# the demographics of zipcar

## study area

**8%** **92%**

Distribution of ZipCar vehicles in Massachusetts

0  10  20   40   60   80
Miles
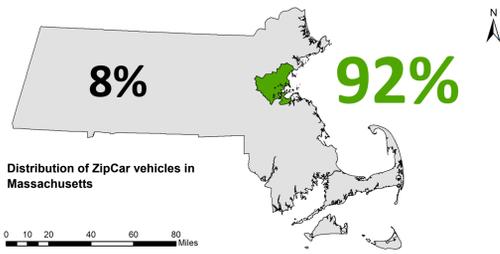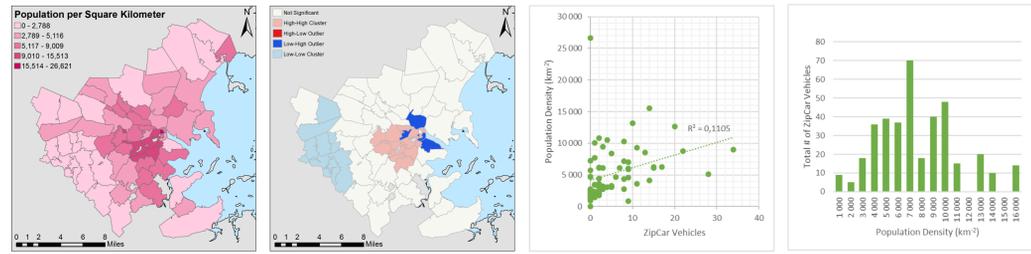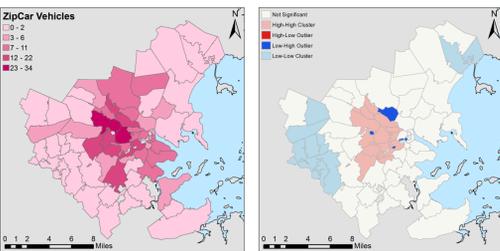
## background

Car-sharing services are a good way to increase the mobility of low-income neighborhoods and minority communities that have little to none car availability and unreliable access to transit. However, many physical and financial barriers often prevent people in need from accessing car-sharing services.

ZipCar is one of the largest car-sharing service providers in the United States. This study aims to assess the availability of ZipCar service in low-income communities in greater Boston by analyzing the relationships between service availability and various demographic and socio-economic indicators.
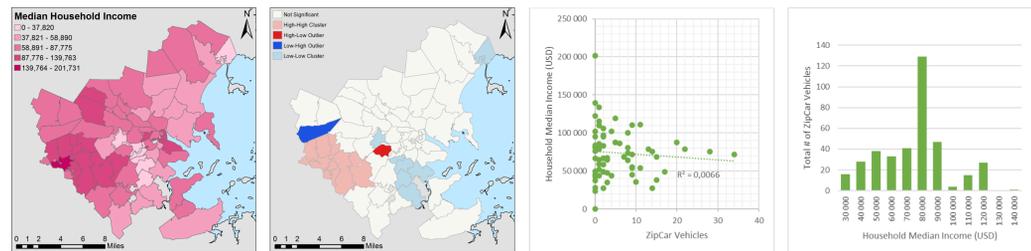
## population density



Population per Square Kilometer
- 0 - 2,788
- 2,789 - 5,116
- 5,117 - 9,009
- 9,010 - 15,513
- 15,514 - 26,621

## zipcar vehicles



ZipCar Vehicles
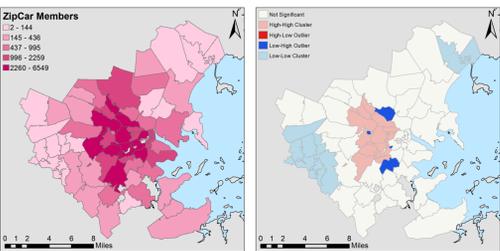- 0 - 2
- 3 - 6
- 7 - 11
- 12 - 22
- 23 - 34

## methodology

Due to ZipCar's no data dissemination policy, a zip code tabulation area (ZCTA) level dataset containing the total number of ZipCar vehicles and members in each ZCTA in Massachusetts was obtained from the Boston Metropolitan Planning Area Council (MAPC). Various demographic and socio-economic data were obtained from the 2013 American Community Survey 5-year estimates and the 2010 United States Census. The data were joined to a ZCTA shapefile obtained from the Census Bureau's TIGER database and the 71 ZCTAs making up the Inner Core Committee sub region of the MAPC (commonly known as the Boston metropolitan area) were isolated via spatial query for further analysis.
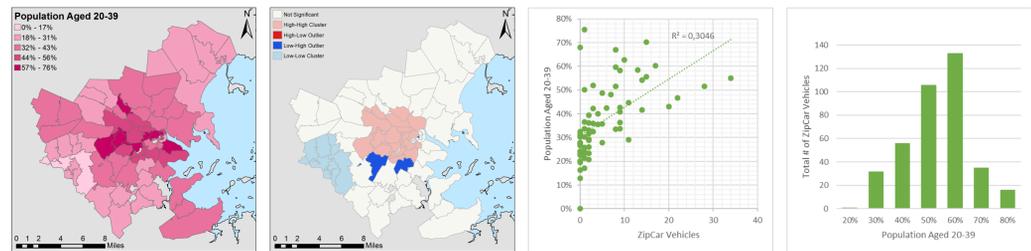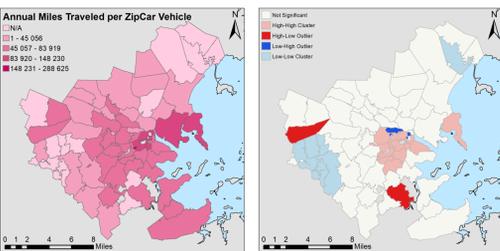
Maps illustrating the spatial distribution of ZipCar vehicles, ZipCar membership indicators, and select demographic and socio-economic indicators were produced in ArcMap for visual assessment. A cluster and outlier analysis (Anselin Local Moran's I) was performed on all the aforementioned indicators and correlation analysis was preformed between the number of ZipCar vehicles and select demographic and socio-economic indicators using Microsoft Excel. Finally, histograms were produced to illustrate the distribution of the total number of ZipCar vehicles between ZCTAs with different demographic and socio-economic indicators.

## median household income



Median Household Income
- 0 - 37,820
- 37,821 - 58,890
- 58,891 - 87,775
- 87,776 - 139,763
- 139,764 - 201,731

## population aged 20-39



Population Aged 20-39
- 0% - 17%
- 18% - 31%
- 32% - 43%
- 44% - 56%
- 57% - 76%

## zipcar members
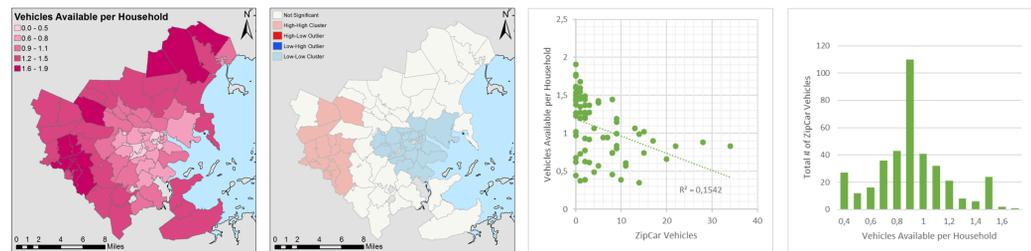


ZipCar Members
- 2 - 144
- 145 - 436
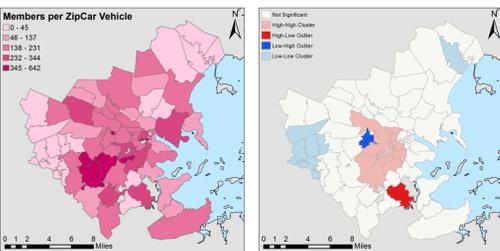- 437 - 995
- 996 - 2259
- 2260 - 6549

## results and discussion

The number of ZipCar vehicles available in each ZCTA within the study area ranged between none and 34 with 53% of all the observed ZCTAs having at most two vehicles available. ZipCar service was concentrated to Somerville, Cambridge, Brookline, and Downtown Boston while Lynn, Newton, and Waltham saw the least vehicle availability.

The number of ZipCar vehicles and members in a ZCTA was strongly positively correlated, indicating that the availability of vehicles in an area is the main factor in determining membership. However, this study does not consider the fees associated with ZipCar membership, which might pose a financial barrier to many communities where service is available. This is supported by the lack of correlation between ZipCar vehicle utilization and the average number of members per vehicle, indicating that there are other factors that determine how much vehicles in a given area are used.

92% of all the ZipCar vehicles within Massachusetts were within the study area, implying that a certain population density threshold must be reach for an area to be considered a potential market. However, within the study area, population density played an insignificant role in determining ZipCar service availability. The lack of correlation between median household income and the number of ZipCar vehicles available suggests that many low-income neighborhoods might be underserved by ZipCar. This is backed by the fact that 76% of all the vehicles within the study area are located in ZCTAs with a median household income above the Boston average of 60,000 USD.
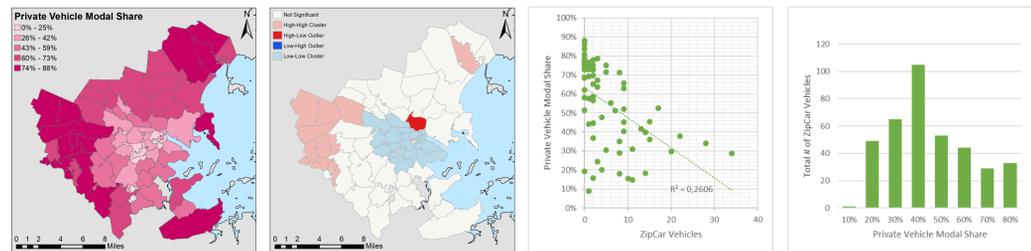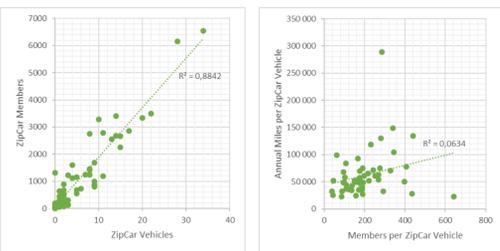
The strong positive correlation between ZipCar vehicle availability and the percentage of the population aged 20-39 implies that ZipCar targets their service towards young adults that are less likely to own a car. This is supported by the negative correlation between ZipCar service availably and the modal share of private vehicles. However, 66% of all ZipCar vehicles available were in ZCTAs with more than 0.8 cars available per household on average, indicating that many areas might be overserved. While there was a positive correlation between ZipCar vehicle availability and transit modal share, 67% of all available vehicles were in ZCTAs with a public transportation modal share of 30% or less. The lack of correlation between racial indicators and ZipCar service availability and the fact that 75% of all vehicles are in ZCTAs with a Hispanic population less than 10% indicates that many nonwhite areas might be underserved.

The results suggest that the main focus of ZipCar seem to be young white middle-class populations that have yet to obtain a private vehicle. Unfortunately, this means that numerous low-income minority communities with little access to private vehicles and public transportation are underserved. This study identified two underserved communities that could benefit from additional car-share availability – East Boston and South Boston. Both areas have a low median household income, little access to private vehicles, a high percentage of minority populations, and have little to no access to car-sharing services.

However, one must keep in mind that this study has vast limitations and significant additional research is required. The field the data analyzed in this study is from the year 2013 and thus possibly outdated. The biggest limitation of this study is that it was performed on the ZCTA level One must keep in mind that ZipCar availability and demographic indicators are never evenly spread. Detailed locations of ZipCar vehicles are required for a more accurate analysis.

## vehicles available per household



Vehicles Available per Household
- 0.0 - 0.5
- 0.6 - 0.8
- 0.9 - 1.1
- 1.2 - 1.5
- 1.6 - 1.9

## zipcar vehicle utilization



Annual Miles Traveled per ZipCar Vehicle
- N/A
- 0 - 45,056
- 45,057 - 83,919
- 83,920 - 148,230
- 148,231 - 288,625

## modal share of private vehicles



Private Vehicle Modal Share
- 0% - 25%
- 26% - 42%
- 43% - 59%
- 60% - 73%
- 74% - 88%

## members per zipcar vehicle



Members per ZipCar Vehicle
- 0 - 45
- 46 - 137
- 138 - 231
- 232 - 344
- 345 - 642

## modal share of public transportation



Public Transportation Modal Share
- 0% - 8%
- 9% - 17%
- 18% - 26%
- 27% - 37%
- 38% - 55%

## zipcar membership indicators



## white population



White Population
- 0% - 21%
- 22% - 63%
- 64% - 76%
- 77% - 85%
- 86% - 95%

**Uku-Kaspar Uustalu**
GIS-0101
21 December 2017

**Tufts**
UNIVERSITY

## hispanic population



Hispanic Population
- 0% - 5%
- 6% - 9%
- 10% - 16%
- 17% - 39%
- 40% - 62%