Poverty and Access to Hospitals:

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Accessing Hospitals Using the Bus in the Greater Boston Area

Introduction

This project seeks to uncover any relationship between inaccessibility of hospitals and impoverished communities in the greater Boston area, i.e. in Middlesex, Essex, Suffolk and Norfolk counties in Massachusetts. According the Economic Policy Institute, the Boston-Cambridge-Newton metropolitan area is the 29th most inequitable when comparing the income of the top 1% to the bottom 99% (Sommeiller, Price, & Wazeter, 2016). But a growing divide between the upper and lower classes is not the only problem that Boston faces, the Massachusetts Bay Transportation Authority, MBTA, services wealthier and, historically whiter areas of Boston far more than effectively than areas where low-income and/or people of color live (Leidolf, 2015)(Moskowitz, 2012). As the federal poverty level shifts with the number of occupants in a house, I decided to have the poverty level be $30,000, under the poverty level for families of 4 or fewer (2019 Poverty Guidelines). As most people with low-income rely heavily on public transportation to get around, it is imperative that hospitals are accessible by public transportation as roughly 35.3% of households in the Boston-Cambridge area do not own cars(Maciag, 2017). This project seeks to determine if there is a correlation between the percent of the community that is below the poverty line and their ability to access hospitals via the MBTA bus routes.

Methods

Gathering & Editing Data

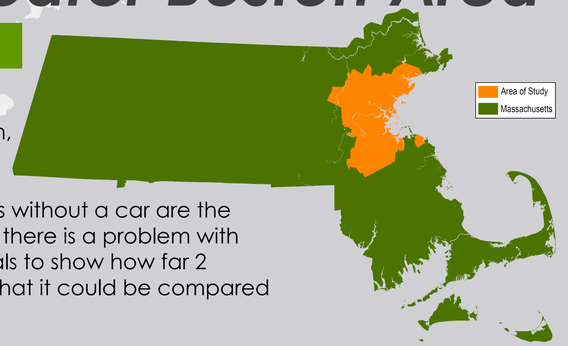
- Using ReferenceUSA, preform an advanced search on the data for U.S. Consumers/Lifestyles by selecting Essex, Middlesex, Suffolk and Norfolk counties and selecting all income brackets, only download one income per household
- Download the data as a table
- Using Microsoft Excel 16.36 add together the number of households earning less than $30,000 for each zip code
- Divide the number of households below the poverty level by the number of households in each zip code and add this number into a new column

Analysis

- Using ArcMap 10.7.1, select all the zip codes in the counties of Essex, Middlesex, Suffolk and Norfolk
- Select all zip codes within half mile of a bus route
- Join the income data with the narrowed down zip codes
- Select the hospitals within the desired counties
- Discard all routes where direction = 2 (outbound)
- Select all hospitals within half a mile of any bus routes
- Create a network dataset based off of the inbound bus routes
- Create a new service area and load the locations of all the hospitals within half a mile of any bus route
  - Set default breaks at 6,000 meters
- Create two more service areas with the same settings except set the default breaks at 4,000 meters for one and 2,000 meters for the other

Results

There are many zip codes, both low and high income, that have poor or no access to hospitals using the MBTA bus system, however the majority of the areas with little to no access to hospitals are low income areas (Fig. 1). Two examples of lower income areas that have very poor access to hospitals without a car are the towns of Lynn, Peabody and Salem, (Fig. 4 & 6). To prove that there is a problem with where the bus routes are, I created buffers around the hospitals to show how far 2 kilometers, 4 kilometers and 6 kilometers actually reaches, so that it could be compared to how far the current bus routes reach (Figures 4, 5, 6, & 7)



Conclusion

While most areas in central Boston, regardless of income level, have good access to hospitals on the bus, many, if not most, low income areas even just a short ways outside of downtown have very limited access to hospitals on the bus, even when the hospitals are inside the town. These maps clearly show that lower income areas are under served. There are limitations to this project. Firstly, I deleted all bus routes that were outbound so that ArcMap would process the amount of data and, also because 96% of the bus routes were the same, regardless of direction, however if I were to continue this project, I would include both inbound and outbound routes. Secondly, this project only focused on bus routes and did not mention the MBTA subway system (the T). Thirdly, the network analysis only chooses the closest bus route into consideration, rather than also considering all the branches that lead off of each bus route. Fourth, measuring the ease of access via public transportation in distance traveled, rather than time spent in travel is an oversimplification. Fifth, the income data is completely based off of self-reporting and therefor is highly subjected to change; some zip codes only had 6 people report and others had tens of thousands. Lastly, As previously stated, the poverty level changes based on how many people are living in the household, less than $30,000 yearly is another simplification. This data can be used to plan new bus routes or hospital sites to best help proved access and care to the communities in need.

References

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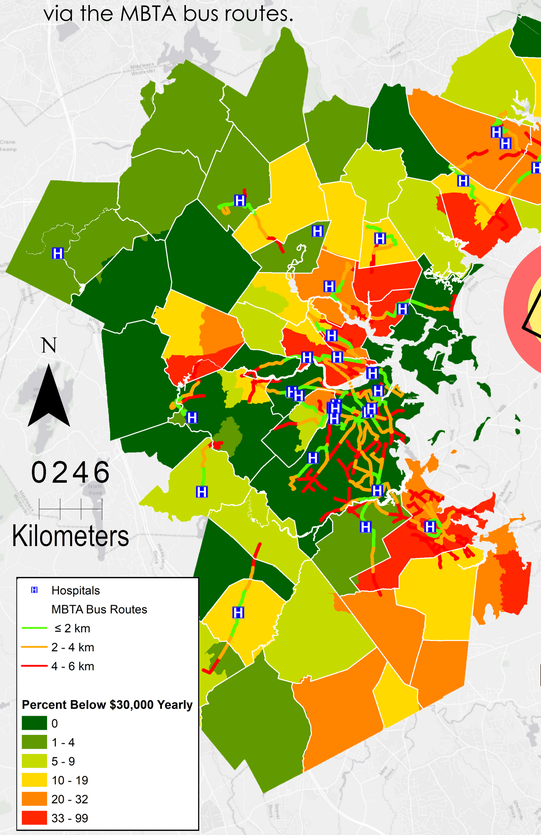

Figure 1. Accessible Hospitals

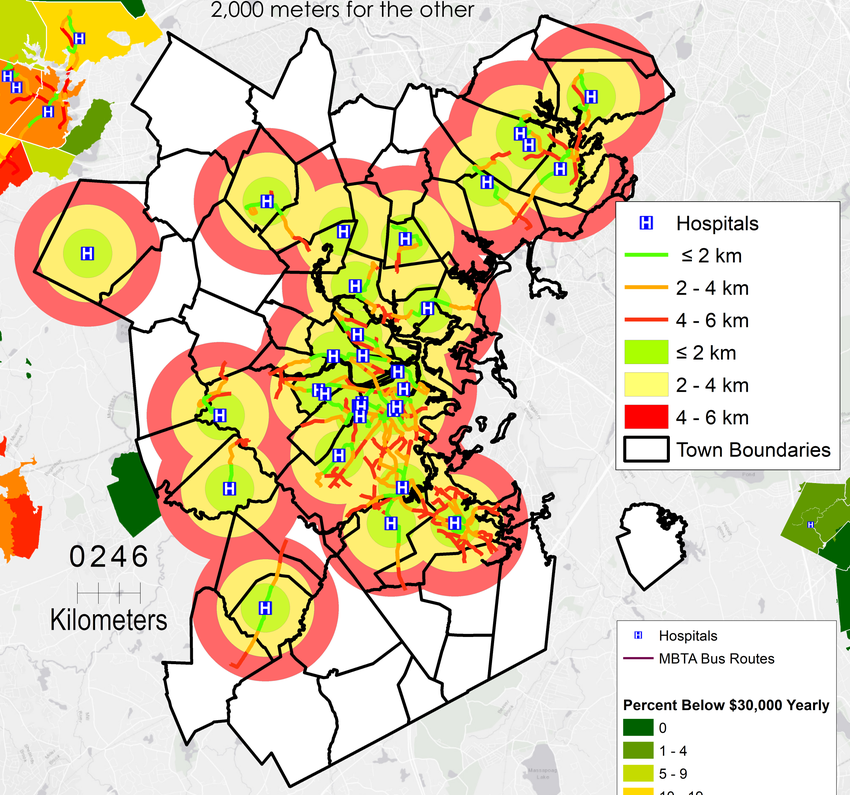

Figure 2. Buffer Areas

Figure 3. MBTA Bus Routes

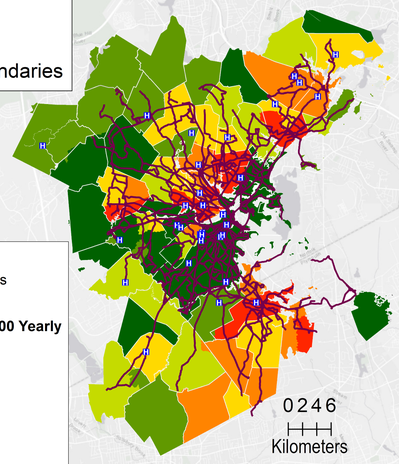

Figure 4. Lynn

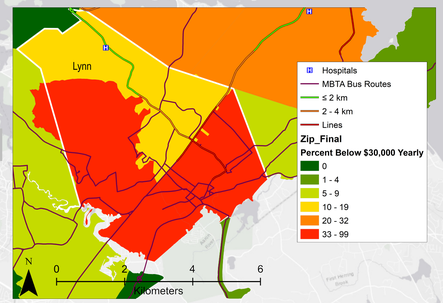

Figure 5. Lynn

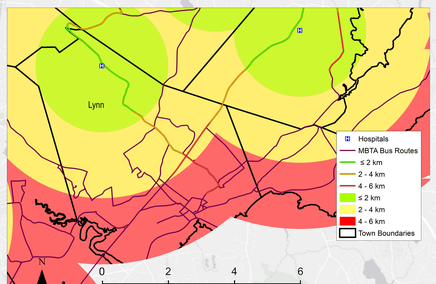

Figure 4. Peabody

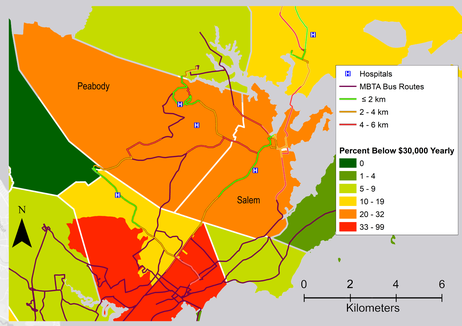

Figure 4. Peabody