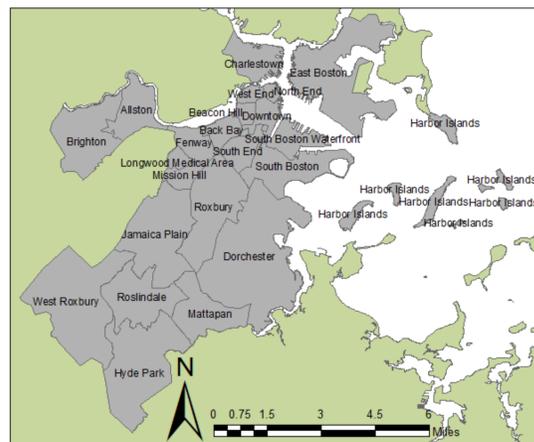


Proximity to Hospitals in Boston: Who Lives the Closest?

BACKGROUND

Boston, Massachusetts is a city of about 50 square miles with a population of about 660,000. As of 2015, the racial and ethnic composition was as follows: 52.9% White, 25.3% Black, 9.4% Asian, 0.4% Native American, 4.5% Multiracial, and 19.5% Hispanic or Latino (of any race). Boston is “a City affected by historic and persistent divisions of race and class”, which means that the race and class of its inhabitants affect many aspects of life. Some of these aspects of life include quality of housing, quality of education, and access to resources in the area.



LEFT: A map of Boston, divided into its neighborhoods

ABOVE: A map showing Boston's location in Massachusetts

METHODOLOGY

The goal of this project is to investigate whether there is even spatial distribution and access to hospitals in the Boston area. If there is any systematic discrepancy, the goal is to investigate factors that may affect the distribution and access of healthcare-related resources.

Assumptions for this project are as follows: proximity to hospitals and ability to travel to hospitals using public transportation are major factors in a population's access to healthcare. Additionally, based on the frequency and timeliness of buses and subways, it was assumed that proximity to subway stations was more useful than proximity to bus stations.

A map was produced by performing a proximity analysis of the Boston area with the distance to each hospital being the variable of interest. Because pure distance is not always representative of the means by which people travel to hospitals, proximity to public transportation stops (bus stops and subway stops) were used to produce two additional maps. The distance intervals for these three maps were created using Natural Breaks (Jenks), and each interval was assigned a score from 1 to 5. The three maps were combined using the Raster Calculator as follows:

$$0.5 * \text{Hospital Distance} + 0.3 * \text{Subway Stop Distance} + 0.2 * \text{Bus Stop Distance}$$

The score intervals were created using Natural Breaks (Jenks).

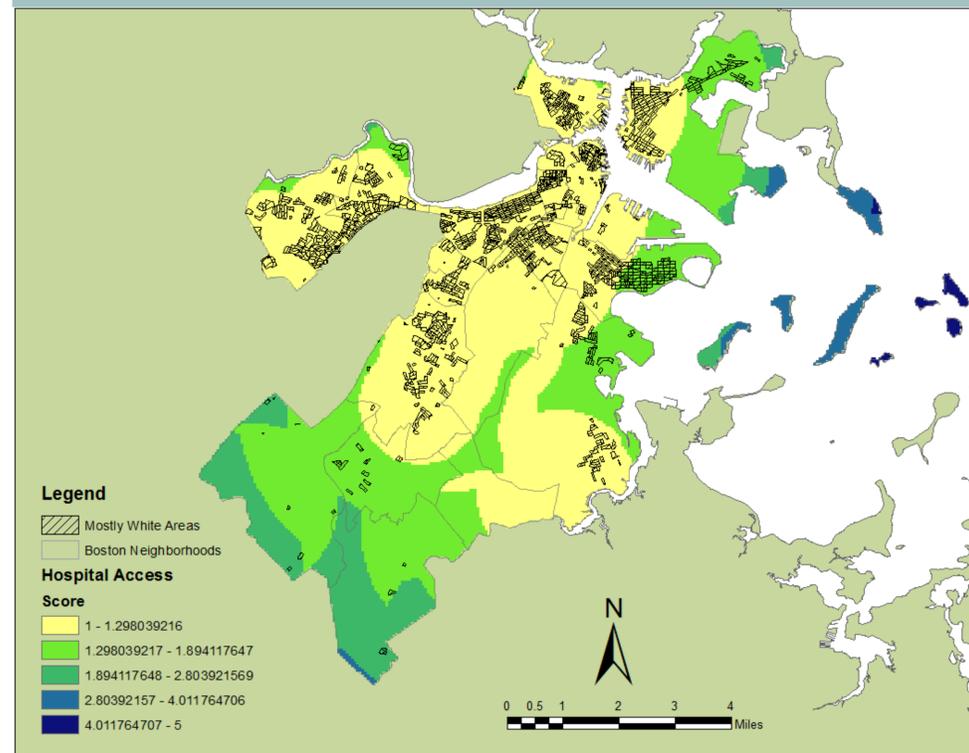
To take into account the racial demographics of the area, the 2010 Census Data was used to calculate ratios of White and Non-White inhabitants. Some of the areas were not densely populated, so population density was also taken into account. In the final maps, areas where the population was more than 30 per acre and more than 50% White or 50% Non-White are highlighted.



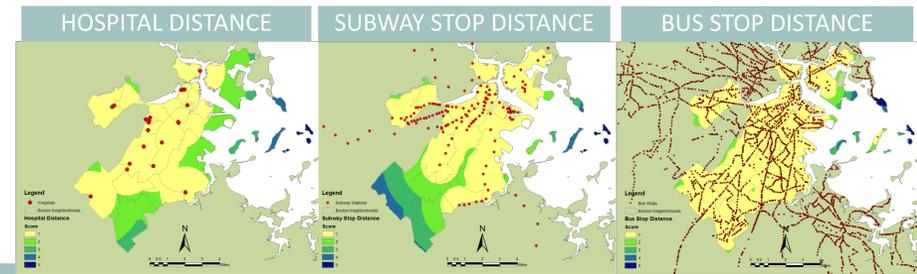
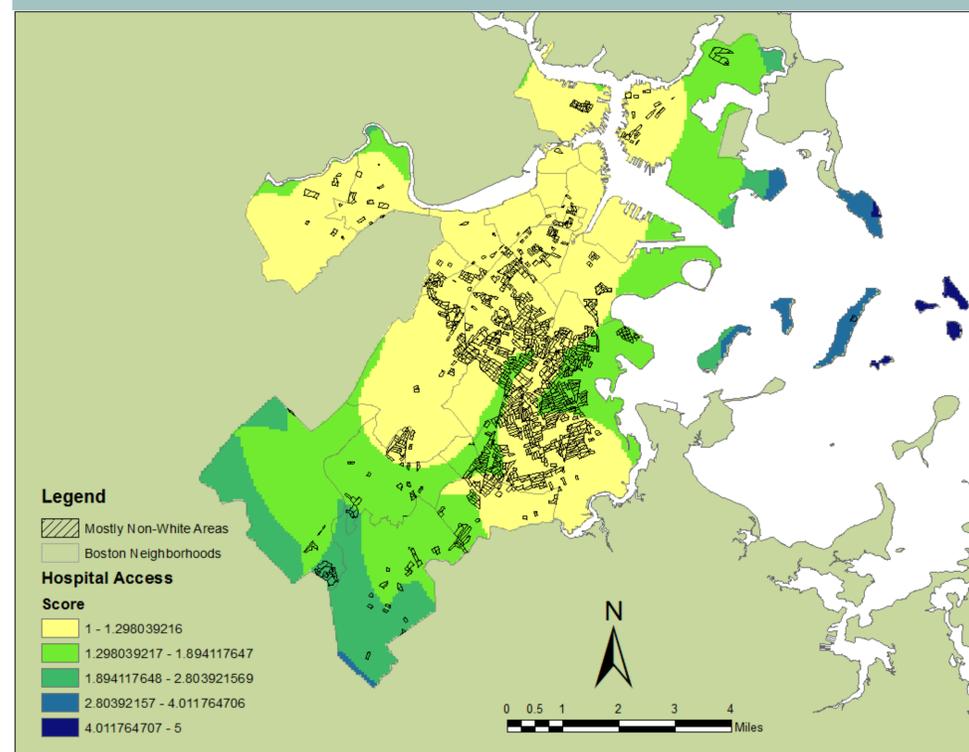
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MOSTLY WHITE AREAS & HOSPITAL PROXIMITY



MOSTLY NON-WHITE AREAS & HOSPITAL PROXIMITY



Three maps showcasing the distance scores for hospitals, subway stops, and bus stops. These maps were used in the weighted average by a factor of 0.5, 0.3, and 0.2, respectively.

RESULTS & DISCUSSION

The final two maps show that the mostly white areas tend to coincide with the areas that scored the best in Hospital Access. The mostly non-white areas seem to occupy slightly more space in the areas that scored lower in Hospital Access. This seems to indicate a systematic bias in deciding where hospitals and public transportation are constructed.

Further analysis must be completed in order to determine the exact area located in each Hospital Access range and whether proximity to bus stops and subway stops affects hospital access to their assumed extents. The scores for the distance intervals could also be adjusted based on people's ability to travel certain distances without assistance from ownership of a vehicle.

Additionally, in order to perform a more well-rounded analysis, data on income and class could be collected and taken into account. This could also affect access to other means of transportation, such as bikes and private vehicles.



http://www.whitecase.com/sites/whitecase/files/images/locations/boston_tablet_1920x960_0.jpg

Cartographer: Belinda Xian

Date: 13 December 2016

Course: CEE 187

Instructor: Laurie Baise

Projection: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001

Data Sources: MassGIS, City of Boston, Mastering ArcGIS (Price)

References:

"Resilience and Racial Equity." Boston.gov. *City of Boston*, 22 Nov. 2016. Web. 13 Dec. 2016.

"Boston." *Wikipedia*. Wikimedia Foundation, n.d. Web. 13 Dec. 2016.