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Tufts UNIVERSITY

Transit Access in Six of Boston's Core, Northern Suburbs:

Is There Equity for Environmental Justice Communities?

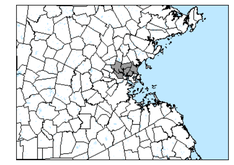
Cartographer: Andrew Wiley

Intro to GIS - UEP232, Spring 2014

Projection: NAD 1983 Massachusetts Mainland State Plane

Data Sources: MassGIS and 2010 U.S. Census (Processed by MassGIS)

http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/



Background

"Transportation touches almost every aspect of our lives and plays a pivotal role in shaping human interactions, economic mobility, and sustainability. Transportation provides access to opportunity and serves as a key component in addressing poverty, unemployment, and equal opportunity goals."[1]
- Robert Bullard

Transportation equity is concerned with ensuring that all people and communities have access to affordable and reliable transportation options. Environmental justice extends this idea to righting the wrongs of the past, and spreading the harms of environmental degradation equally across all people. As the transportation infrastructure choices made by past policymakers have caused significant harm to certain communities, especially low-income communities and communities of color, transportation equity is needed to rectify those disparities, reduce environmental harm and enable all people to access work, school and recreational opportunities.

Boston has been wrestling with transportation equity and environmental justice for decades. The history of the Orange and Silver Lines are fraught with controversy regarding which neighborhoods are gaining and losing the most access. This debate has included arguments about whether or not bus, or bus rapid transit (BRT), are equivalent to the subway in terms of service. BRT is supposed to combine the cost savings and flexibility of buses while providing the service frequency, limited stops and dedicated rights-of-way found with subway or light rail lines. Given that even Boston's much touted Silver Line BRT service falls short when considering these criteria,[2] it would be hard to argue that traditional bus service in the Boston metro area could be considered "rapid transit."

With this in mind, this project analyzes the mass transit options available to residents of six core, northern suburbs of Boston. In particular, I am concerned with determining the degree to which these cities' residents have access to bus, subway and commuter rail service in comparison with each other, especially given that large swaths of all of these cities are home to environmental justice communities. This includes all of the Cities of Everett and Chelsea.

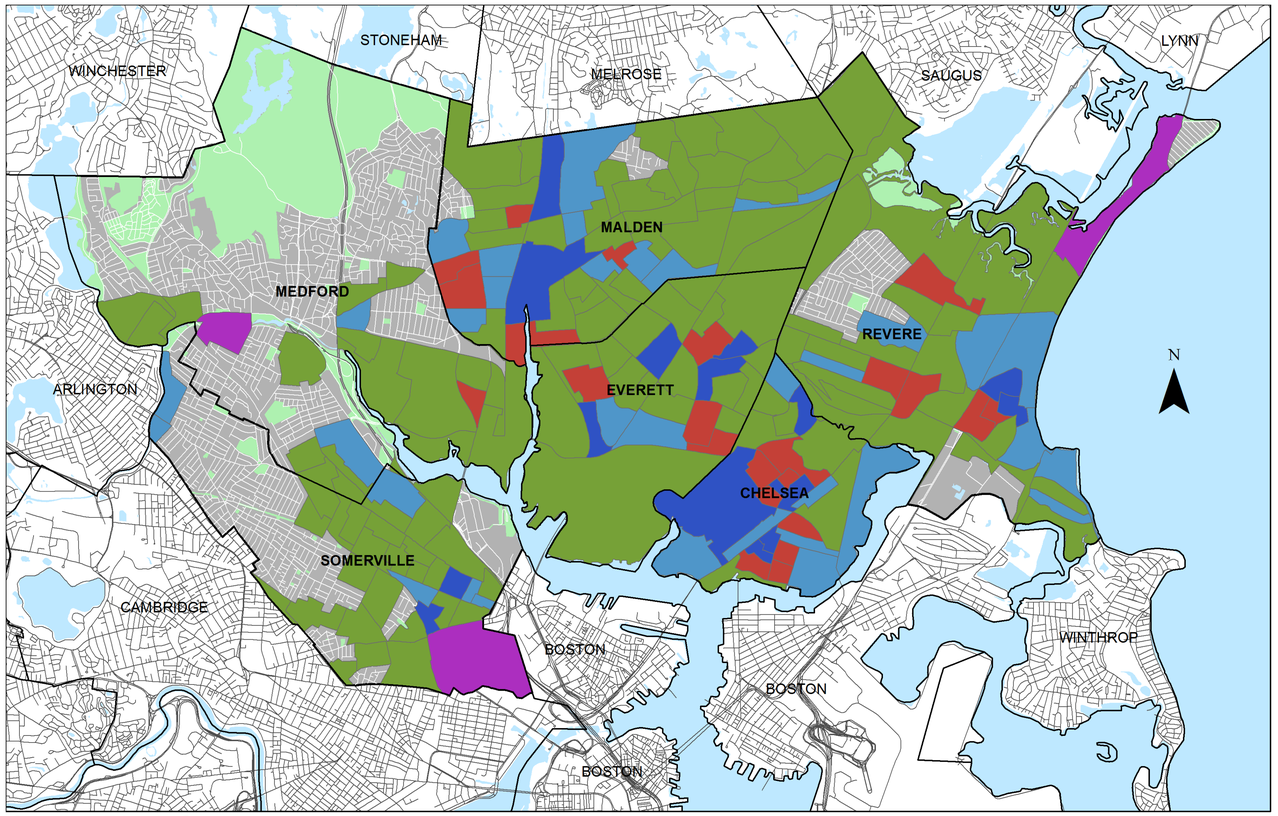
[1] Bullard, Robert. D. (2003). Addressing Urban Transportation Equity in the United States. *Fordham Urban Law Journal*, *31*(5), 1183-1209.
[2] Carter, Kris (Producer and Director). (2012). *Equal or Better: The Story of the Silver Line.* Boston, MA. Retrieved May 6, 2014 from http://www.imdb.com/video/wab/vi633184537/

Methodology & Limitations

I created a map demonstrating the extent of environmental justice communities in Chelsea, Everett, Malden, Medford, Revere and Somerville, and three additional maps to show current service via bus, subway and commuter rail across those six cities. U.S. Census Bureau data were used in creating environmental justice block groups, while MassGIS data was used in creating service territories for MBTA service.

For all three forms of transit, I used ArcMap's network analyst tool to create quarter-mile and half-mile buffers around each transit stop or station. These buffers are not as the crow flies – they are true distances that citizens would travel to get to and from the stops and stations via the street network. I then calculated the population of all census blocks that intersect each of the buffers to come up with a reasonable estimate of the number of people who are within a quarter-mile and half-mile walking distance of each stop.

This is admittedly an imprecise measure, as some of the residents of a given block group may actually live slightly outside a buffer zone. However, census blocks are the narrowest measurement available, providing the best possible estimates. The upshot is that my figures are, if anything, an overestimate of service levels for these cities, and should be considered an absolute ceiling in terms of how many people can reasonably walk to a transit stop or station.



Census Block Groups

Environmental Justice Criteria

- Low Income
- % Minority
- % Minority + Language Isolation
- % Minority + Low Income
- % Minority + Low Income + Language Isolation
- Open Space

City	Total Population	Pop. Of Census Blocks Within 1/4 Mile of Subway Stops	Pop. Of Census Blocks Within 1/2 Mile Subway Stops
Chelsea	35,177	0	0
Everett	41,667	0	0
Malden	59,450	4,332	14,818
Medford	56,173	691	2,000
Revere	51,755	7,357	15,632
Somerville	75,754	8,053	22,914
Total	**319,976**	**20,433**	**55,364**

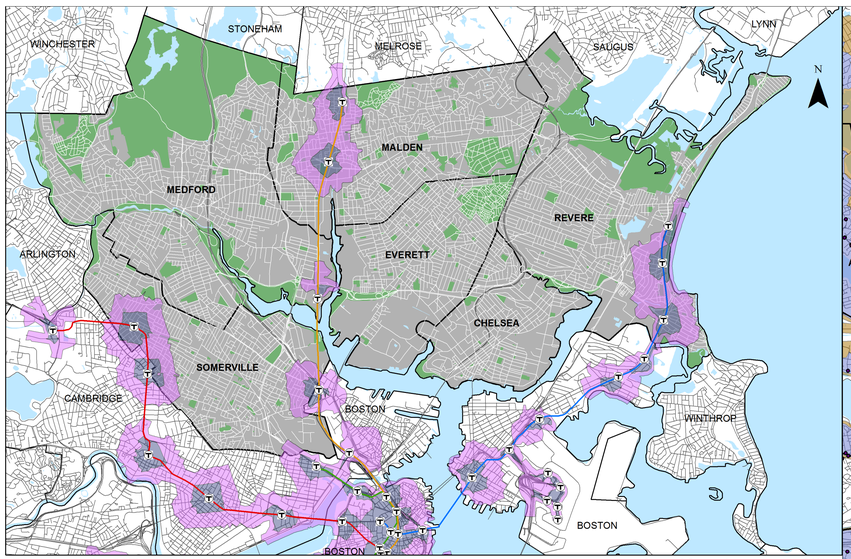
City	Total Population	Pop. Of Census Blocks Within 1/4 Mile of Bus Stops	Pop. Of Census Blocks Within 1/2 Mile of Bus Stops
Chelsea	35,177	35,177	35,177
Everett	41,667	41,657	41,667
Malden	59,450	59,222	59,450
Medford	56,173	55,281	56,173
Revere	51,755	51,492	51,755
Somerville	75,754	75,754	75,754
Total	**319,976**	**318,583**	**319,976**

City	Total Population	Pop. Of Census Blocks Within 1/4 Mile of Commuter Rail Stop	Pop. Of Census Blocks Within 1/2 Mile of Commuter Rail Stop
Chelsea	35,177	7,358	18,278
Everett	41,667	0	0
Malden	59,450	3,023	10,976
Medford	56,173	2,301	6,441
Revere	51,755	0	0
Somerville	75,754	1,590	6,164
Total	**319,976**	**14,272**	**41,859**

Results

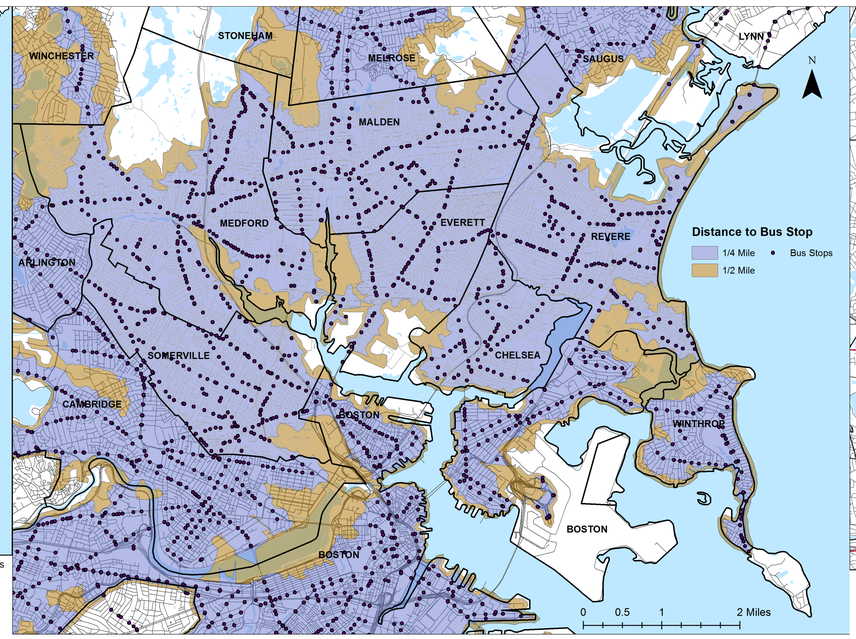
As the maps show, all six cities have excellent access to bus stops, but have a definite lack of access to both subway and commuter rail. Everett is in the worst position, having no access whatsoever to either form of rail service. Chelsea has no subway access, while Revere lacks commuter rail service. Of course, the cost of providing either form of rail service to all residents of these cities would be enormous; yet, it would be hard to argue that access to buses is the same as access to trains, especially as far as the subway is concerned.

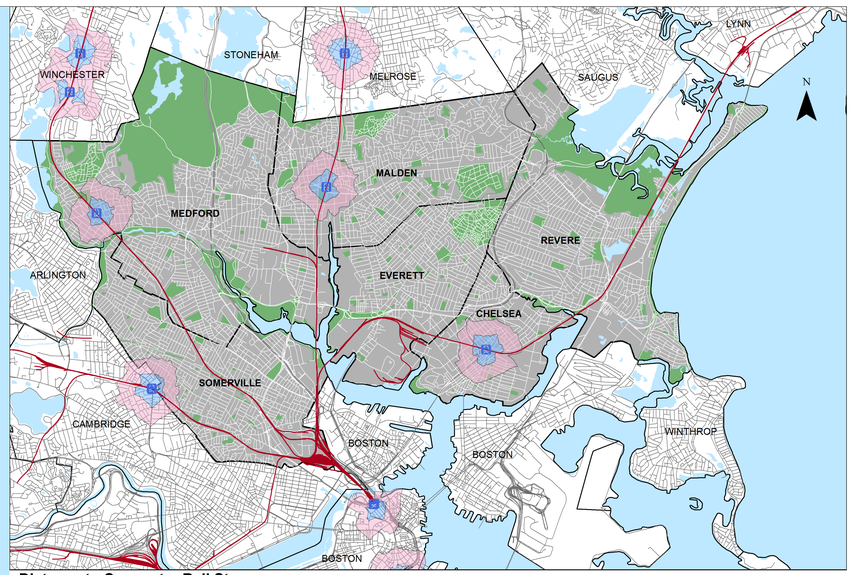
Future analyses should consider the cost of each trip for a commuter via each transit mode, as well as time spent waiting for a bus or train to arrive. Combining these into a total cost of travel for residents would enable further consideration of how to ensure all people have adequate access to public transportation.



Distance to MBTA Stations

- 1/4 Mile
- 1/2 Mile
- Blue Line
- Orange Line
- Green Line
- Red Line
- Open Space





Distance to Commuter Rail Stop

- 1/4 Mile
- 1/2 Mile
- Open Space

0 0.5 1 2 Miles