

# Exploring Characteristics of the Locations of Big Box Stores in Massachusetts

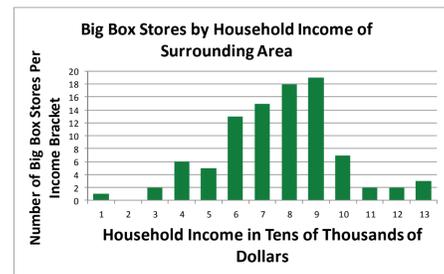
## Introduction

According to Business Insider<sup>1</sup>, 90% of Americans live within 15 miles of a Wal-Mart. With this statistic in mind, one can easily see how Wal-Mart and other big box stores are a large presence in the American social and economic landscapes. Therefore, it may be worth scrutinizing these institutions which have become an ordinary feature of quotidian American life. This poster seeks to examine characteristics regarding the locations of big box stores in Massachusetts.

## Clustering

In order to begin visualizing the locations of big box stores, I created a set using Google Maps to locate coordinates of the five brands (BJ's, Costco, Sam's Club, Target and Wal-Mart) I found most emblematic of big box stores. After compiling the list in Microsoft Excel, the X,Y data from the table were located in ArcMap and made into a point shapefile. To best provide context to the locations of the stores, a map of all the towns in Massachusetts was set as a background. Cursory analyses of location such as Mean Center and Central Feature were run on the locations.

One of the first noticeable characteristics of the locations is how these stores tend to be located in pairs or larger clusters. In order to determine whether the perceived clustering exists and is significant, an Average Nearest Neighbor Analysis was run on the points distributed into the land area of Massachusetts. As displayed in the summary, the mean minimum distance to the nearest store (4506 meters or 2.8 miles) is well below the expected value (7502 meters or 4.66 miles) for an area the size of Massachusetts. With a z-score of -7.37, the p-value is astronomically small and well below .01 indicating the statistical significance of the clustering. To ensure that the clustering is not purely related to the population centered around Boston, the same analysis was run on 6 smaller sections of the state and all yielded significant results as well.

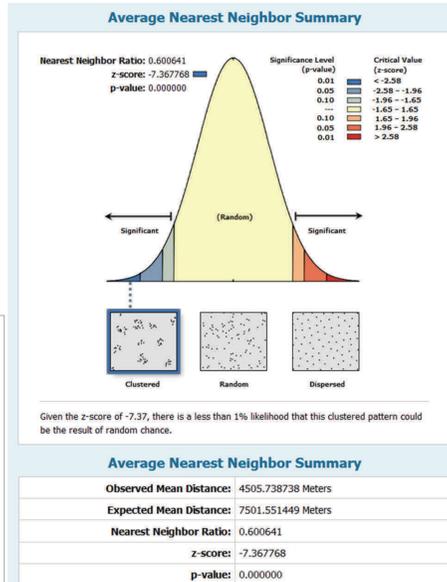


## Proximity to Highways

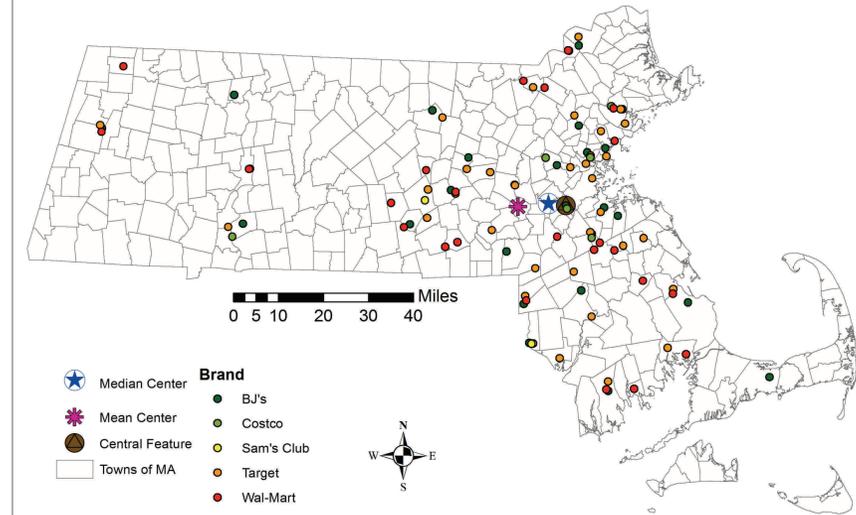
Since big box stores typically have large parking lots to welcome travel there by automobile, it is entirely likely that these stores are strategically located near highways in order to provide better access to customers. While it might be convenient to test the Euclidean distance (as the crow flies) from stores to highways, it would not quite be accurate because drivers must follow roads. First, a Network Analysis Dataset was created for all of the roads in Massachusetts. Using the Closest Facility Network Analysis Tool, the big box stores were inputted as facilities while highway exits were inputted as incidents. Network Analyst then solved for the route to the nearest highway exit from each big box store. As visible on the map, some big box stores are very far away from the nearest highway, most notably those in Western Massachusetts. However, most big box stores are relatively close to the nearest highway. The average road distance to the nearest highway is only 2.78 miles from any big box store in Massachusetts.

## Social Factors

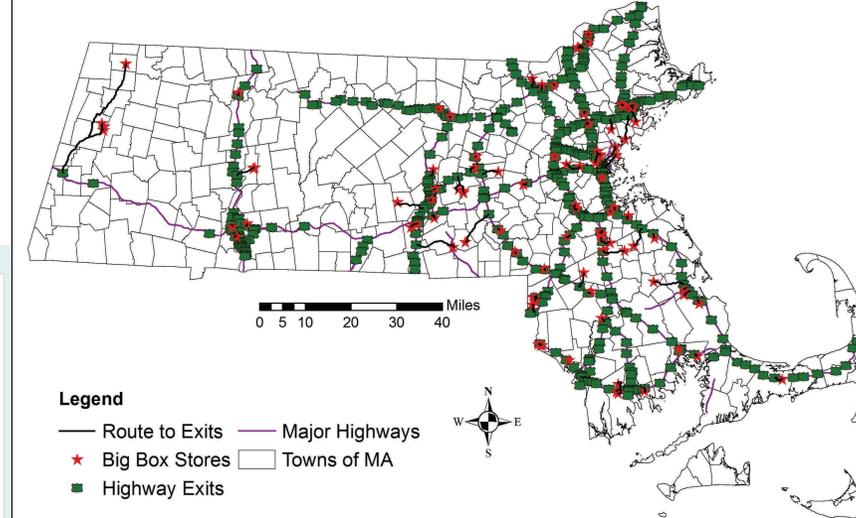
Are the communities in which big box stores are located any different from other Massachusetts communities? Four social factors were selected as possible indicators of selection bias of big box stores: income, race, educational attainment and car ownership. Data for all four factors came from Census and American



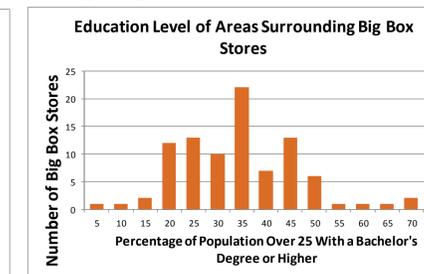
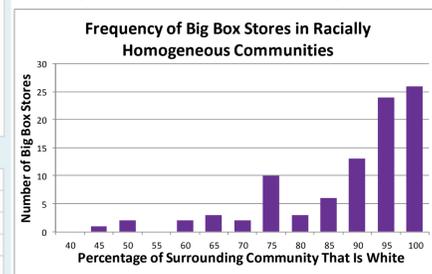
## Big Box Stores of Massachusetts



## Big Box Stores & Proximity to Major Highways



Average road distance from big box stores to highway exits: **2.78 miles**



Community Survey data through the American Fact Finder website. After formatting the data in Microsoft Excel, they were joined to a shapefile of all the census tracts in Massachusetts. The maps at the bottom of this poster display each factor in all of the census tracts in Massachusetts. These data layers were spatially joined to the points of big box stores that were located within them. To display information about the specific tract in which each store is located, the symbol for each store was made proportional to the value it represented. The table of this data (big box stores with characteristics of their surrounding communities attached) was then copied and analyzed in Microsoft Excel.

Simple descriptive statistics regarding the communities in which big box stores are located were tabulated. For example, the mean income of communities in which big box stores are located is \$71,234. Additionally, histograms were rendered to best display the distribution and frequency of communities in which big box stores reside for each given characteristic. These histograms are meant to give a general idea about the place where big box stores are found. However, the critical piece of information is whether the places where big box stores are located are statistically significant in their difference from the rest of Massachusetts. To assess this, a T-test comparing each factor in census tracts where big box stores were located to the rest of Massachusetts census tracts was run. The results were interesting, but not too surprising. With a P-value of 0.255, income was found not to be statistically different in areas around big box stores. On the flip side, race was found to be significant with a P-value of 0.001. The average percentage of white people in a community around a big box store is 85.15% versus 79.40% for the rest of the Commonwealth. Education was also found to be statistically significant with a P-value of 0.0003. Around big box stores, 32.66% of people over the age of 25 have bachelor's degrees or higher compared with 37.90% for the rest of Massachusetts. Finally, car ownership was found to be significant yielding a P-value of 0.000001. Around big box stores, car ownership is 1.11 per household versus 0.96 per household elsewhere in the Commonwealth.

## Conclusions

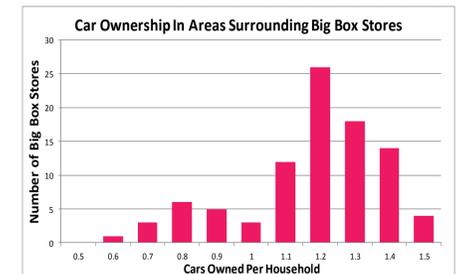
Although not every aspect investigated on this poster produced definitive results, there are many conclusions that can be drawn from this information. Big box stores are definitely found in clusters; it seems

likely that one does the research on a location and the others follow. These stores are also found relatively close an average of less than three miles (on the road) to highways. Even though income was found not to be significant, big box stores tend to be found in areas that are whiter, have fewer college graduates, and greater rates of automobile ownership. These findings are not meant to indicate anything about the communities in which they are found, but to raise a point about larger trends. A new Wal-Mart moving into your town is not purely a reflection on the race, education and car ownership of where you live. It may be that some of these trends hold true for other states, but there is no guarantee especially with variances in state policies, local cultures and geographic differences.

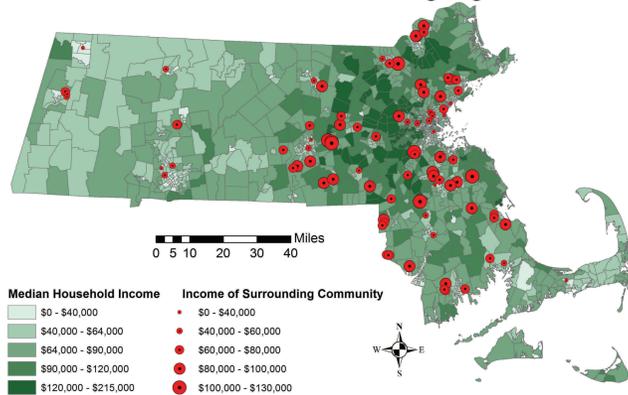
The results displayed by this poster are meant to provoke thought about where big box stores choose to locate themselves. Additionally, there are many other ideas in this realm that have yet to be studied, including other social factors, land use, differences in other states, other approaches and predictive modeling.

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Class: Advanced GIS, Spring 2013  
Date: April 29, 2013

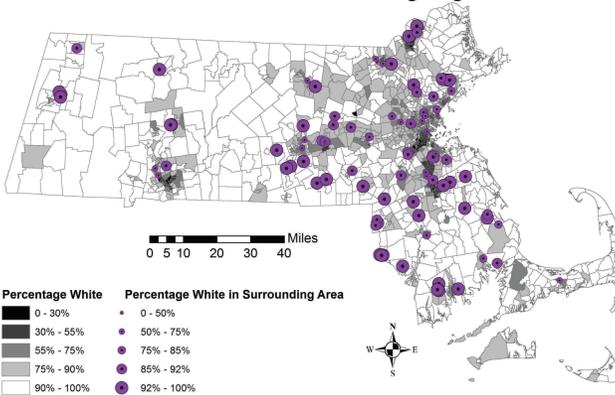
Data Sources: MassGIS (April 2012), US Census Bureau (April 2012), American Community Survey (April 2012), Google Maps (March 2012)  
Projection: NAD 1983 State Plane Massachusetts Mainland FIPS 2001  
<sup>1</sup><http://www.businessinsider.com/crazy-facts-about-walmart-2012-11?op=1>



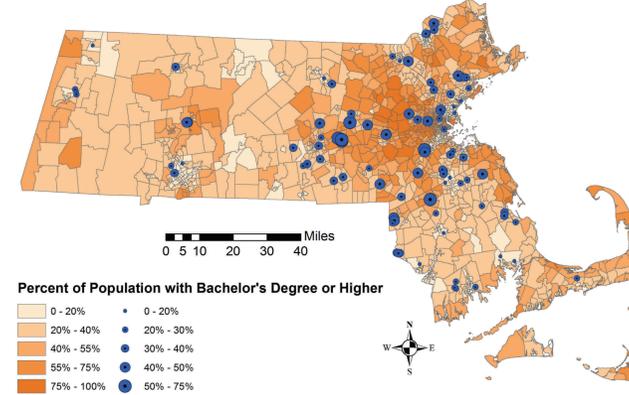
### Income of Communities Surrounding Big Box Stores



### Race of Communities Surrounding Big Box Stores



### Educational Attainment of Communities Surrounding Big Box Stores



### Car Ownership of Communities Surrounding Big Box Stores

