Measuring the Impacts of Disruptions on Public Transit Accessibility and Reliability

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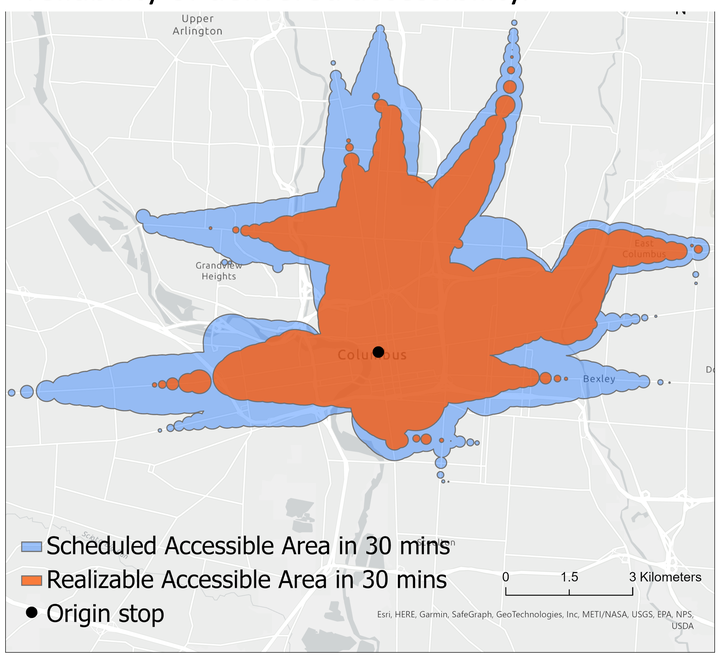
Background

Public transit systems are at higher risk of system degradation and decreased reliability due to external disruptions, making resilience (maintaining functions during a disruption) a crucial assessment.

Data & Method

We calculate two space-time prism-based measures using GTFS-RT data**: realizable real-time accessibility** (achievable by users with delays) and **scheduled accessibility.**

We also calculate **accessibility unreliability** as the deviation between realizable and scheduled accessibility to measure the reliability of delivered accessibility.

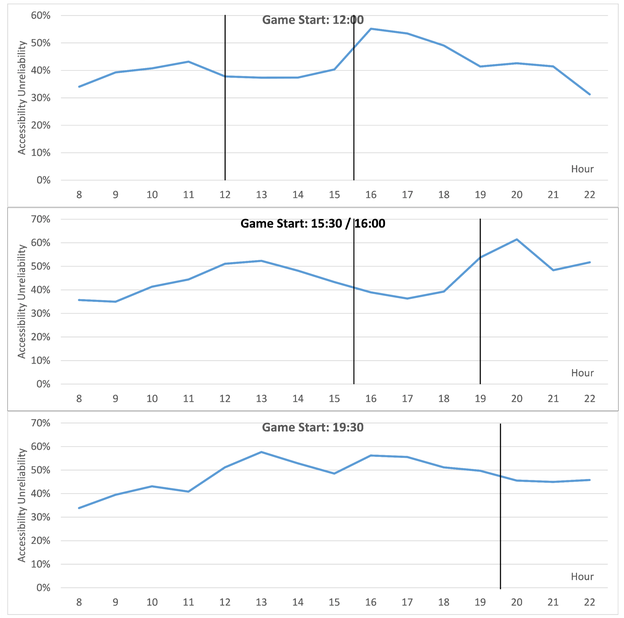


***Unreliability**: difference between scheduled and realizable accessible area*

Short-term Disruption: Ohio State Football Game

About 100k people arrived at Ohio Stadium per game in 2019, creating heavy traffic and acute disruption.

Before/after-game unreliability peaks: Most game days had two periods of increased unreliability before and after the game, due to traffic to and from the stadium.

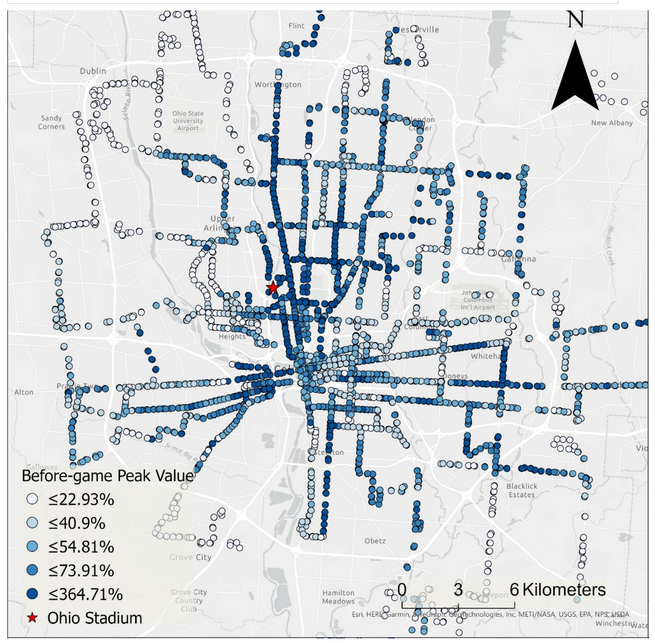


The positions of the peaks are shifting along with the changing game start time

The 19:30 game did not have an after-game peak because it extended past normal operation hours

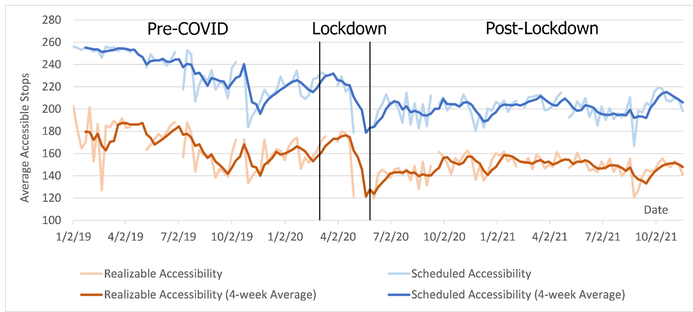
Highest unreliability at each stop

Football games create large amount of traffic and unreliability around the event location



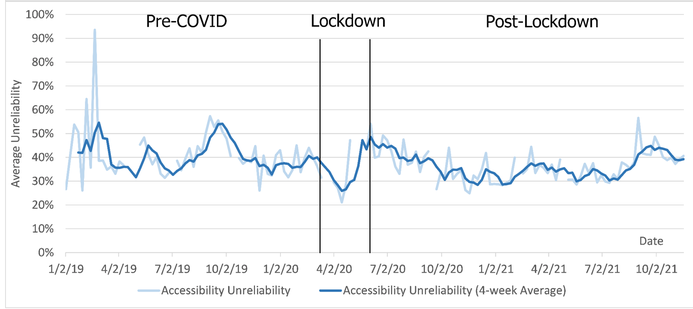
Long-term Disruption: COVID-19 Pandemic

COVID-19 has persistent and chronic negative impacts on public transit accessibility and accessibility reliability.



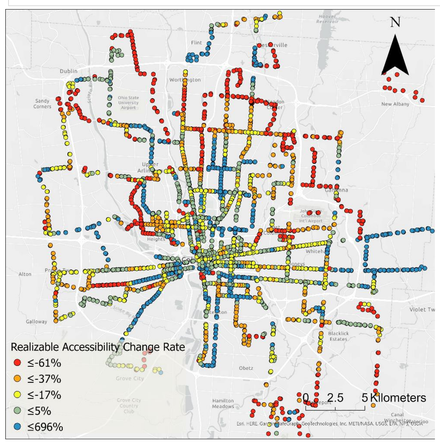
Realizable and scheduled accessibility 2019 – 2021

- Both accessibility measures rapidly declined in May 2020
- Scheduled accessibility declined faster
- Accessibility stayed low during 2021



Accessibility unreliability 2019 – 2021

Accessibility unreliability during the lockdown first declined and then increased



Change rate of accessibility during COVID

- Most service cuts were in suburb and urban outskirts, resulting plunging accessibility in those areas
- Downtown area suffered least from COVID-19; some neighborhoods even experienced increase in reliability due to better traffic condition

Conclusions

- Schedule-based accessibility is unreliable
- OSU football games significantly affect public transit performance
- COVID-19 have persistent negative impacts on both accessibility and reliability
- Unreliability should be considered with other measures, like accessibility, to understand overall system performance