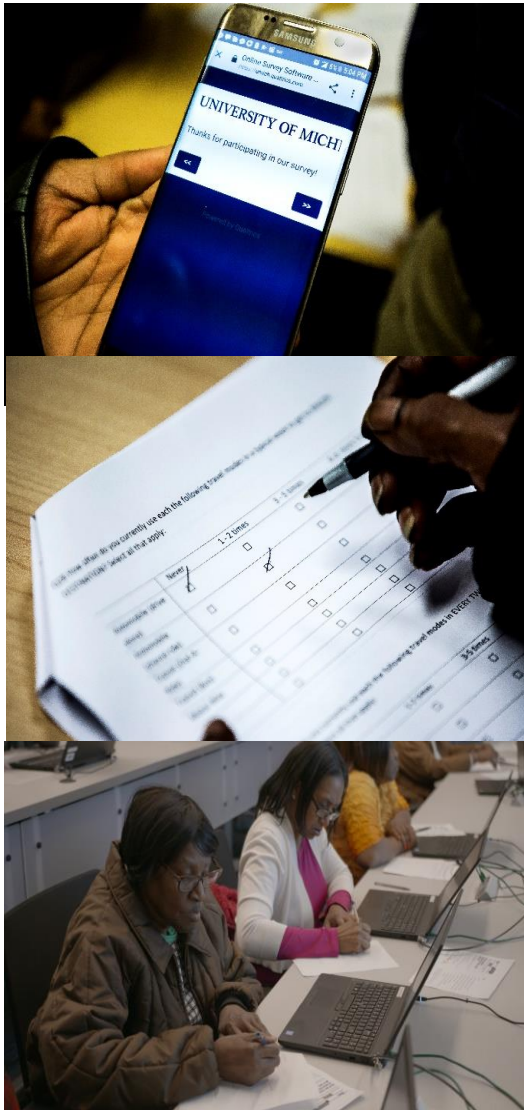
Insights

3. Travel needs

- Identifying clear accessibility needs based on survey questions
 - We asked more direct questions about travel needs



Case Study 1: Benton Harbor Travel Needs Survey

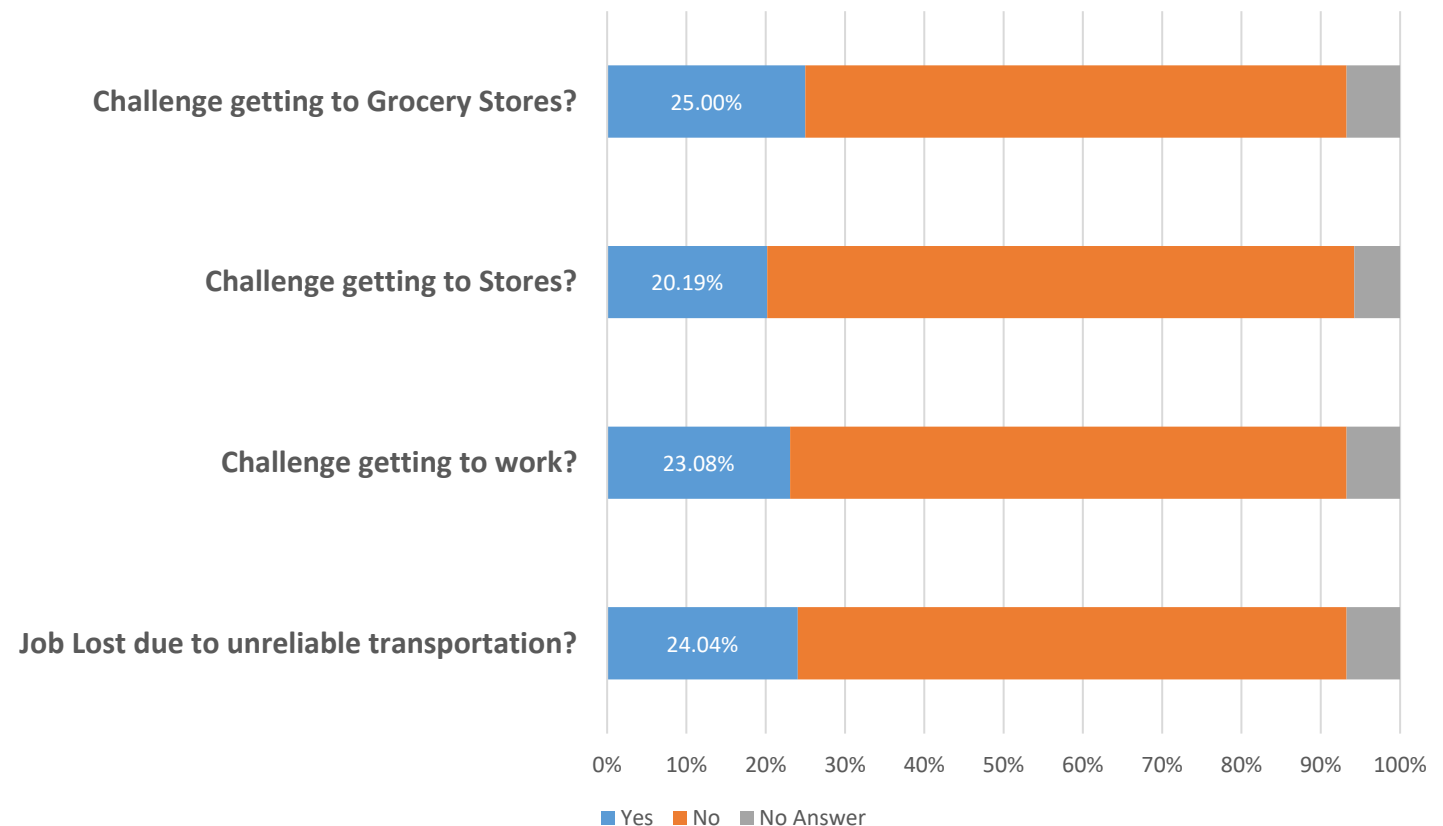


Insights

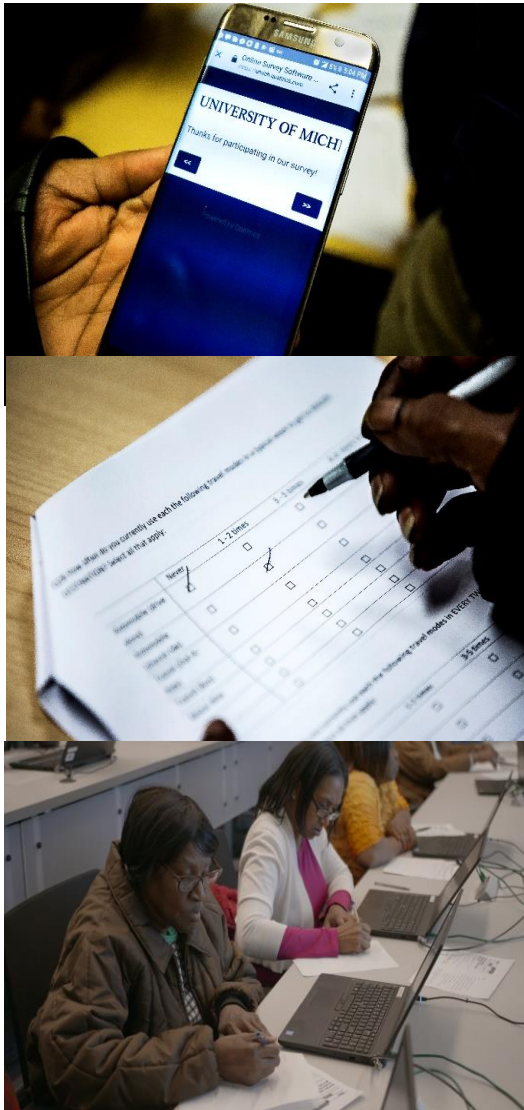
3. Travel needs

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Transportation Struggles



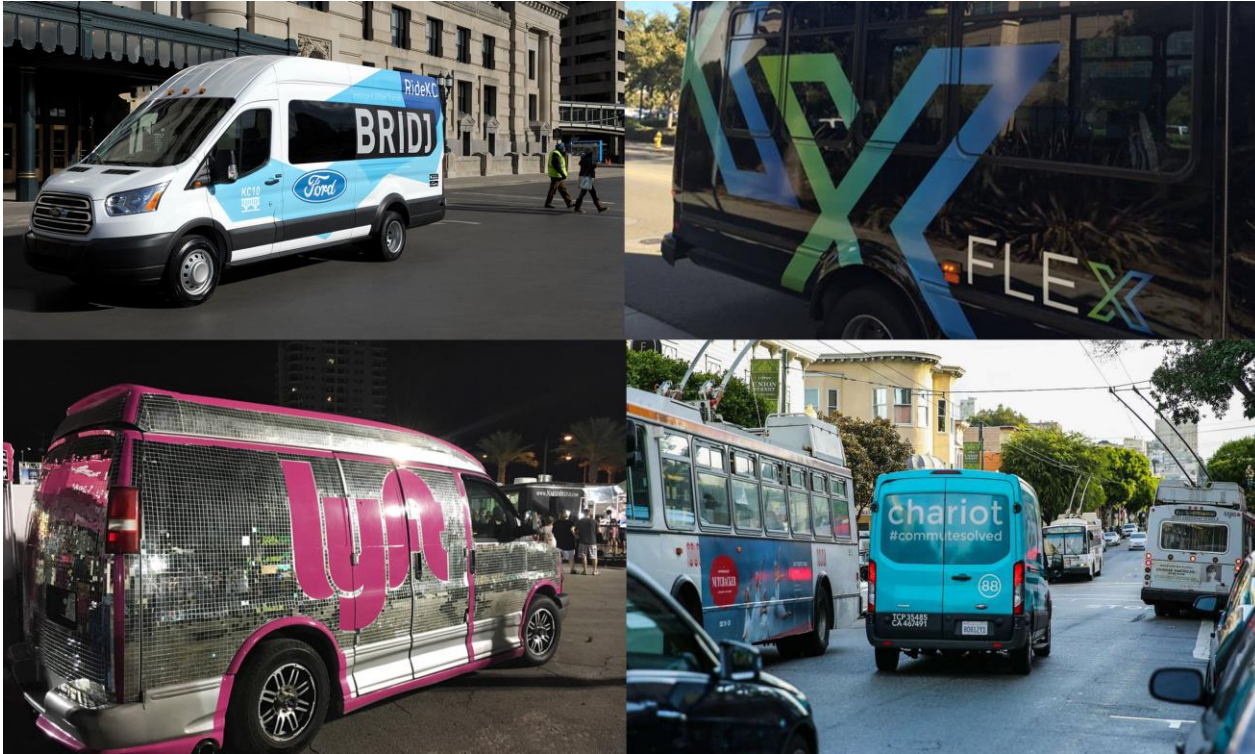
Case Study 1: Benton Harbor Travel Needs Survey



Next steps and Remaining Questions

- We are currently building our mode and destination choice modes using our travel needs survey + MDOT survey
- Can we improve model predictions using our sample of data?
- **Questions that we expect to investigate:**
 - What sample strategies lead to more representative data sets
 - How effective are conventional data expansion methods in addressing under-representativeness?
 - What is the nature of model prediction distortions that can result from under-representativeness
- **Broader questions:** How far off the mark are we? And how might transportation decisions change with more representative data?

Case Study 2: Detroit Microtransit Scenario Analysis



Motivating: How can we support transit accessibility for Detroit households who most need it?

This study use SEMCOGs Travel model to assess the equity outcomes of various Microtransit scenarios

SEMCOG Travel Demand Model

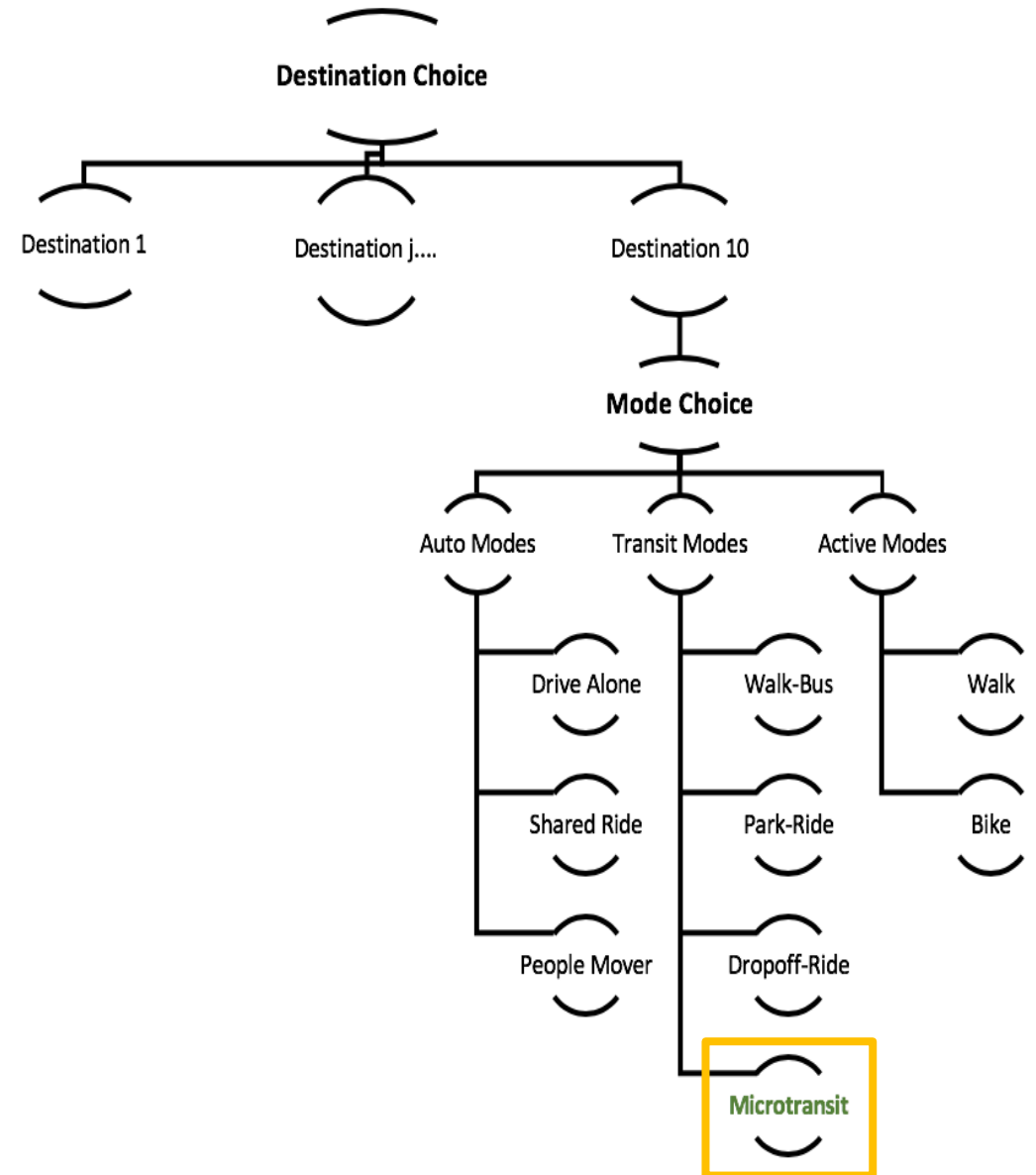


Case Study 2: Detroit Microtransit Scenario Analysis

Critical Questions:

When forecasting the equity impacts of new transit options, the question becomes: **is the model structure appropriate to all groups?**

- For some groups it make be **more appropriate** for the new micro transit option to fall under auto modes (more like a shared-van experience), and for others it may be mostly correlated with transit modes.
- What is the **cost of mis-specification**, in this case?



Thank you!
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