

Introduction

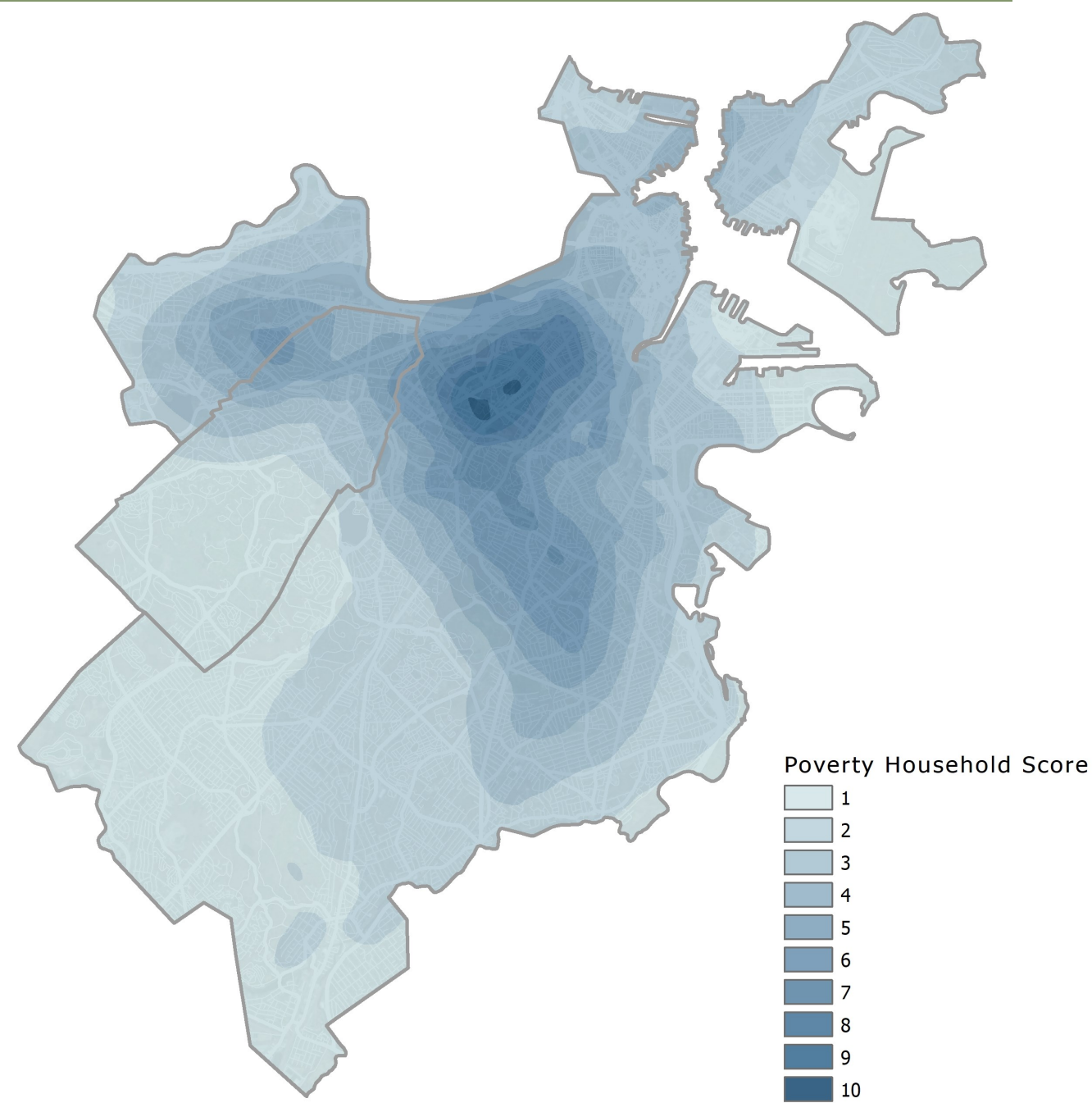
According to United States Department of Agriculture (USDA), food secure is defined as “households have access, at all times, to enough food for an active, healthy life for all household members.” The annual Food Security Supplement survey conducted by U.S. Census Bureau estimated that in 2016, approximately 12.3% (15.6 million) of U.S. households were food insecure, among which that households with income-to-poverty ratio under 1.85 (31.6%) are more vulnerable to food insecurity¹. Launched in 2013, Fresh Truck, an innovative mobile grocery truck that contrasts with traditional grocery stores, is a non-profit organization stationed in Boston serving low-income communities, which aims to close the gap of disproportionate rates of diet-related health issues in these communities by bringing fresh, healthy and affordable food to the neighborhoods. Fresh Truck visits eight Boston neighborhoods weekly, including South Boston, Hyde Park, Roxbury, Charlestown, East Boston, Dorchester, South End, and Brookline.

I would like to evaluate the implement of Fresh Truck, specifically whether the existing stops of Fresh Truck are well located near low-income neighborhoods, and whether the locations are near other grocery stores that sell fruit and vegetables. In addition, I would like to investigate if there were neighborhoods in need that are not currently served by Fresh Truck.

Method

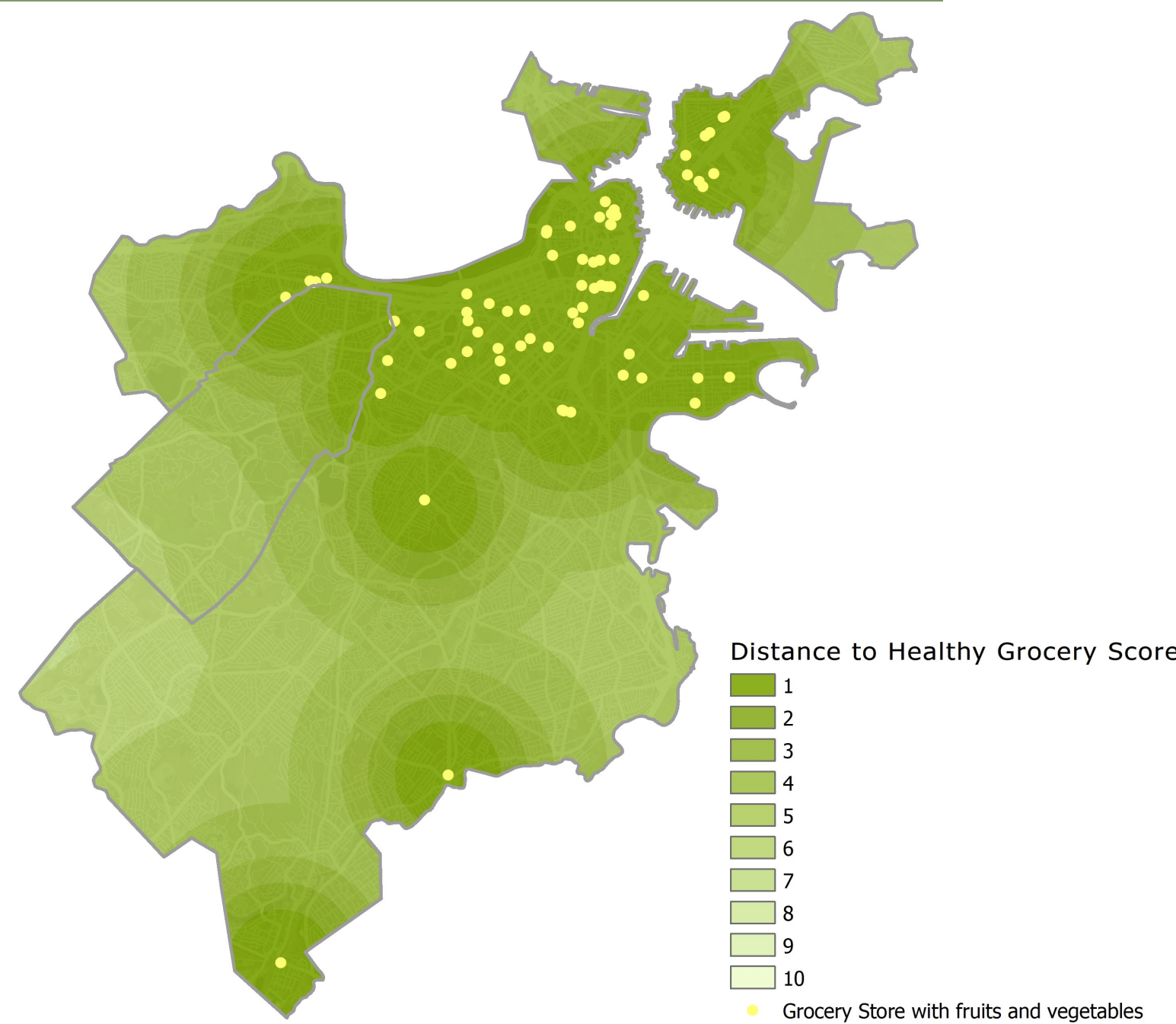
Household poverty status on block group level from American Community Survey (ACS) 2012-2016 5-Year Estimates was used as a proxy for low-income households. Food stores in Boston that have fruits and vegetables were obtained from Reference USA. All addresses were geocoded using ArcGIS World Geocoding Service. Locations and coordinates of Fresh Truck stops were obtained from Fresh Truck website and map. I created two scores: one evaluated the estimated number of households below poverty level within 1500 m-radius circle (the larger the number, the higher the score), the other one assigned scores for the distance from grocery stores that have fruits and vegetables (the further the distance, the larger the score). Then I combined the two indexes and formed the healthy food access index.

Poverty Score



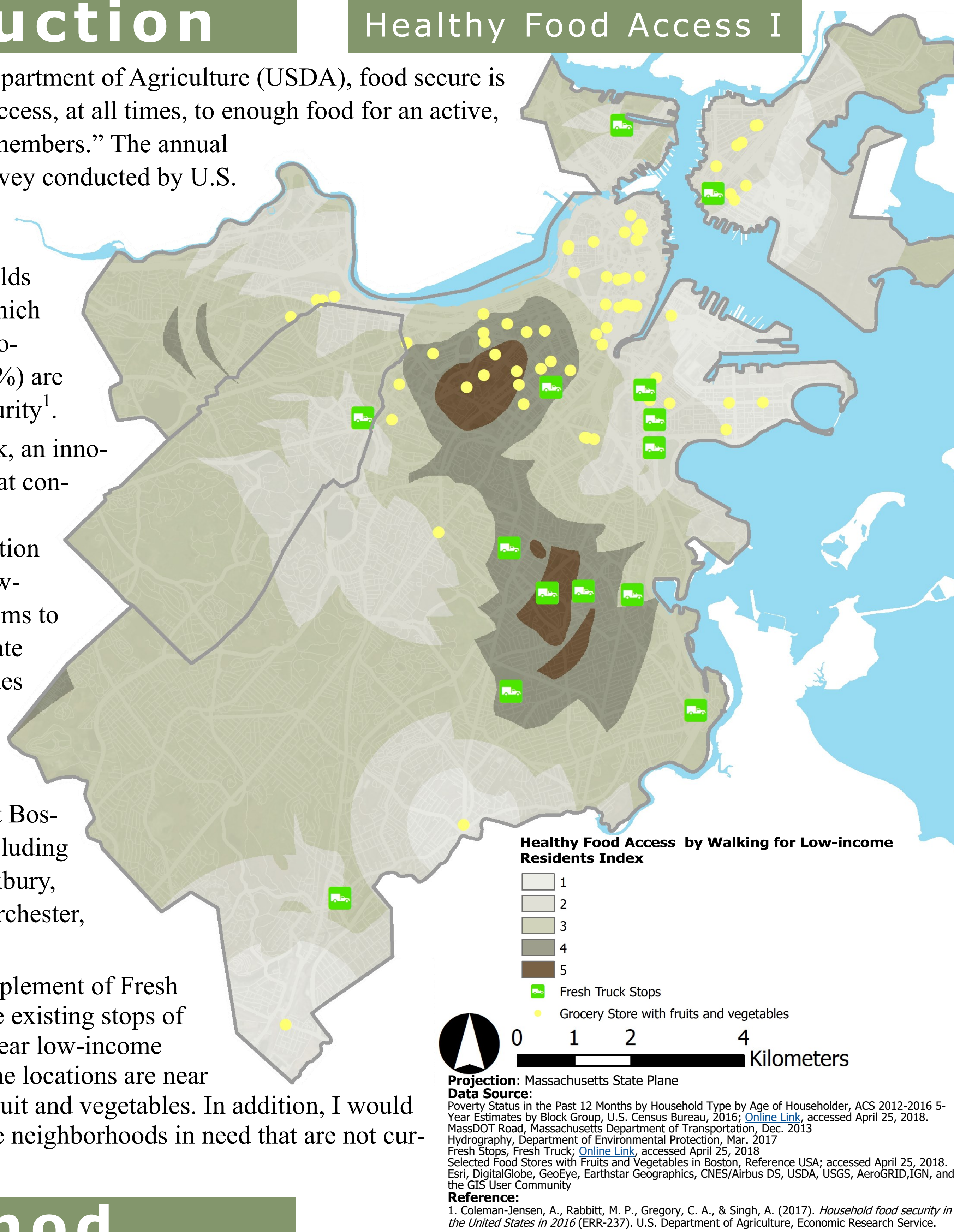
- Density of households below poverty level was estimated through dividing the number of households below poverty level by the area of the block group.
- A raster data was created with cell size of 100 m² based on the estimated density of households below poverty level.
- A focal sum tool was used to calculate numbers of households below poverty level within 1.5 km radius (roughly 15-minute walking distance).
- Scores were assigned to ranges of number of households on a scale of 1 – 10 (1: 0 – 1000; 2: 1000 – 2500; 3: 2500 – 4000; 4: 4000 – 5000; 5: 5000 – 6000; 6: 6000 – 7000; 7: 7000 – 8000; 8: 8000 – 9000; 9: 9000 – 10000; 10: 10000 – 11000).

Store Score



- Euclidean distances (meters) of identified stores were calculated.
- Scores were assigned based on the distance from the store on a scale of 1 – 10 (1: 0 – 1000; 2: 1000 – 1500; 3: 1500 – 2000; 4: 2000 – 3000; 5: 3000 – 5000; 6: 5000 – 7000; 7: 7000 – 9000; 8: 9000 – 11000; 9: 11000 – 13000; 10: 13000 – 18000).
- These procedures were repeated to create a new store score including Fresh Truck stops as healthy food stores.

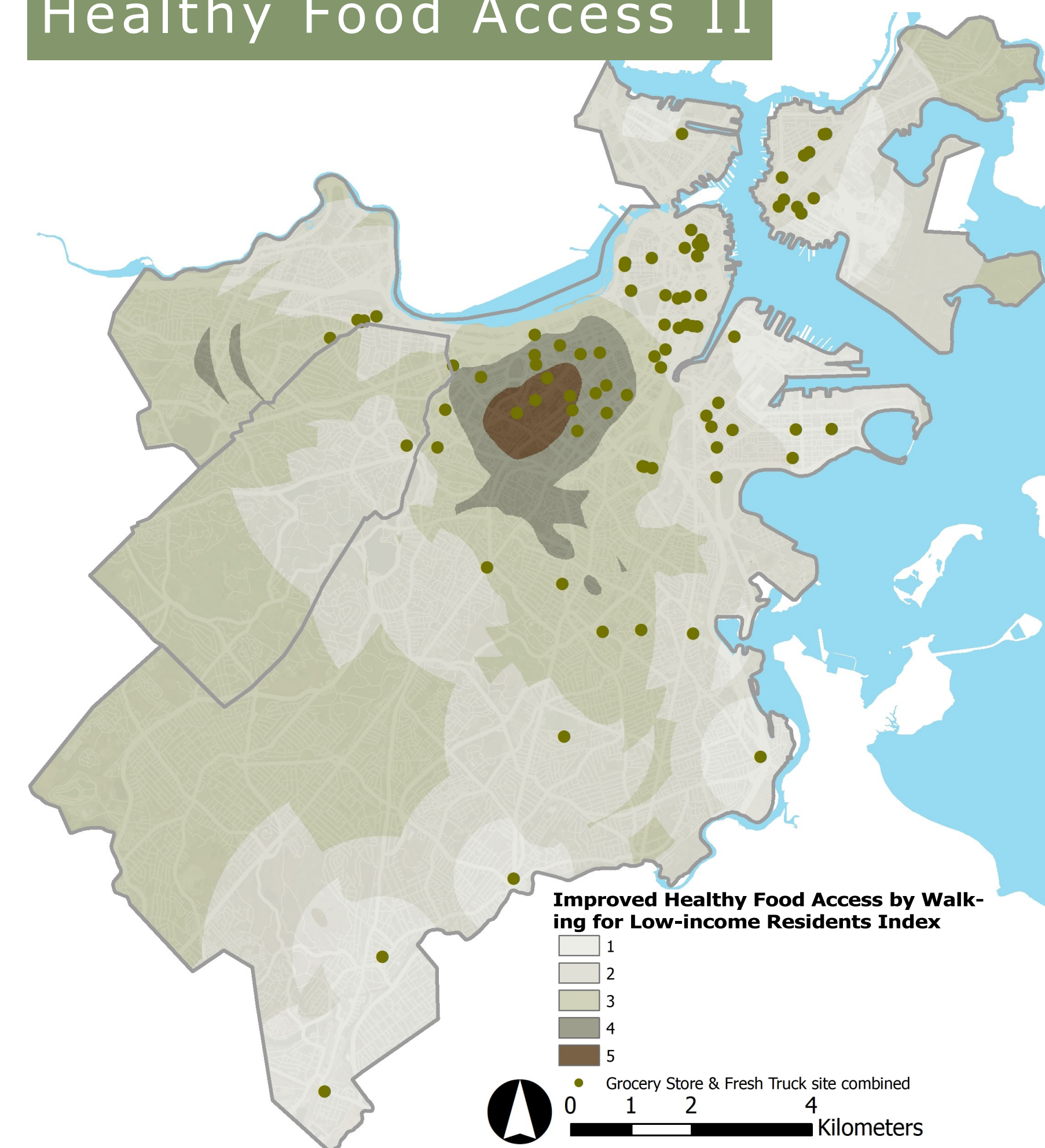
Healthy Food Access I



Results

Areas near Fenway/Kenmore and Columbus were found to have the highest density of households below poverty level, whereas part of Mission Hill, Roxbury, Dorchester, and Allston also scored high in Poverty Household Score. Majority of grocery stores with fruits and vegetables aggregated at the metropolitan area of Boston, potentially leading to low food access for residents outside the metropolitan area. Healthy Food Access I map illustrated that Dorchester has high density of low-income households and very poor access to healthy food. One interesting finding is that even though there are many grocery stores in the Kenmore and Columbus area, the number of households below poverty level outweighs the proximity to healthy food, making this area an ironic aggregation of healthy grocers and low-income households. This phenomenon also implies the importance of affordability of healthy food like fruits and vegetables when considering food access. Being near a grocery store may not indicate food access; a low-income household might still need to travel to a farther store with affordable food.

Healthy Food Access II



After counting Fresh Truck stops as healthy grocery store (Healthy Food Access II), severity of poor food access in Dorchester area was much alleviated. Despite of this considerable improvement, it is worth noting that Fresh Truck operates on a weekly schedule, and stays at one stop for a few hours. While Fresh Truck brings fresh fruits and vegetables to many residents, there are households which, due to time conflicts, physical restraint, etc., may not be able to shop at Fresh Truck.

Fresh Truck could consider adding future stops in Dudley Square and Allston/Brighton area. These areas scored high in healthy food access for low-income households and are not currently covered by healthy grocers.

In summary, this analysis, focusing on Fresh Truck and its impact on healthy food access of low-income households by walking, found that most stops of Fresh Truck are well located with regard to density of low-income households and distance to other healthy food stores. Potential stops could be extended to Dudley Square and Allston/Brighton area. Future study should evaluate how other aspects, such as public transportation, food affordability, and travel time, affect the implementation of Fresh Truck.

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