Access to opportunities and user benefits in public transit performance assessment

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UT-Austin

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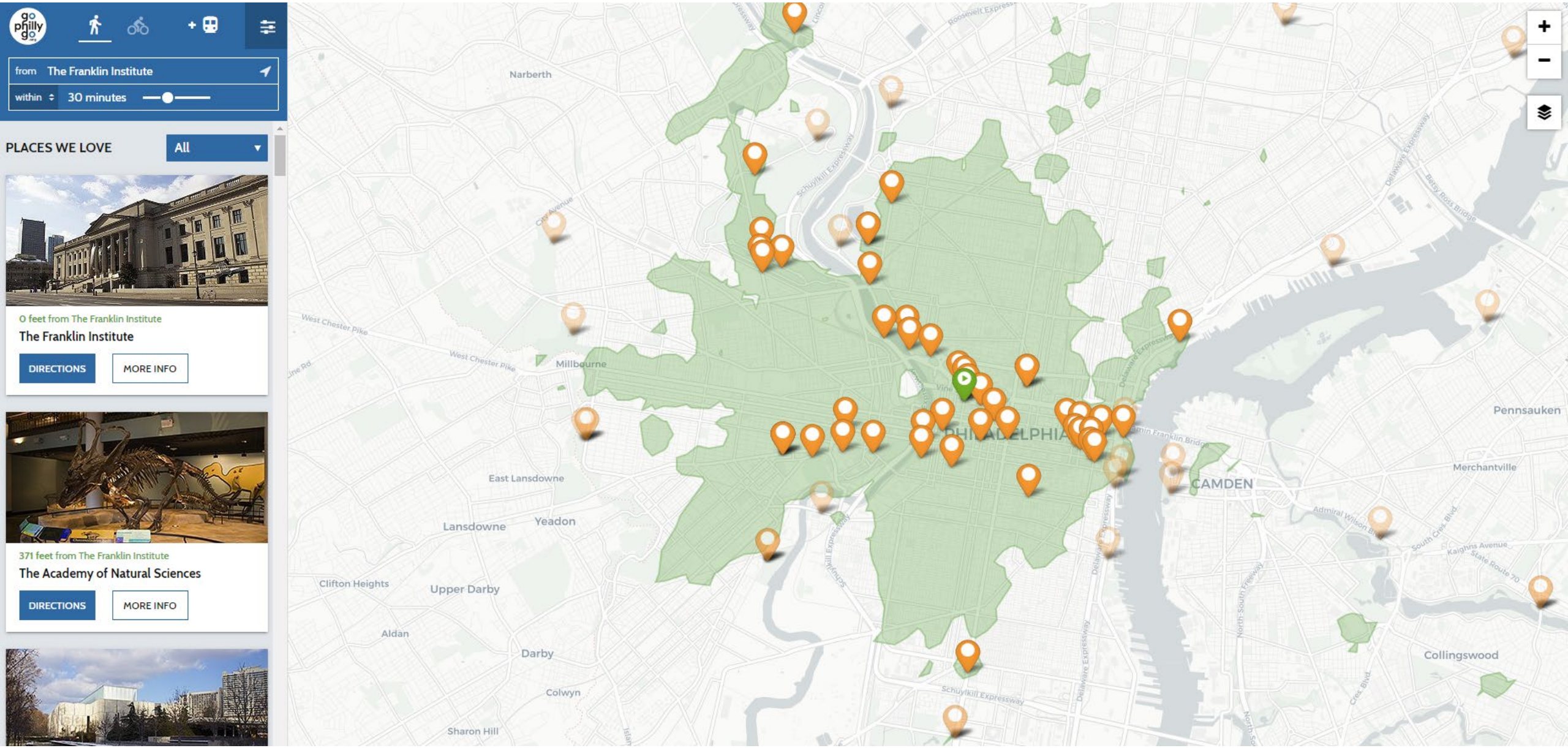
TEXAS
The University of Texas at Austin

U.S. Department of Transportation
Federal Transit Administration

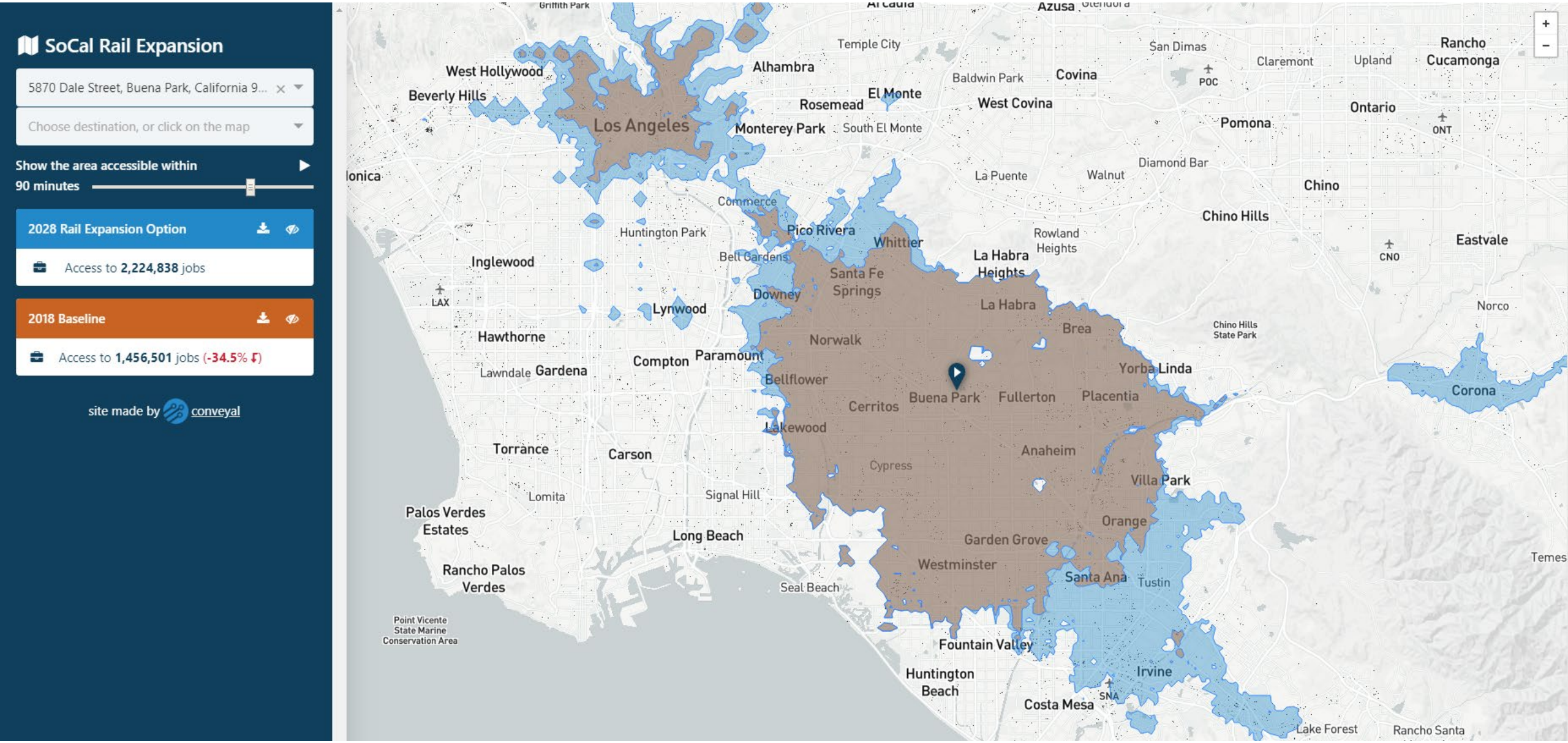
How should we assess the equity-related performance impacts of public transit service changes?

Accessibility

Mobility

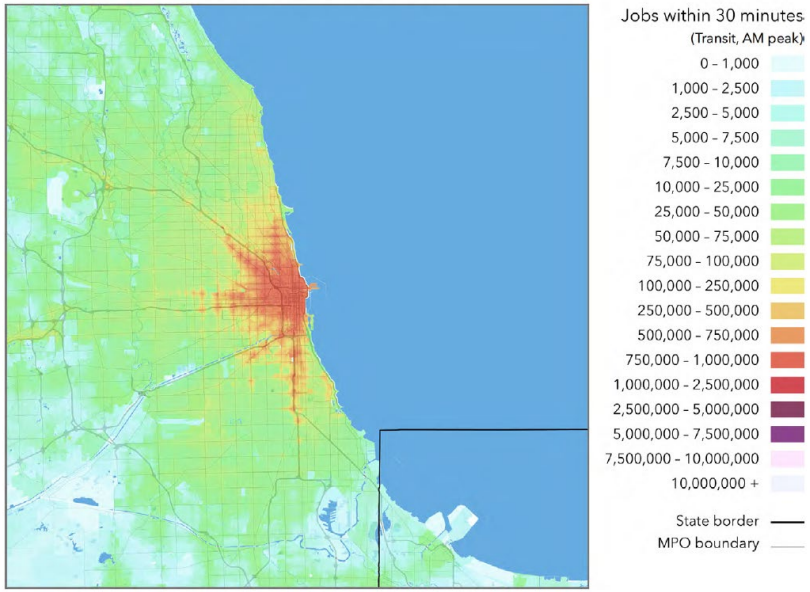


source: gophillygo.com

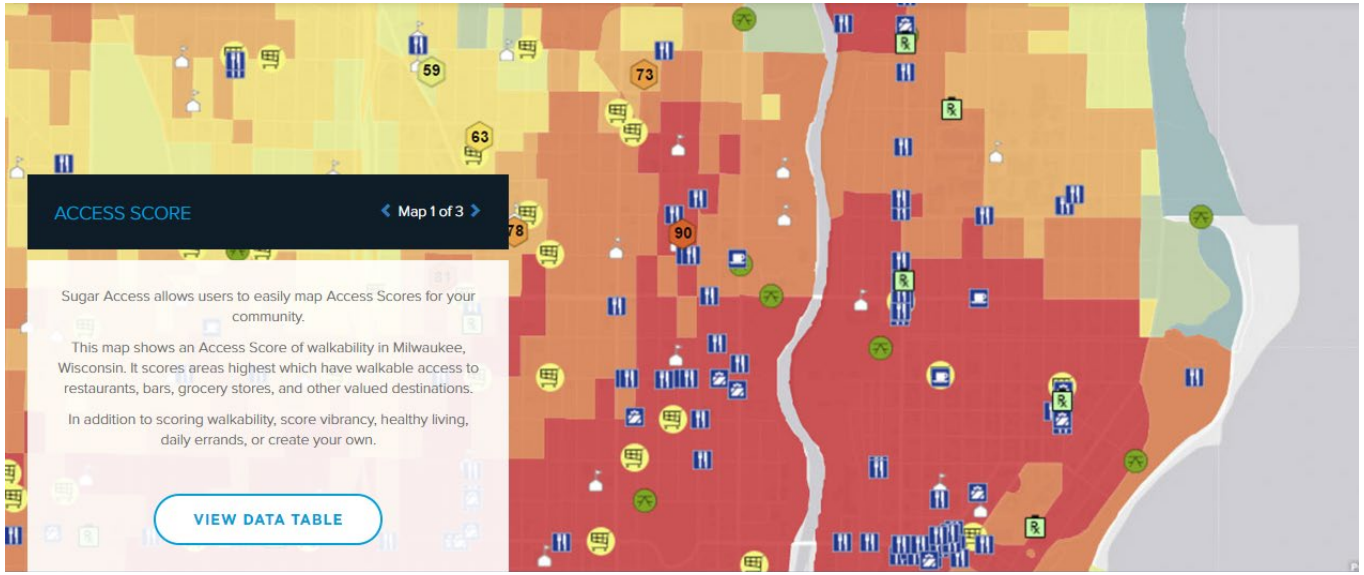


source: Anson Stewart (Conveyal)

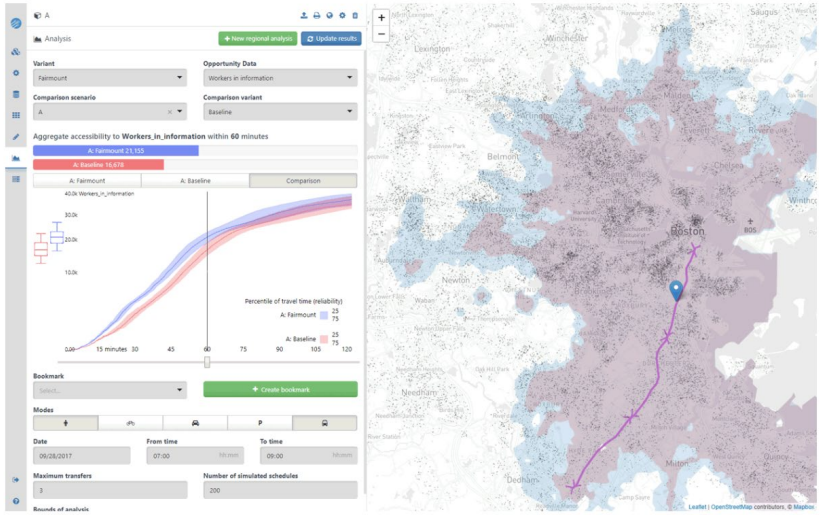
Chicago-Joliet-Naperville, IL-IN-WI



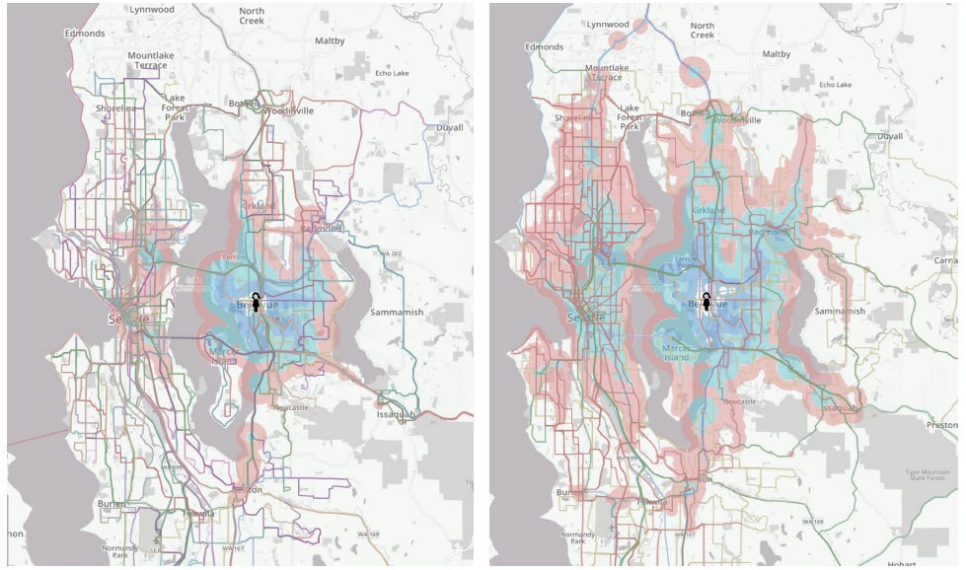
Univ. Minnesota



Citilabs



Conveyal



Remix

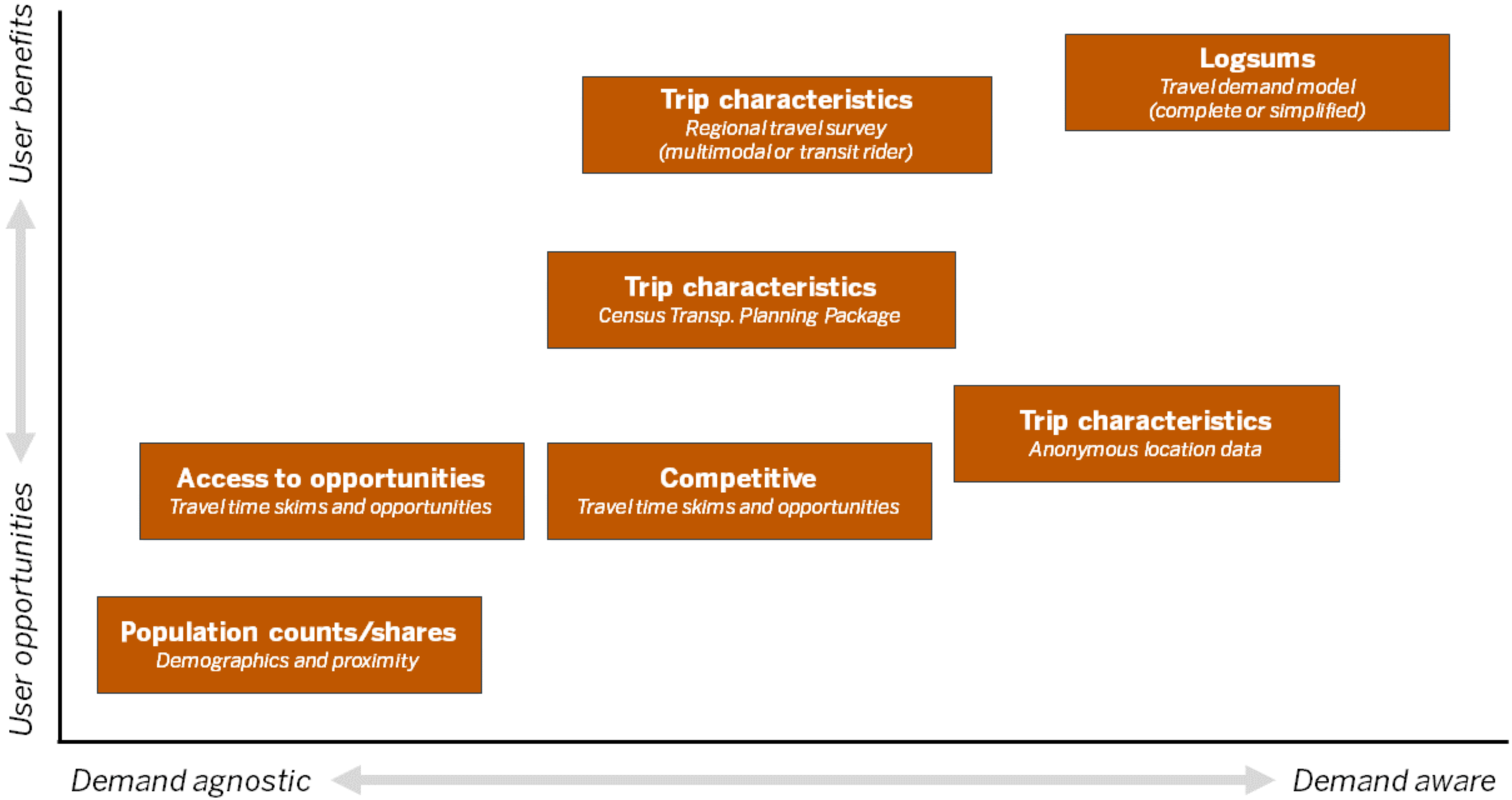
How should we assess the equity-related performance impacts of public transit service changes?

Realizations

- Typical “access to opportunities” measures are easily understood for individual travelers

- But unclear how to “roll up” these types of measures into a regional benefit
  - Regional average change in jobs accessible within 90 minutes?

- Multiple data sources are available that give us information about how people are traveling today


User benefits
User opportunities
Logsums
Travel demand model
(complete or simplified)
Trip characteristics
Regional travel survey
(multimodal or transit rider)
Trip characteristics
Census Transp. Planning Package
Trip characteristics
Anonymous location data
Access to opportunities
Travel time skims and opportunities
Competitive
Travel time skims and opportunities
Population counts/shares
Demographics and proximity
Demand agnostic
Demand aware

Two guiding principles

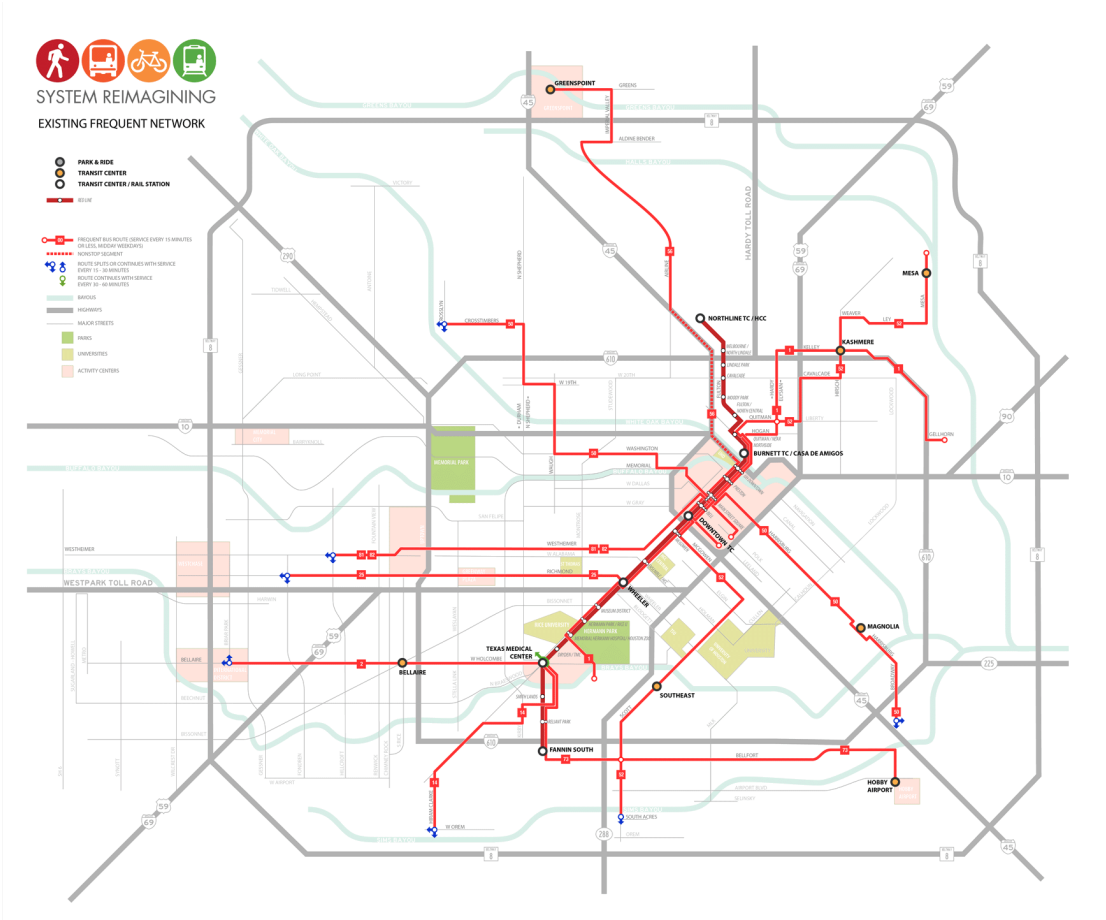
Karel Martens
Assoc. Professor, Technion

"The only way forward … is to explicitly acknowledge the multi-dimensional nature of accessibility by measuring it in multiple ways."

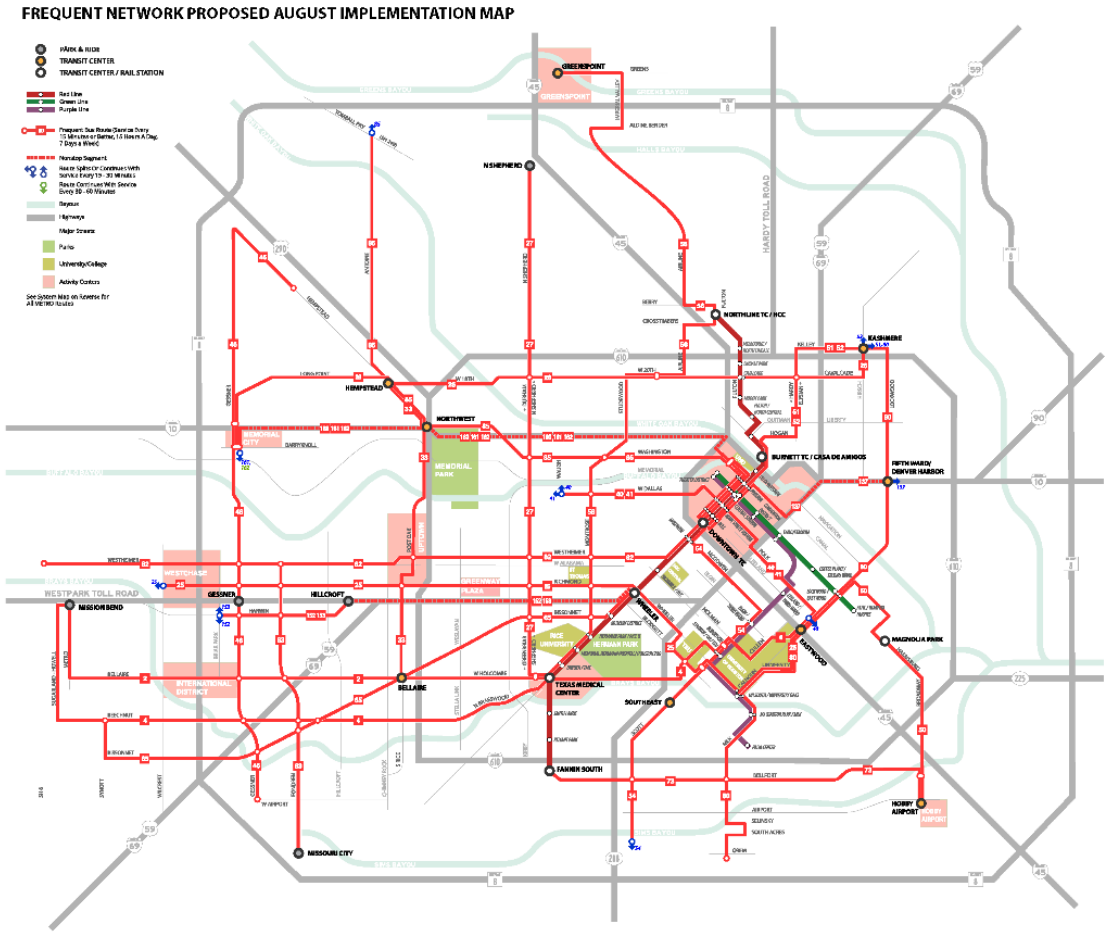
Current riders' travel patterns should form the core of a meaningful performance analysis

Case study location

Houston METRO System Reimagining (2015)



***Before** System Reimagining*



***After** System Reimagining*

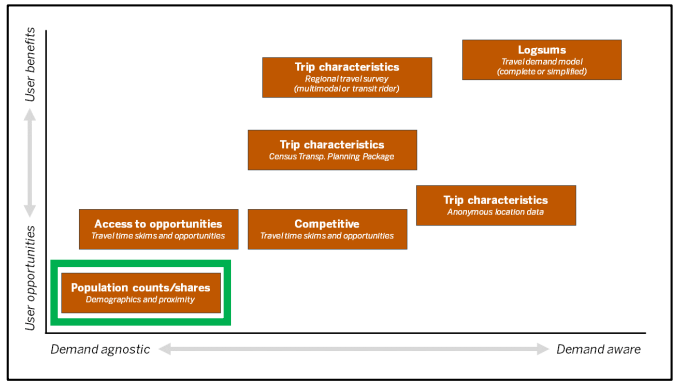
source: Asakura Robinson, http://www.asakurarobinson.net/

Results

Population counts/shares

Population within ¼ mile of transit stops

	White	Black	Asian	Latinx	Total
before	387,694	352,023	110,288	701,680	1,551,127
after	388,967	350,430	109,849	688,295	1,536,969
% change	0.33%	-0.45%	-0.40%	-1.91%	-0.91%

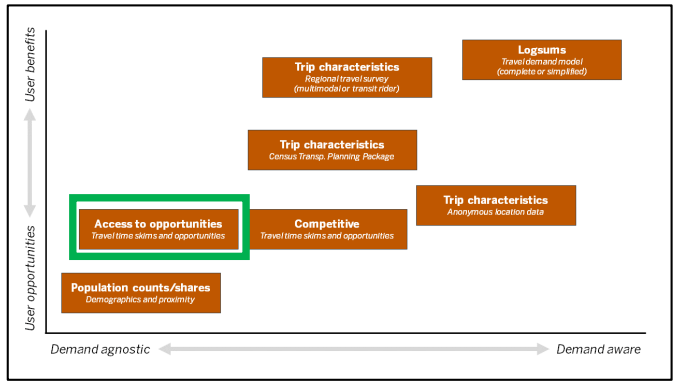


Mean headway (minutes)

	White	Black	Asian	Latinx
before	28.6	31.6	28.6	31.0
after	26.5	30.6	25.6	30.2
% change	-7.1%	-3.3%	-10.4%	-2.7%

Results

Access to opportunities (total jobs < 45 minutes), AM peak



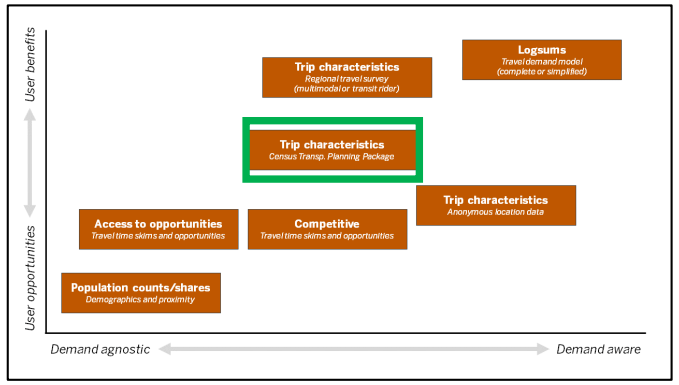
Population-weighted means

	total	white	people of color
before	142,713	183,181	129,271
after	125,009	163,641	112,243
% change	-12.4%	-10.7%	-13.2%

Results

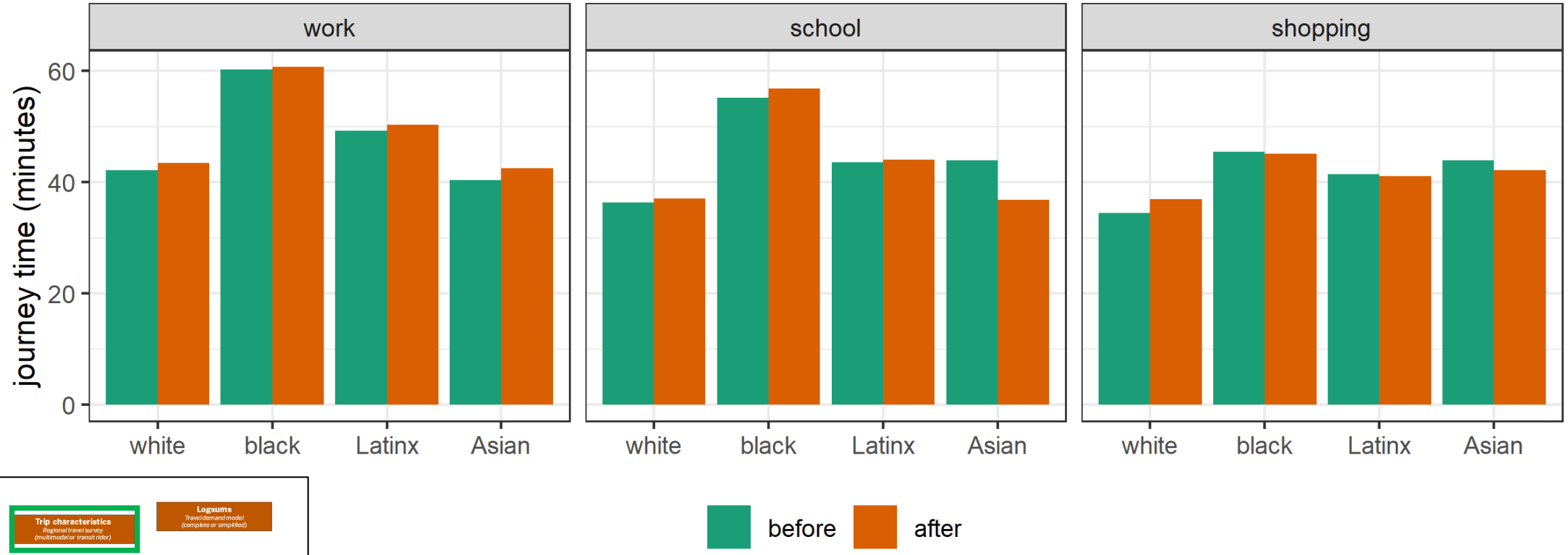
Trip characteristics (based on CTPP commute flows)

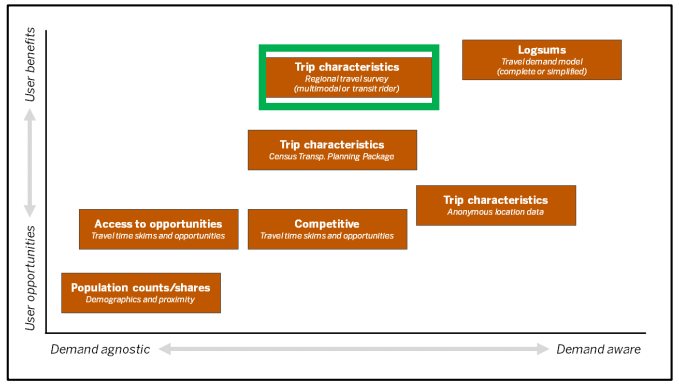
	overall			people of color			white		
	before	after	pct.	before	after	pct.	before	after	pct.
Travel time (min)	67.7	69.2	2%	68.9	70.4	2%	59.6	61.1	3%
Walk time (min)	19.5	20.5	5%	19.6	20.7	6%	18.4	19.2	4%
In-vehicle time (min)	39.4	38.7	-2%	40.2	39.4	-2%	34.5	34.4	0%
Wait time (min)	8.8	9.9	13%	9.08	10.3	13%	6.75	7.45	10%
Number of transfers	0.5	0.7	21%	0.57	0.69	21%	0.42	0.49	16%



Results

Trip characteristics (based on rider survey data)





Value added

- Completely automated and reproducible workflows using publicly available (or obtainable) data
- Open source code, complete transparency, flexibility to tailor analysis needs depending on community engagement/agency needs
- Multiple perspectives on performance impacts
- Challenges
  - Some familiarity with basic programming/data wrangling required
  - Allowing for shifts in travel behavior (to come with STOPS)

Looking ahead

- Demonstrate all possible performance measures in three case study areas
- Consider physical accessibility and drive-transit paths
- Create additional guidance documents, code, and data
- Examine non-spatial equity practices

- Create multimodal accessibility guidance across many different use cases under NCHRP 08-121

Acknowledgements

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