



Quantifying Adverse Effects of Transit Changes Using MTOI

Steven Andrews



MassDOT
INNOVATION
+ **MOBILITY**
Exchange



FTA requires large agencies to evaluate major service changes for disparate impacts

The requirements come from

Title VI of the Civil Rights Act of 1964

Federal Transit Administration (FTA) Circular 4702.1B

Large agencies making significant changes must perform analysis

50 or more fixed-route vehicles in max service

Urbanized area with 200,000 or more people

Major service changes, as defined by the agency

FTA suggests using either surveys or census data to complete the analysis

Survey-based analysis can be problematic

Low ridership routes may have unreliable survey results (in this context)

The populations of concern may be less likely to take surveys

Surveys don't tell you anything about riders of new services

Census-based analysis can be problematic

People who don't live near a route may use the service

People might have alternative options

Neither method addresses differing severity of changes

The Modified Transit Opportunity Index (MTOI) method mitigates problems with existing service equity analyses

More significant changes lead to larger changes in MTOI

We can balance medium and large changes

People who could use a service are included

Although they may not weigh as heavily on the final results

Alternative services may mitigate effects

Other lines may still provide useful options

New services and modified services can be incorporated

All we (expect) to need is a new GTFS file

MTOI has three main components

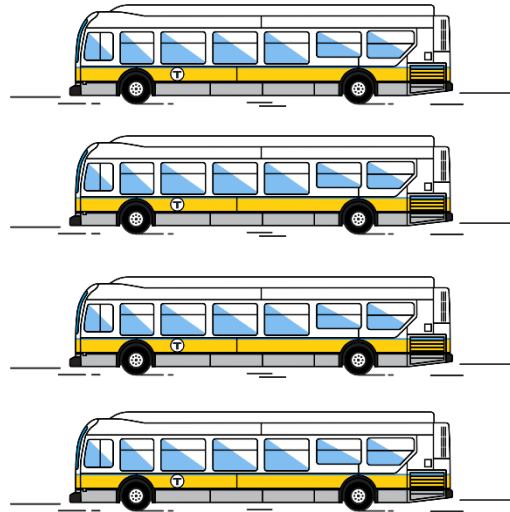
Access Opportunity

Who can
access a service?



Trip Opportunity

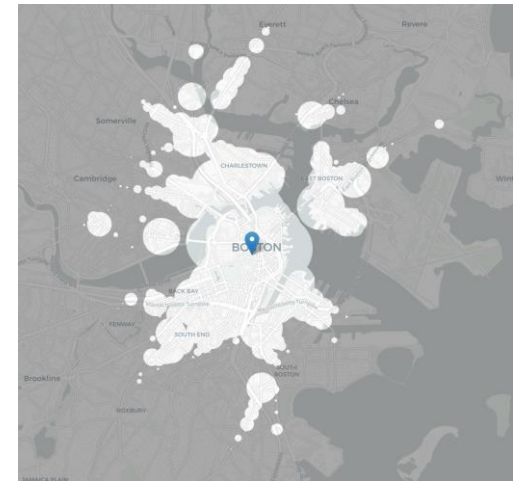
How many
trips are available?



source: mbta

Temporal Comparability

How far can they go?



mapnificent.net/boston/

An analysis compares the share of the change in MTOI to the share of total MTOI

For a given protected class ...

$$\frac{60\% \text{ of the change in MTOI}}{40\% \text{ of the total MTOI}} = 1.50 \stackrel{?}{\leq} 1.20 \quad \times \quad \text{Disparate impact}$$

Or ...

$$\frac{30\% \text{ of the change in MTOI}}{40\% \text{ of the total MTOI}} = 0.75 \stackrel{?}{\leq} 1.20 \quad \checkmark \quad \text{No disparate impact}$$

↖ the threshold