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## Understanding the Grocery Store Environment in A Michigan Urban Setting: A Case Study in A Bangladeshi Community

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### ABSTRACT

The Banglatown area of Hamtramck, Michigan is home to Bangladeshi Americans (26% of the population) and has a 49.1% poverty rate. There are no supermarkets in Hamtramck; however, there are many small food stores. The NEMS-CS tool was used to assess 21 food stores. Of the stores surveyed, 33% of offered 3 or more fruits and vegetables. Thirty-six percent offered brown rice and almost half offered dried legumes. Stores scored poorly on all three categories included in the NEMS-CS score: availability, quality, price. Results of the study contribute to the knowledge base about healthy food availability in urban Bangladeshi communities.

### KEYWORDS

Asian Americans; poverty; fruits and vegetables; community health; geographic information systems; NEMS-CS


## Introduction

Hamtramck is a 2.09 square mile city near Detroit, Michigan and is home to one of the nation's densest clusters of Bangladeshi-Americans; 26% of the population in Hamtramck is Asian American. According to the U.S. Census Bureau, Hamtramck has a population of 21,599 and a poverty rate of 49.1% compared to Detroit, which is 36.4%, and a median annual household income of \$25,478 (2019) compared to Detroit, which is \$29,481 (2019).<sup>1</sup> There are no supermarket stores in Hamtramck but there are small grocery stores, corner/convenience stores, and a few dollar stores.

The Nutrition Environment Measures Survey (NEMS) has been used to assess urban food environments in a limited number of U.S. cities. There are several versions of the NEMS, including the NEMS-Store (NEMS-S) and the NEMS-Corner Store (NEMS-CS). The NEMS-S was designed to assess the nutrition environment of a store that sells food; looking at availability, quality,

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and pricing of healthy and less-healthy foods, while the NEMS-CS was designed to assess the nutrition environment at corner stores.<sup>2</sup> In addition to specifically assessing corner stores, the NEMS-CS assesses additional categories of foods, including canned and frozen fruits and vegetables, snacks, and additional beverages. Cannuscio et al. collected data in 373 stores in Philadelphia and found that convenience and corner stores had the lowest NEMS-S scores among all stores.<sup>3</sup> Díez et al. assessed 14 stores in Baltimore and found that corner stores did not offer many fruits and vegetables.<sup>4</sup> Pike et al. collected data in two urban neighborhoods in Ohio in which more than 40% of the population lived below the poverty level and more than 70% of residents were a racial/ethnic minority.<sup>5</sup> Sixty-three percent of stores (n = 55) scored in the lowest score category, indicating lower availability, higher pricing, and reduced quality of healthy food options. Shaver et al. used a modified NEMS-S and visited 365 stores in Flint, Michigan. Results indicated that stores in higher socio-demographic distress areas had lower availability and quality of healthy foods.<sup>6</sup> Additionally, Cavanaugh et al. surveyed 233 stores in Philadelphia, Pennsylvania using the NEMS-CS tool and found that healthier versions of food items were less likely to be available and when available, were more expensive than the less healthy version.<sup>7</sup>

There is a paucity of information on the availability of healthy foods in underserved Asian American communities, which is of concern as these populations are often considered “model minorities” with respect to health, when in reality, they are at risk for nutrition related chronic diseases. Asian Americans are stereotyped as being in good health and as high income earners, without the health risks that are associated with overweight and obesity and low socioeconomic status (SES).<sup>8</sup> However, disparities exist both with respect to health and SES. For example, Asian Americans are at increased risk for developing type 2 diabetes and hypertension even at BMIs that fall below the obese weight category.<sup>9–11</sup> With respect to SES, the income gap among Asian Americans is 10.7, which means the highest earning 10% of Asian Americans earn 10 times that of the lowest earning 10% of Asian Americans.<sup>8</sup> Assumptions about good health and high SES have resulted in Asian Americans often being left out of policy and programming related to health and income inequality.<sup>8</sup> The goal of this study was to use the NEMS-CS tool and Geographic Information Systems to assess 21 stores in Hamtramck regarding the availability, quality, and prices of healthy foods.

## **Methods**

### ***IRB Approval***

All methods and procedures were approved by the Eastern Michigan University Institutional Review Board for Human Subjects.

## **Study Design**

The study used a descriptive design. The study team conducted observational surveys in small grocery stores and corner/convenience stores. For the purposes of this study, grocery stores were stand alone stores that sold food and other everyday items. Whereas corner/convenience stores were stores that sold food and were associated with gas stations or liquor stores.

The setting of our study was the city of Hamtramck, Michigan. Policy Map was used to identify food stores that accepted Supplemental Nutrition Assistance Program (SNAP) benefits.<sup>12</sup> Input from a local community partner, the Bangladeshi Americans Public Affairs Committee, assisted the study team to identify 22 stores that are popular among Bangladeshi Americans. One store declined to participate and surveys were conducted in 21 stores.

## **Study Tools**

The Nutrition Environment Measures Survey-Corner Stores (NEMS-CS), a tool standardized and validated by the University of Pennsylvania, was utilized to assess 21 small grocery and corner/convenience stores in Hamtramck, Michigan. The study team chose to use the NEM-CS tool for the following two reasons: 1) It includes information on additional foods (e.g., low-calorie beverages, frozen fruits and vegetables, and 100-calorie snacks) that are not collected in the NEMS-S, and 2) NEMS-CS data collection tool captured data on additional foods common in the Bangladeshi diet. The NEMS-CS tool was used by Cavanaugh et al to measure the food environment in corner stores<sup>7</sup> and is comprised of eleven categories of food: milk, fruit, vegetables, ground beef/alternative ground meat, hot dogs, frozen dinners, baked goods, beverages, bread, chips and 100-calorie snacks, and cereal. Fruits and vegetables are scored on quality, availability, and price, while the rest of the categories are scored on availability and price. Additional points are awarded if a healthier version of a food item is priced lower than a less healthy version (e.g., whole wheat bread compared to white bread).

## **Data Collection Procedure**

The trained researchers conducted 5–6 surveys in a collection day and each survey took approximately 30–45 minutes. Protocols outlined in the NEMS training manual were followed for data collection. Data were entered into an Excel spreadsheet provided by the University of Pennsylvania's NEMS website ([nems-upenn.org/tools](http://nems-upenn.org/tools)). Verbal permission from the store owner or manager was obtained before a survey was administered. One store manager did not give permission; thus 21 surveys were completed. Stores were visited in 2019 and data was collected using the NEMS-CS tool.

### ***Cultural Modifications Made During Data Collection***

During data collection, the study team made appropriate cultural modifications to fully capture all the information with original study tools. For example, for the frozen dinner category, the ethnically Bangladeshi-owned grocery stores offered Indo-Mediterranean frozen dinner foods such as Colonel Kababz vegetable samosa or chicken or beef kebabs, which include more than one serving in a single package. Researchers recorded the nutrition data based on one serving of the food and the number of servings and the size of the package was noted. In addition, researchers collected information on the availability and price of staple food in traditional Bangladeshi dishes in the stores (e.g., dried and canned beans and legumes and grains) as they are not originally included as part of the NEMS-CS scoring. If there were more than two sizes of the packaged legumes and/or grains available, the smallest package size was included in the NEMS-CS survey.

### ***Geographic Information System***

Geographic Information System (GIS) was used to create a map identifying where the surveyed stores were located with kernel density representing store NEMS-CS scores (Fig. 1). Additionally, GIS was used to create a map identifying where the stores were located in relationship to where Asian Americans live in the city (Fig. 2). This map also provides a visual representation of the availability, quality, and price scores of the stores in comparison to where Asian Americans live.

### ***Data Management and Analysis***

NEMS-CS scores were tabulated using Microsoft Excel. Descriptive analyses were run using IBM SPSS Statistics 25 software. Maps were created using ArcGIS software and data from the U.S. Census Bureau 2013–2017 American Community Survey Estimates.

## **Results**

### ***NEMS-CS Scores and Key Findings***

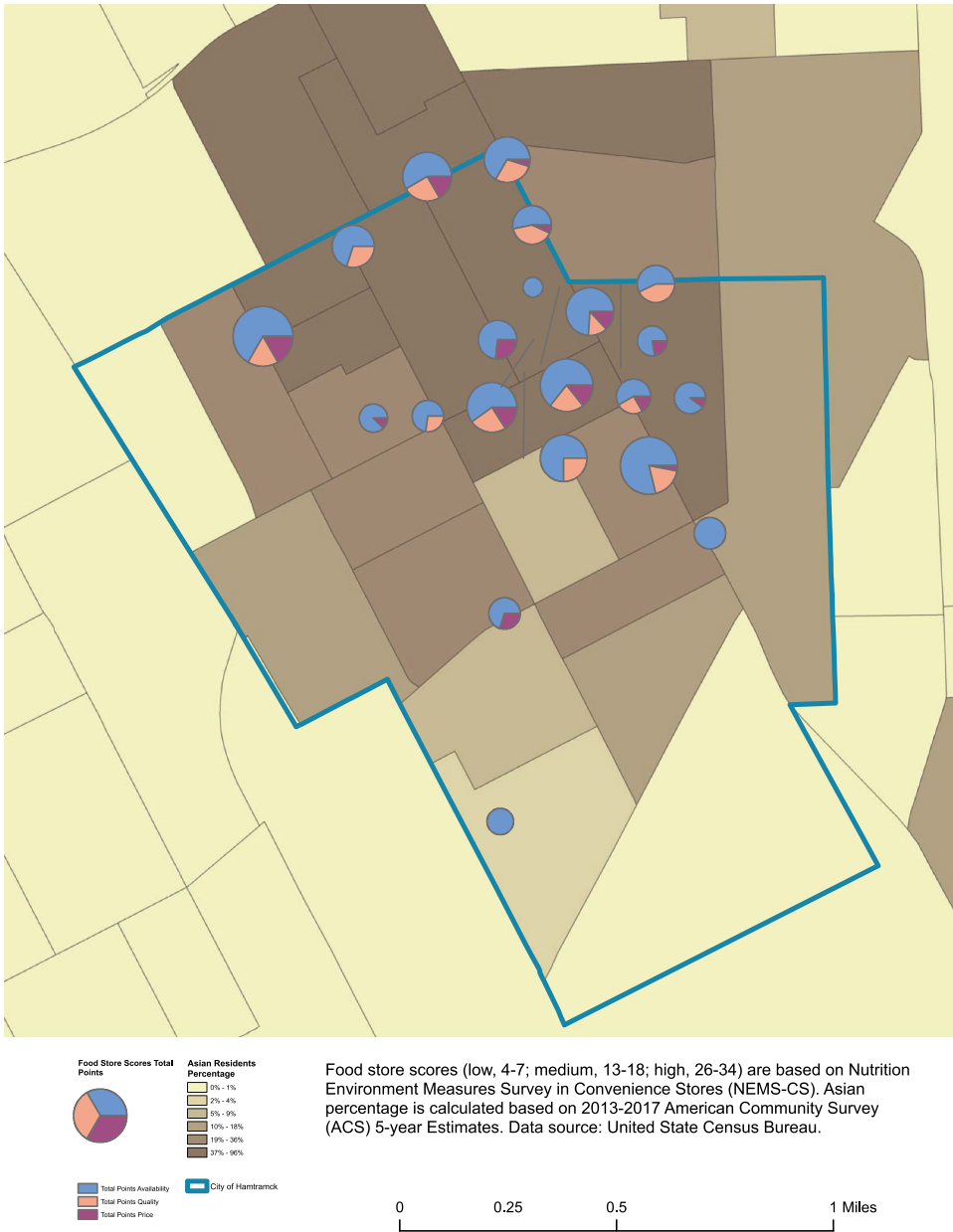
The overall score is comprised of three components: availability, quality, and price. The maximum number of points that can be earned is 58; 34 of those are for availability, 18 are for quality, and 6 are for pricing. The average NEMS-CS score was 18.4 for grocery stores ( $n = 16$ ) and 12.8 for corner/convenience stores ( $n = 5$ ) (Table 1). For both grocery and corner/convenience stores, the category with the highest variability was availability. The category with the

## NEMS-CS Scores for 21 Food Stores, 2019 With Kernel Density of Scores in Hamtramck



**Figure 1.** NEMS-CS scores for 21 food stores in Hamtramck, MI, 2019, with Kernel density of score.

## NEMS-CS Food Store Scores by Availability, Quality, and Price Hamtramck, 2019 with Asian Percentage by Census Tract



**Figure 2.** NEMS-CS food store scores by availability, quality, and price, in Hamtramck, MI, 2019, with Asian population percentage by census tract.



**Table 1.** Scoring of availability, price, and quality of healthy foods among 21 grocery and corner/convenience stores in Hamtramck, MI, 2019.

Characteristic (Total points available for that characteristic)	Grocery Stores (n = 16)	Corner/convenience Stores (n = 5)	
		Mean (SD) Average (SD)	
Availability (34)	12.7 (6.4)	10.6 (3.9)	
Quality (6)	4.1 (2.7)	0.6 (1.3)	
Price (18)	1.6 (2.2)	1.6 (2.1)	
Total (58)	18.4 (9.2)	12.8 (6.4)	

lowest variability was price for grocery stores and quality for corner/convenience stores. Grocery stores and corner/convenience stores had the same mean score for price.

The healthy options available in over 50% of grocery stores—from lowest to highest—were fresh vegetables (69%), fresh fruit (75%), low-sugar cereal (81%), 100% juice (81%), low-fat milk (81%), and frozen vegetables (88%) (Table 2). Eleven of the 16 grocery stores offered at least one type each of a fresh fruit and vegetable. Of those stores, five also offered frozen fruit and eight offered frozen vegetables; seven also offered skim, 1%, or 2% milk; and ten of the stores also sold at least one type of dried legume. None of the corner/convenience stores surveyed sold lean ground meat, low-fat baked goods, lean hot dogs, or fresh vegetables, and one of the corner/convenience stores had fresh fruit (apples). More stores had 100% juice than fresh fruit (Table 2). This may be because juice can be stored longer than fresh fruit and some types of juice do not require refrigeration. On the other hand, four grocery stores and 3 corner/convenience stores sold canned fruit, indicating that canned fruit may not be a popular way to consume fruit in this community. Four of the 16 grocery stores sold lean ground meat, and slightly more than half of the grocery stores had at least one fresh vegetable (n = 11) or fruit (n = 12).

**Table 2.** Available healthy food options for grocery (n = 16) and corner/convenience (n = 5) stores in Hamtramck, Michigan, 2019.

Available Healthy Food Options	Number of grocery stores (%)	Number of corner/convenience stores (%)
Skim, 1%, or 2% milk	13 (81)	5 (100)
100% juice	13 (81)	5 (100)
Diet soft drinks	6 (38)	5 (100)
Fresh fruit	12 (75)	1 (20)
Fresh vegetables	11 (69)	0
Frozen fruit	9 (56)	0
Frozen vegetables	14 (88)	1 (20)
Canned fruit	4 (25)	3 (60)
Canned vegetables	5 (31)	2 (40)
Whole wheat bread	7 (44)	1 (20)
Baked chips	4 (25)	3 (60)
(≤3 g fat per serving)		
Low sugar cereal	13 (81)	3 (60)
(<7 g sugar per serving)		
Lean ground beef or chicken (10% fat per pound)	4 (25)	0



**Table 3.** Availability and price of selected legumes and grains, per pound or per can, among grocery (n = 16) and corner/convenience (n = 5) stores in Hamtramck, 2019.

	Availability of dried n (%)	Price, in dollars, per lb. of dried legumes Mean (SD)	Availability of canned n (%)	Price, in dollars, per can (14 or 15 oz.) Mean (SD)
<b>Legumes</b>				
Green or red lentils	14 (67)	1.37 (0.43)	-	-
Garbanzo beans	11 (52)	1.22 (0.40)	3 (13.6)	0.99 (0)
Split peas	9 (41)	1.29 <sup>a</sup> (0.27)	-	-
Kidney beans	6 (29)	1.64 (0.37)	5 (23.8)	1.37 (0.45)
Black-eyed peas	5 (24)	1.55 (0.47)	1 (4.76)	1.99 (0)
Black beans	4 (18)	1.87 (1.03)	-	-
White beans	4 (18)	2.07 (0.57)	3 (13.6)	1.16 (0.47)
Lima beans	3 (14)	2.06 (0.55)	1 (4.76)	1.99 <sup>b</sup> (0)
Fava beans	2 (10)	0.94 (0.07)	1 (4.76)	0.99 (0)
<b>Grains</b>				
White rice	17 (81)	N/A	-	-
Brown rice	8 (36)	N/A	-	-
Additional whole grains (barley, oats, bulgar, or corn kernels)	10 (48)	N/A	-	-

<sup>a</sup>One missing price value<sup>b</sup>20 oz can of lima beans

In terms of legumes, the three most commonly available were green or red lentils (67% of stores), garbanzo beans (52% of stores), and split peas (41% of stores) (Table 3). White rice, which is a staple of Bangladeshi cuisine, was offered in 81% of food stores, while 36% of stores sold brown rice. The most inexpensive dried beans sold were fava beans at \$0.94 per pound while the most expensive were white beans at \$2.07 per pound.

### **Store Characteristics**

Additional measures of the NEMS-CS survey are the percentage of store space that is dedicated to food and the number of cash registers. Because there are no supermarkets in Hamtramck, the grocery and corner/convenience stores also sell household items such as dishes, cookware, paper goods, and cleaning products. Sixteen out of 21 stores dedicated 50% or more of the store space to food and 2 stores had less than 25% space for food. Fifty-two percent of the stores had 1 cash register and 38% had 2. One store had 3 cash registers and another had 4, but only 2 of the cash registers were in use at the time that the store was visited.

### **Store Location and Asian American Population**

The two maps generated from GIS show the NEMS-CS scores of the food stores surveyed in Hamtramck, MI. Figure 1 highlights how well neighborhoods are equipped to address healthy eating concerns. It reveals that neighborhoods in the north Hamtramck region have more food stores compared to the south region, which is predominately categorized as industrialized land

according to the city land use.<sup>13</sup> The kernel density of food store scores also indicates a lack of healthy foods in the southwest neighborhood of the geographic area.

Figure 2 represents food store scores in relation to the percentage of Asian Americans (the priority population for this project) living in that area. In Figure 2, neighborhoods with higher proportions of Asian Americans tend to cluster in northeastern Hamtramck, while there are fewer Asian Americans living in western Hamtramck, and virtually no Asian Americans living in southern Hamtramck. Many food stores are clustered in the northwestern area of Hamtramck along the three main corridors in the city: Conant Street, Caniff Street, and Carpenter Avenue. Stores that have higher NEMS scores are primarily distributed along these three streets and store scores decrease toward the southern and western boundaries of the city.

Figure 2 illustrates the relationship between the availability, quality, and price factors of each store in relation to the spatial distribution of Asian Americans. The bigger the pie chart, the higher the NEMS-CS score for that food store. The blue area on the pie chart indicates the number of points given for the availability of healthy food. The orange area indicates the number of points given for the quality category of the survey (e.g. the quality of fruits and vegetables). The purple area on the pie chart indicates the total number of points given for the pricing of the healthy foods; if the healthy foods are priced lower than the regular items there are more points given. If the maximum number of points were earned for each category, availability points (blue area) would account for 59% of the pie chart, quality (orange area) would account for 10%, and price (purple area) would account for 31%. Out of 21 stores, 9 (43%) had a score above the average, for the stores in this survey, for availability. Thus, there is room for improvement as well as gaps to fill on improving the quality and affordability of the food in these areas as seen by the lack of orange or purple areas in 12 of the pie charts.

## Discussion

We present the first study of its kind, assessing the urban food environment in a Bangladeshi community in Hamtramck, Michigan with both quantitative survey and GIS approaches. The purpose of this study was to gather food store data from an area with a low-income, underserved Asian American population and to objectively quantify the healthy foods that were available. GIS maps were created to identify geographically the accessibility of healthy food supplies in grocery and corner/convenience stores in Hamtramck. The results of this study contribute to the knowledge base regarding healthy food availability in Asian American communities with over 50% of the population categorized

as low-income. This is an important population to study, as the availability of data is limited and this population is at increased risk of nutrition-related chronic diseases.

According to the USDA Food Access Research Atlas, the area of study is in a low-income, but not the low-access area, meaning the residents are less than 1 mile from a supermarket.<sup>14</sup> However, the data collected supports the conclusion that the population is in need of reasonably priced, high quality fruits and vegetables and other healthy foods. The overall availability score of healthy foods in both grocery stores and corner/convenience stores was 50% or less of the maximum score that could be earned. Similar to the findings of Cannuscio et al and Pike et al, the corner/convenience stores in Hamtramck had lower overall scores than the grocery stores, with an average score of 12.8 for corner/convenience stores and 18.4 for grocery stores.<sup>3,5</sup> Corner/convenience and grocery stores had the same average score for price. However, corner/convenience stores had lower scores for availability and quality as compared to grocery stores. Although grocery stores had higher overall as well as availability and quality scores than corner/convenience stores, these scores were low and indicate a need for increased availability of higher quality, lower-priced healthy foods.

The greatest shortcomings with respect to the availability of healthy foods were lack of variety of fresh fruits and vegetables, lean meat, and whole grains. One of the corner/convenience stores offered fresh produce (fruit) and while most grocery stores offered canned or dried beans, prices varied widely (Table 3). This finding supports that of Díez et al, who found that among corner and convenience stores in Baltimore, few fruits and vegetables were offered.<sup>4</sup> As Pike et al and Shaver et al found, not only are healthy foods less available and lower quality in this urban setting, prices are also increased.<sup>5,6</sup> These factors can make healthy eating a challenge for Bangladeshi American immigrants in Hamtramck, as the poverty rate for the city is 49.1%.<sup>1</sup>

### **Limitations and Strengths**

This study had several limitations. First, the food items available at the stores during the time of the survey may not have been representative due to seasonality or availability from suppliers. It may be beneficial to repeat the survey at other times of the year. Furthermore, data were not collected from all of the stores in Hamtramck, which may have affected the mean score for the corner/convenience stores and grocery stores. However, the goal of the study was to assess the food environment for Bangladeshi Americans in Hamtramck, MI, and the stores surveyed were identified by community partners as those which Bangladeshi Americans patronize. However, it is possible that residents supplement their grocery shopping in the city by going to supermarkets and/or farmers' markets outside the city. Lack of explicit pricing was a barrier to

completing the surveys. The prices were typically not posted on the shelves and few stores labeled their food products with price stickers. Researchers had to ask the employees or store owners for the prices. Lastly, findings may not be generalizable to populations that are not urban and low-income.

Regardless of these limitations, there are several strengths of this study which contribute to the literature on the nutrition environment in small ethnic grocery stores. One of these strengths includes using a validated survey tool, the NEMS-CS survey, and focus on Hamtramck, a small geographic area with a high concentration of Bangladeshi residents. There is currently no published research on the food environment of Bangladeshi American communities. Another strength is the inclusion of data on legumes; a staple food in the Bangladeshi culture. The use of GIS maps also sets this study apart from many NEMS studies. This mapping technology is an effective tool that can be used to visually characterize a food environment and quickly show which factors (affordability, quality, or price) are of concern in the food stores. This study sheds light on an underserved Asian American population and highlights the role of these ethnic grocery stores and their contribution to the food environment.

## **Conclusions**

It is well known that neighborhoods with lower socioeconomic status have decreased access to healthy foods and that available foods are higher in price. This is the first study to report on availability, quality, and price of healthy foods in a low-income Asian American community. Findings contribute to the knowledge base about healthy food availability in urban Asian American communities. Results can be used to provide technical assistance to store owners in low-income urban areas that will improve the stores' ability to provide a variety of healthy foods, which can impact the prevalence of health disparities and chronic diseases.

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## **Disclosure Statement**

No potential conflict of interest was reported by the author(s).

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