Health is a Human Right

Assessment of Access to Health Center Locations in Cambridge

Introduction

The problem is to assess specific aspects of health center locations in Cambridge. It is preferable to have a health center near transit stations and close to residential areas where there are high population densities. It is important to be a distance from existing health centers to ensure adequate coverage is provided.

To meet these objectives, the following information is required:

- Is a location close to transit stations.
- Is a location far enough away from other health centers.
- Is a location close to residential areas which are densely populated.

The spatial mechanism that make these locations interesting is accessibility within 500m walking distance to existing health centers, proximity to T stations and proximity of high density residential areas. We define access as walking distance which is within 500m from residential areas to the health center. By using the mapping data, public health planners will be better informed and able to make decisions on whether locations are suitable and in the best location.

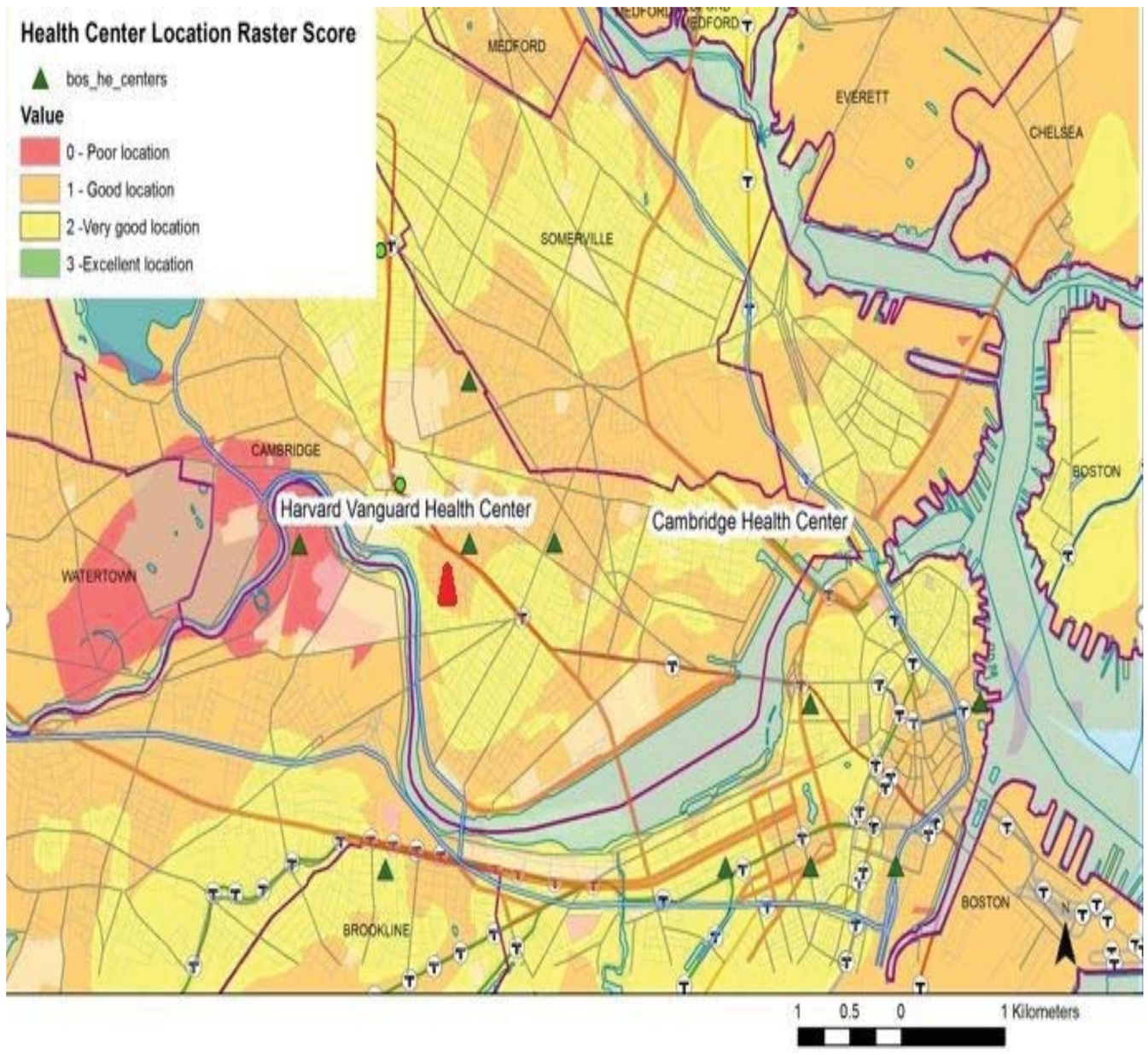
From research in 2007, we know that residents would be happy to walk up to 500 meters to a health center (Alshalalfah et al., 2007).

Methods:

In the model, distance was translated for the purpose of evaluating locations. Locations near a T station, far from existing health centers and close to where people live are preferred was based on a study in 2015 on 'Geographic access to gynecologic cancer care in the United States.' The study used GIS to assess United States counties farther than 50 miles from the closest gynecologic oncologists, and hospital referral regions (Shalowitz et al., 2015).

Locations were modeled with a raster of distance from the nearest existing health centers and a raster of distance from T stations . Residents who have access was modeled by residential density by blocks. A computed individual score created values based on the three above criteria above combined together to create an aggregate score to pinpoint locations which were classified as ranging from poorly located to well located.

One disclaimer is even though the analysis is concerned about walking distance, the distance was estimated using a simple crow's distance and does not account for slope.



Data Sources:

One data set used was U.S. Census Bureau 2010 blocks to represent the population density of Cambridge residents.

A second data set used was a Reference USA database for 2017 which gave data on existing health centers for Boston, Cambridge, Somerville, Medford, Watertown and, Brookline.

A third data set used a MBTA Rapid Transit from MassGIS data which was last updated on September 2014.

Results:

A location was selected as shown by the red triangle on the health center location raster score map to assess access associated with the location.

Distance from the closest transit station	+861meters
Distance from an existing health center	+558 meters
Population density within 500m based on the sum of cells.	11,389

Population density appears a little high but not too high as an estimate because population density is not too big for the area. The location is well situated as there is very good access to the T station and is close to a highly dense population. In addition, the nearest health center is just outside the recommended walking distance of 500m.

Discussion

It should be stated that the model is not perfect in terms of its ability to model actual accessibility to existing health center locations.

The model appears to do a good job of assessing locations for a health center. In relation to the Cambridge study area, I am certain that the procedures used assessed many areas as very good for health centers which may not actually be appropriate. This would indicate the possibility of the model being overly optimistic in some locations. The health center model no doubt left out some locations that are excellent health center locations which could point to a model that is overly pessimistic in certain locations. A further criticism of the model is that the existing locations are processed using estimated data.

Although this is not ideal for representing the relationship, it is not easy to propose a more complete method to demonstrate health center services.

However, there is a certain degree of confidence in the model. The model provides useful information for health planners to assist with the overall decision-making process. The model provides at a minimum an understanding about the challenges of the data-world that assist in ruling in and ruling out locations for a health center.

Two techniques not assessed in the model were network analysis and cost-distance. The network analysis tool finds routes for the residents to the health center that are the most cost effective, but may not permit possible routes to a pre-existing network. Another useful technique is cost distance; this tool assesses costs over continuous space. These techniques would have been useful for accessing modeling movements across Cambridge and providing more comprehensive information for the decision-making process which could be used in future models.

Cartographer: Michael Evans, Tufts University

Nutr0231: Introduction to GIS, 7th May 2017

Sources:

MassDotroads for Massachusetts, June 2014, Massachusetts Dept. of Transportation- Office of Transportation Planning

Census Blocks 2010, Census Tiger Bureau

Health Care Centers, Reference USA, 2017

Community Boundaries, March 2017, Executive Office for Administration and Finance, published by MassGIS

MBTA Rapid Transit, September 2014, Executive Office for Administration and Finance; published by MassGIS

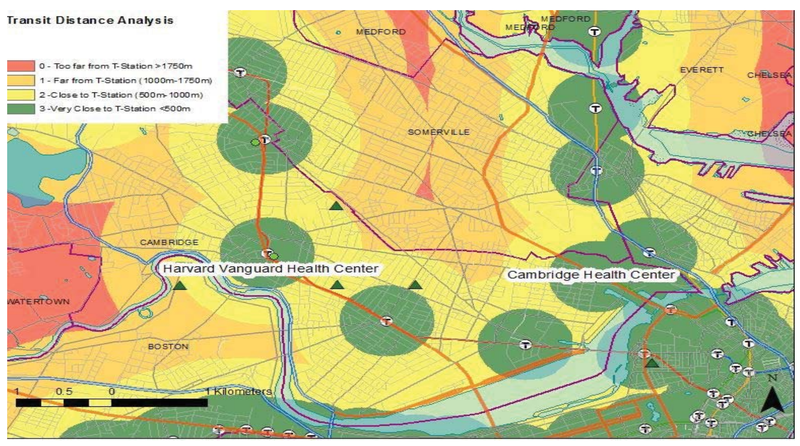
References:

Alshalalfah, B. W., & Shalaby, A. S. (2007). Case study: Relationship of walk access distance to transit with service, travel, and personal characteristics. *Journal of urban planning and development*, *133*(6), 558-118.

Business Analyst. (n.d.). Retrieved May 07, 2017, from https://doc.arcgis.com/en/bao/help/calculation-estimates-for-user-created-areas.htm

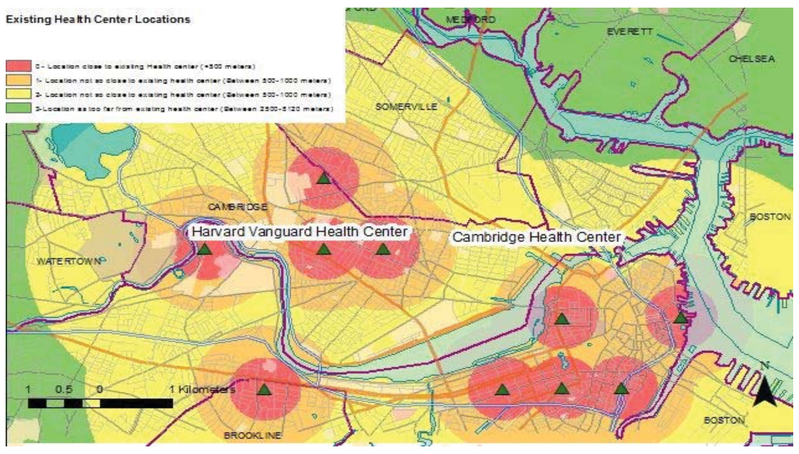
Shalowitz, D. I., Vinograd, A. M., & Giuntoli, R. L. (2015). Geographic access to gynecologic cancer care in the United States. *Gynecologic oncology*, *138*(5), 559-120.

The maps used a State Plane Massachusetts Mainland FIPS 2001 projection



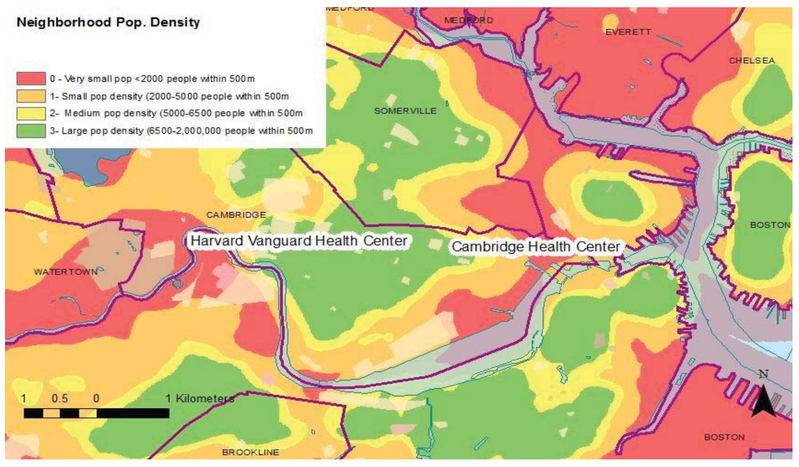
Transit Distance Analysis

The above map used a model which assessed proximity to T stations as estimated with a simple crow-flight distance. A rasterization of distance from the nearest T station is classified as very close to a location if within 500m.



Distance from Existing Health Center Locations

A second map used a model to assess distance from existing health facilities as estimated with a simple crow-flight distance. A rasterization of distance from a location that is not too close to an existing health center was classified as any location greater than 500m.



Neighborhood Population Density

The third map above used a model to assess estimated proximity to the Cambridge residential population, as represented by the 2010 census blocks, using a function to represent estimated number of Cambridge residents within 500m of each cell on the map and were classified as shown by the map's legend. To account for population that may not be uniformly distributed geographically throughout a block group, the map looked at population distributed at the block level which is a more granular level than a block group and uses the information to summarize the census data more precisely (Business Analyst, n.d.).