Can biking save students time?

A comparison of transit and biking travel times in Boston

Introduction
A recent report on Boston youth transportation challenges revealed that students in Boston deal with significant transit reliability and frequency issues along with long commutes. Students reported being late to school, job interviews and health appointments. Academic consequences included tardiness to school, not being able to turn in homework on time, and being put at risk of having to attend summer school or not graduating. Being detained at school also resulted in being late to work, after school activities, or getting home to take care of younger siblings in order to relieve parents needing to go to work. Biking is a reliable transportation alternative, however, another finding of the report was that youth have misconceptions about the length of time it takes to bike around the city. Some felt biking would take too long or would not be feasible. This project demonstrates the potential time savings for students through comparing travel times for public transit with biking for Boston students between home and school.

Methodology
A list of simulated student home addresses were obtained through the BPS transportation challenge in 2017. Students were randomly assigned to a BPS high school using a random number generator. Address data was converted using Geocodio. Origin-destination (OD) cost matrix and service area analyses were performed using a network. The network was built using the Massachusetts roads dataset and MBTA transit feed specification (GTFS) data. OD cost matrices analyses were performed for each high school and its students to find transit travel times. Bike travel time was approximated using the network length between ODs (based on 268 meters/mile or 10 miles/hr). SQL was used to combine OD cost matrices from each high school and calculate data by neighborhood.

Neighborhood Travel Times

For the most part, students living in Hyde Park and West Roxbury do not have bike share stations yet. There are parts of Roxbury, Jamaica Plain, Mattapan, Dorchester, Brighton and East Boston with students who are not within an 800 meter walkshed of any current station. Lately, while some neighborhoods are covered by an 800 meter (5 min) walkshed, more stations could be placed in order to provide all students across Boston with a more convenient 400 meter (5 min) walkshed.

List of stations was obtained through Bluebikes. If there are any current stations (upcoming stations are included), the lat/long data was converted using Geocodio. Numbers were calculated using a spatial join with service area polygons.

Conclusion
The travel cost comparisons between using public transit or biking in Boston demonstrate that there is potential for high school students to reduce their travel to school time through biking. The simulated dataset shows that there is the potential for travel cost savings at every high school. Nearly all neighborhoods showed a reduction in average travel time across students with biking compared with public transit. Additionally, the case study of Margarita Muñiz Academy demonstrates that many student trips that take between 30-45 minutes with public transit can be shortened to 15-30 minutes with biking. Because of this time savings and because biking is a relatively reliable travel mode, the City of Boston should provide students with more opportunities to learn how to bike and practice safely biking in the city, as well as more affordable biking options, such as a student bikeshare rate. The city should also increase accessibility to bike share stations.

Limitations
The BPS dataset contained over 22,000 simulated addresses for grades 6-12. Given that the number of students was selected to limit the dataset. Some ODs were not possible to route given the road network connectivity. The network contained only 17 high schools. 24 were not connected to the network. A portion of students at each high school also lived in locations where it was not possible to map their routes. This could be due to road reconstruction or station locations. Some students were routed. However, there were over 150 students who were assigned a distance cost (the range of neighborhoods and locations) that could be taken into account to calculate bike time.

Reference

Map Information
Sources: MassGIS, MBTA, Boston Public Schools, Bluebikes Project, NGS, 1983 State Plane Massachusetts, Mainland, EPS, 2001 Datum
Geographic Coordinate System: GCS North American, 1983

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