

# Spatial Variations in the Food Environment of Manhattan, NY

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## Abstract

Organic food availability in stores presumably has expanded since the implementation of the USDA National Organic Standard in 2002. Research suggests that the likelihood of purchasing organic food depends on consumer characteristics, such as income, education, and ethnicity. However, few studies consider the impact of the availability of organic food when analyzing consumer demand. A recent paper exploring organic consumers incorporates a crude measure of access to organic food, which shows some promise at closing this research gap. This paper extends this research by making use of a unique in-store dataset of organic food availability, and presents (1) initial findings on spatial availability of organic food in Manhattan, NY, and (2) preliminary efforts towards an econometric analysis explaining the patterns of availability based on socioeconomic and spatial characteristics. The methods under development here can be readily extended to the healthy food access literature, by proposing a methodology which links actual food availability (rather than implicit food availability associated with store location) to socioeconomic characteristics. Thus future extensions of this research will have direct implications for diet-related public health issues, and can potentially add to the body of literature that informs local and federal policy decisions regarding food access.

## Introduction

To incorporate the availability of organic food, survey instrument developed and used in Manhattan, New York:  
23 square miles  
About 70K residents per square mile  
Median HH income: \$59K, mean \$98K  
35% of HH income < \$35K  
61% of children free lunch eligible



## Methods: Survey Instrument

Phase I: Food Systems I class – Fall 2010  
Phase II: Hired team – January 2011  
1260 Food Stores

Table with columns for Store ID, Name, Address, City, State, Zip, and various demographic and socioeconomic variables. Includes sections for 'Store Information', 'Demographics', and 'Socioeconomic'.

## Summary Statistics

Table 1. Organic food availability, Manhattan, NY, January 2011

| Organic product    | Stores |         | Organic product       | Stores |         |
|--------------------|--------|---------|-----------------------|--------|---------|
|                    | number | percent |                       | number | percent |
| Apples             | 119    | 9       | Potatoes – frozen     | 87     | 7       |
| Baby carrots       | 111    | 9       | Strawberries - frozen | 57     | 5       |
| Bananas            | 72     | 6       | Grapes                | 2      | 0       |
| Beef               | 38     | 3       | Lettuce               | 40     | 3       |
| Carrots            | 82     | 7       | Milk                  | 437    | 35      |
| Cheese             | 135    | 11      | Onions                | 50     | 4       |
| Chicken            | 68     | 5       | Packaged lettuce      | 137    | 11      |
| Eggs               | 290    | 23      | Pears                 | 56     | 4       |
| Broccoli - frozen  | 101    | 8       | Potatoes              | 62     | 5       |
| Corn - frozen      | 109    | 9       | Strawberries          | 23     | 2       |
| Mixed veg - frozen | 100    | 8       | Tomatoes              | 78     | 6       |
| Peas - frozen      | 97     | 8       | Yogurt                | 272    | 22      |

Source: Data collected by authors and research team.

$$\text{Availability Index: } \sum_{i=1}^{24} x_i * 100 / 24 \quad \text{where } x_i = 1 \text{ if organic product is available, and } x_i = 0 \text{ otherwise.}$$

$$\text{Depth Index: } \sum_{i=1}^{46} x_{i,p} * 100 / 46 \quad \text{where } x_{i,p} \text{ is an indicator variable reflecting the presence of organic product, more than one variety/brand, and private label, and } p \text{ varies by product line (dairy, produce, frozen produce, and meat)}$$

Table 2: Indices of organic food availability: Manhattan, NY January 2011

| Product        | Discrete availability index | Depth of availability index |
|----------------|-----------------------------|-----------------------------|
|                | Mean (standard deviation)   | Mean (standard deviation)   |
| Dairy          | 26 (38)                     | 11 (18)                     |
| Produce        | 6 (17)                      | 7 (14)                      |
| Frozen produce | 7 (22)                      | 0 (1)                       |
| Meat           | 4 (17)                      | 3 (12)                      |
| All products   | 9 (18)                      | 7 (13)                      |

## Results I: Econometrics

Availability of organic food = f (median income, median age, education, percent of black households, spatial factors, availability of healthy food, and interaction between median income and median age)

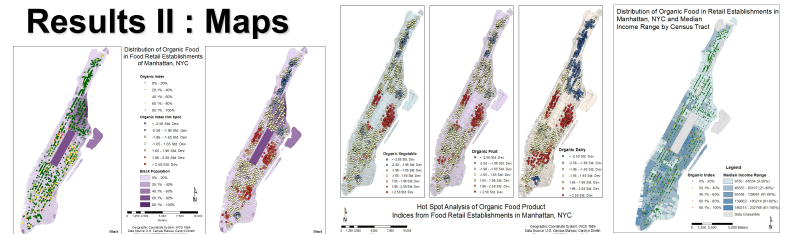
Tobit regression  
Number of obs = 1089  
LR chi2(10) = 2139.73  
Prob > chi2 = 0.0000  
Pseudo R2 = 0.2280

Log likelihood = -3623.1127

| OrgIndex      | Coef.     | Std. Err. | t      | P> t  | [95% Conf. Interval] |
|---------------|-----------|-----------|--------|-------|----------------------|
| Median Inc    | -.0000517 | .00000315 | -1.64  | 0.101 | -.0001135 .0000102   |
| Median Age    | -.0337899 | .0560669  | 0.60   | 0.547 | -.0762226 .1438024   |
| SomeCol       | -.0560951 | .0588053  | -0.95  | 0.340 | -.1714807 .0592906   |
| CollegeGra    | .0430713  | .02752    | 1.57   | 0.118 | -.019274 .09707      |
| GradDeg       | -.0749192 | .0253018  | 2.96   | 0.003 | -.0252729 .1245654   |
| Black_per     | .0009586  | .0129049  | 0.07   | 0.941 | -.0243628 .0262801   |
| 1000 M buffer | .0364626  | .015765   | 2.31   | 0.021 | .0055291 .0673961    |
| Int_Age Inc   | 1.37e-06  | 7.42e-07  | 1.84   | 0.066 | -8.82e-08 2.82e-06   |
| res_healthy   | -1.167553 | .019559   | -59.69 | 0.000 | -1.205931 -1.129175  |
| healthy_index | 1.287356  | .0176064  | 73.12  | 0.000 | 1.252809 1.321902    |
| _cons         | -42.96174 | 2.45308   | -17.51 | 0.000 | -47.77509 -38.14839  |

1000 M buffer measures the number of stores within 1000 meters of each observation.

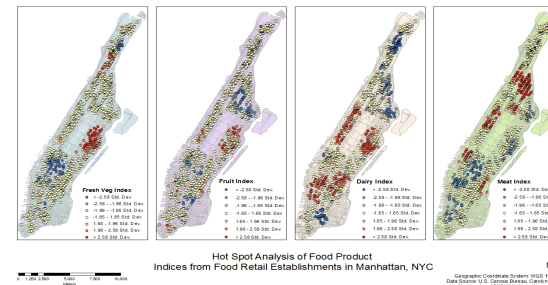
## Results II : Maps



**Spatial Location of Organic Food Availability:** Stores with no organic products are located throughout Manhattan, but are concentrated in the neighborhoods north of Central Park, many of which are lower income. Stores with a wide range of organic products are located throughout the city as well, but are concentrated in the areas on each side of Central Park, and in the downtown areas, which typically attract younger residents. The spatial distribution of organic products, by product category, reveals there is a greater amount of clustering in the availability of organic dairy products than of vegetables and fruit.

**Household Income:** Highest median income below the northern most edge of Central Park. The stores with the greatest number of organic food items, with the exception of a few store locations, are located in the census tracts with the highest median income.

## Results II : Maps



**Spatial Availability of Each Product Line, (Organic and Conventional):**

The availability of all healthy foods show a similar spatial distribution to the individual organic product line spatial distribution.

As the regression results suggest, all healthy food availability is likely to be highly endogenous to organic food availability, as stores that offer organic foods are likely to offer conventional versions of similar foods. This potential dependency will be investigated in future research.

## Conclusions and Future Research

This paper draft presents research currently in development; the initial phase of this research examines the availability of organic food in retail stores in Manhattan NY. To do so, the research makes use of a new, unique dataset collected by the author. While numerous technical difficulties are still present, the preliminary results are promising. The inclusion of availability of organic food logically strengthens the current body of literature that examines organic consumers and the retailing of organic products. One important finding is that organic food is available throughout Manhattan, although few stores carry a wide range of organic food. The most significant finding is that organic food is less available in census tracts with a high percent of black households in residence, which suggests that earlier findings of black households being less likely to buy organic food may be the result of availability and not preferences. Future work will ask the following questions: what are the spatial patterns of healthy food access? How, and to what degree, does the availability of healthy food depend on demographic variables? To what extent do restaurants crowd out healthy food availability in Manhattan? How does availability vary around Manhattan in stores accept federal nutrition benefits. Finally, are there policy instruments that can be adopted to increase the availability of healthy foods?