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The Utilization of Local Food Environments By Urban Seniors

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Abstract

Objective—The objective of this study was to describe food shopping patterns for urban seniors and measure the influence of neighborhood and individual level factors on intake of fresh fruits and vegetables.

Method—Between September 2005 to August 2006, 314 Black, White and Latino participants from ten Brooklyn senior centers were interviewed about types of produce recently purchased, satisfaction with selection, cost and quality of produce, intake of produce, and location of food store used to purchase produce.

Results—Individual level factors (race/ethnicity and age) were significantly associated with produce intake. Although environmental and distance factors did not reach statistical significance in multivariate models, living or shopping in a Black or racially-mixed neighborhood was positively associated with the reported number of servings per day of fruits and vegetables. Also, a greater proportion of Blacks traveled more than a mile to do primary food shopping and most Seniors do not shop within their residential census tract. Blacks and Latinos consumed less produce than Whites.

Conclusion—This study illuminates a number of important factors about the delivery of foods to urban Seniors and how those Seniors navigate their local environment to obtain healthy diets, measured here as intake of fruits and vegetables. The albeit small increase in servings per day associated with distance traveled to primary food stores does suggest that fruits and vegetables are not locally available and therefore presents an opportunity for policy makers and city planners to develop areas where healthy food options are convenient for consumers.

Keywords

local food environment; supermarkets; racial disparities; diet

INTRODUCTION

Over the past decade, researchers have investigated the associations between food environments, diet and health outcomes (Austin SB, 2005; Block JP, 2004; Cheadle A, 1991; Cheadle A, 1993; Cummins SC, 2005; Fisher BD, 1999; Hearn MD, 1998; Horowitz CR, 2004; Laraia BA, 2004; Lewis LB, 2005; Maddock J, 2004; Morland KB, 2002a; Morland KB, 2002b; Morland KB, 2006; Sooman A, 1993; Sturm R, 2005; Wechler H, 1995; Zenk SN, 2005a; Zenk SN, 2005b). Studies have demonstrated that access to foods differs by

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neighborhood characteristics such as socioeconomic and race/ethnic composition (Austin SB, 2005; Block JP, 2004; Cummins SC, 2005; Horowitz CR, 2004; Lewis LB, 2005; Morland KB, 2002a; Sooman A, 1993; Wechler H, 1995; Zenk SN, 2005a;). In addition, proximity to supermarkets has been shown to be linked to diet and related health outcomes in some social groups (Cheadle A, 1991; Laraia BA, 2004; Maddock J, 2004; Morland K, 2002b; Morland KB, 2006; Sturm R, 2005; Zenk SN, 2005b). There is also some evidence that changes in environments (e.g. school environments) has an influence on the purchasing of healthier food options (French SA, 2003; Gortmaker SL, 1999; Lytle LA, 2004). These studies have made important contributions to the public health literature by beginning to provide empirical evidence of the impact of environmental factors on individuals' dietary behaviors. However, fewer studies have measured how individuals interact with and utilize their local food environments. Understanding the ways in which individuals navigate and make use of food purchasing options could have important implications for the design of interventions to improve access to healthy foods.

The elderly population is the fastest growing sub-population in the United States. Roughly one in eight Americans were over the age of 65 in 1994 and it is estimated that by 2030 one in five Americans will be 65 or older (Hobbs FB, 1995). This population is at greater risk for chronic disease such as heart disease, stroke, diabetes and hypertension, all of which can be controlled with diet and exercise (U.S Department of Health and Human Services, 1990). The majority of U.S. Seniors live independently and are often self reliant for obtaining their daily meals. It has been shown that grocery shopping among Seniors is restricted to their immediate neighborhood and therefore proximity to grocery stores contributes to the well being of Seniors (Smith GC, 1991; Smith GC, 1995).

This study aims to (a) describe food shopping patterns for urban Seniors and (b) measure the influence of neighborhood and individual factors on servings per day of fresh fruits and vegetables. Because previous research in the United States demonstrates that a greater proportion of supermarkets are located in white areas (Morland KB, 2002), and that these types of food stores carry the greatest variety of produce (Morland KB, 2007), we hypothesized that Seniors living and shopping in black or racially mixed areas would consume fewer servings of fruits and vegetables and travel further to obtain produce. Finally, we aimed to measure the relative contribution of neighborhood and individual-level factors on the variation of fruit and vegetable intake among Seniors.

METHODS

A cross sectional study was conducted from September 2005 to August 2006 in which 314 participants were recruited from ten Brooklyn, NY senior centers. Senior center events coordinators scheduled daytime recruitments at each site and an interview-administered questionnaire was conducted in English or Spanish by trained research staff. Respondents were queried about how and what types of produce were usually purchased for their household, satisfaction with selection, cost and quality of produce, intake of produce, as well as location of the primary food store used to purchase fruits and vegetables.

Daily Intake of Fruits and Vegetables

Participants were asked about their intake of fruits and vegetables using the National Cancer Institute Fruit and Vegetable Screener. Participants reported their frequency and portion of intake of specific food groups over the past month including: 100% fruit juice, fruit, lettuce salad, French fries and other fried potatoes, other white potatoes, cooked dried beans, other vegetables, tomato sauce, vegetable soup and mixtures that include vegetables. The average daily fruit and vegetable Pyramid servings for each food group was calculated by multiplying the average daily frequencies by the number of Pyramid servings for specified portion sizes.

The average daily servings were coded based on the algorithm provided by the NCI: Fruit and Vegetables Screeners: Scoring the All-Day Screener.¹

Demographic Characteristics

Individuals were asked to report their gender, date of birth, race/ethnicity (black, white, Latino, Asian or other), and marital status (married/living with partner, divorced/separated, single, widowed or other).

Distance to Primary Food Store

The closest distance between place of residence and reported primary food store based on road networks were measured. Walking distances from home addresses to primary stores were calculated using the ArcMap distance measuring tool, and represent a one-way trip. For each measurement, the most direct walking path was chosen (since we did not collect this information) and distance was calculated in miles and rounded to the nearest tenth of a mile.

Produce Purchasing Behaviors and Influences

Individuals were asked to report if they had purchased any of the listed types of produce during the previous month. The list of 28 produce types were determined from a comprehensive survey of fresh produce available in neighboring areas (Morland KB, 2007). For reasons types of *produce were not purchased*, individuals were asked why those types were not purchased and selected from the following choices: do not like types; types not available; types too expensive; not familiar with types; and low quality of types. In addition, 'Other' is a combination of a positive response to any of the following response options: not in season; do not like to cook; receive nutrition from another source (i.e., vitamins, vegetable powders); and open-ended responses. Also, the category for 'Low quality for types' is a combination of either reporting yes to 'goes bad too quickly' or 'quality isn't good'. In addition, *for produce purchased*, using a 4-point Likert scale, individuals were asked to rate their satisfaction with the quality and price.

Neighborhood Racial Segregation

Addresses of home and primary food stores were address matched to street files then geocoded to a centroid using ArcMap then matched the 2000 U.S. defined census tract². Racial segregation was defined based on the proportion of total residents that were black Americans. The following categories of neighborhood racial segregation were created and used to classify 92 tracts where participants resided and shopped: predominately white, less than 20% black American; predominately black, greater than 80% black American; and racially mixed, 20%–80% black American (Massey and Denton 1993; Morland KB, 2002a). Dummy variables were created for residential areas (live in black, racially mixed, or white neighborhoods) and for the location of primary food store areas (shop in black, racially mixed, or white neighborhoods).

Statistical Analysis

Frequencies and means of individual and neighborhood variables were calculated describing the study population. Chi-square statistics were used to compare frequencies of items purchased, reasons for not purchasing, satisfaction with quality and cost, and distance to primary food store across race/ethnicity. Mixed models with a random intercept for each tract were used to estimate the associations of distance to primary food store, neighborhood type of residences and location of primary food store and individual level factors on servings per day of fruits and vegetables. The continuous outcome variable was the average daily servings based

¹<http://riskfactor.cancer.gov/diet/screeners/fruitveg/scoring/allday.html>

²ArcGIS v.9.2, ESRI, Redlands CA, 1999–2004

on the NCI Fruit and Vegetable Screener. Indicator variables were created for the following individual level factors: Race (Black, Latino and White); Gender (Male); Marital Status (Divorced; Single, Widowed and Married); where white, female and married were used as the reference. Age was calculated by subtracting the reported date of birth from the date of the interview, truncating to whole numbers. Age and distance were used as continuous variables.

Records were excluded if: (a) home or store address was not reported; (b) could not be geocoded; or (c) race was reported as 'Asian' or 'Other' (n=36). In addition, records were excluded from analysis if dietary information was not reported or responses were considered outliers (daily servings in the range of 14 – 36 servings per day) (n=21). All statistical analyses were conducted using SAS Systems, version 9.1.

RESULTS

The mean age for participants was 72 years and the majority of participants were women (81.3%) and either black American or Latinos (77.4%) (Table 1). Most Seniors were either divorced, single or widowed (82.1%) and only a third lived in a household containing more than one adult. Nearly half of the Seniors lived in racially-mixed areas, while one-quarter lived in predominantly black areas. Most of the participants reported that they did their own food shopping (90.7%) and the mean distance traveled to a primary food store was 0.8 miles (with only 17% of seniors reported they shopped within their census tract of residence). A large proportion of participants living in predominately white areas reported that they also shopped in white areas (89.2%), whereas only about half of residents of black or racially mixed areas reported shopping in areas of similar race composition to their census tract of residence. Mean daily servings of fruits and vegetables were close to five or just above five for all race/ethnicity groups. On average, individuals living in predominately white areas reported the lowest intake.

Seniors' produce purchasing patterns are presented in table 2 by race/ethnicity. The greatest variation in purchasing produce between the three race/ethnic groups were observed in the purchasing of eggplant, mushrooms, berries, green beans, corn, asparagus, squash, cauliflower and nectarines (where p-values were less than 0.05). Other produce such as oranges, broccoli, bananas, leafy greens, carrots, grapes and peas are reported to be purchased by over 80% of all Seniors during the past month. Over one third of all Seniors reported not purchasing certain produce because they did not like the taste. Less than 16% of all participants reported that the availability of any type of produce influenced their purchasing patterns. One third of Blacks reported that some produce types were too low in quality to be purchased. However, when asked about overall satisfactions with quality of *produce purchased*, most seniors of all race/ethnic groups reported that they were satisfied. Roughly 25% of all groups reported being not very satisfied or completely unsatisfied with the price of produce purchased. A greater proportion of Blacks travel more than one mile to obtain produce, followed by Latinos and Whites (32.3%, 22% and 13.8% respectively).

Table 3 describes the influence of neighborhood and store location neighborhood characteristics; distance traveled to primary food store and individual level factors on servings per day of fruits and vegetables among urban Seniors. A 0.03 increase in servings per day of fruits and vegetables was observed for each 10th of a mile traveled to Seniors' primary food store (mean difference (MD) = 0.029, standard error (SE)=0.135). Moreover, individuals living in Black or racially-mixed areas report higher intake of produce compared to seniors living in predominately White areas (MD Black=0.668, standard error (SE)=0.618; MD mixed=0.523, SE=0.437). Seniors shopping in black neighborhoods also had a higher intake of produce (MD=0.770, SE=0.595) than those shopping in predominately white areas. Nevertheless, Blacks and Latinos reported fewer servings of fruits and vegetables (MD Black = -0.827, SE=0.474; MD Latino = -1.334, SE=0.429). Age is also inversely associated with produce

intake, whereas being male and marital status other than married, were positively associated with intake. Only individual level factors (age, gender and race/ethnicity) were statistically significant ($\alpha < 0.05$).

DISCUSSION

This study illuminates a number of important factors about the delivery of foods to urban Seniors and how those Seniors navigate their local food environment to obtain healthy diets, measured here as intake of fruits and vegetables. For instance, 90% of the Seniors surveyed did their own shopping and traveled an average of 16 city blocks to get to the store. Furthermore, less than 20% of these Seniors shopped within their residential census tract. Secondly, while most Seniors do not shop within their residential census tract, nearly 90% of Seniors living in predominately white census tracts also shop in predominately white census tracts. Little differences between race/ethnic groups were observed in relation to satisfaction with the quality or price of produce purchased. However, black Americans more often reported quality to be a reason for not purchasing some produce types. Third, dietary intake of produce was high for these Seniors where average intakes were roughly five per day as recommended. Seniors' reported dietary intake is supported by their equally high responses of purchases of fresh produce during the previous month. Out of the 28 types of produce queried, 80% or more of all Seniors reported buying nearly half of all varieties. Finally, although we did observe fewer servings of produce among Blacks and Latinos, the associations between racial makeup of residential and primary food store locations and intake did not support our hypothesis, suggesting that variation in dietary intake by race/ethnicity cannot be fully explained by neighborhood availability of foods. However, these findings may be influenced by the fact that most Seniors do not shop within residential census tracts (the geographic boundary used to describe their local food environment in this study) and hence differential misclassification by neighborhood type may have influenced our results.

Our findings are limited by a number of factors. First, because Seniors were recruited from Senior Centers, this group of Seniors may be healthier and more mobile than other Seniors of similar ages. Furthermore, the majority of these Seniors do their own shopping and cooking (where 68% report eating breakfast at home and 90% report eating dinner at home most often). Any effect observed regarding reliance on a local environment for the purchase of produce may be underestimated with this group. Second, these Seniors may also be unique in the fact that the reported servings per day of fruits and vegetables were high regardless of race or residential neighborhood type. This finding due may in part be due to the large portion sizes reported. As people age, their portion sizes tend to get smaller. Yet for the participants in this study, the mean serving size was greater than one for almost all categories of foods queried in the Fruit and Vegetables Screener. However, since portion sizes do not vary by race or neighborhood of residence, differential bias has not likely occurred. Third, although we asked Seniors where they did their primary shopping, we did not directly measure what types of foods were available in those stores, nor did we collect data on the types of food stores located in residential areas. Fourth, we are limited by our observational study design where we sampled Seniors from Seniors Centers, which resulted in our study population being distributed over an area in close proximity to the Center. Our sampling method did not allow us to over-sample specific race/ethnic groups within certain neighborhood types. Hence, we had small cells for some race/ethnic groups within specific neighborhood types and therefore low statistical power to detect effects of each race/ethnic group living and shopping in each of the neighborhood types. Finally, models did not include produce satisfaction measures because models would not converge which limits our ability to make conclusions on how these factors would effect our results.

CONCLUSIONS

The few studies that have investigated competing factors that influence dietary choices (cost, food quality, convenience, etc.) have shown proximity to food to be an important factor for determining diet (U.S. House of Representatives Select Committee on Hunger, 1987; Mooney C, 1990; U.S. House of Representatives Select Committee on Hunger, 1992; Turrell G, 1996; Glanz K, 1998; Cade J, 1999). However, the causal mechanisms involved in how Seniors maintain a healthy diet are a complex interplay between many individual level and environmental factors. A better understanding of how different groups of people go about these activities of daily living has potential importance in a clinical setting where Seniors are at particular risk for diet related illness, but also has significance as we further develop public health programs to address disparities in access to healthy and affordable foods. Despite the fact that statistical significance was not reached, even in densely urban environments, this study found that for every mile traveled to a primary food store there is a 0.3 increase in servings of fruits and vegetables (6% of the recommended amount). Although small, the increase in servings per day associated with distance traveled to primary food stores suggest that fruits and vegetables are not locally available and presents an opportunity for policy makers and city planners to develop areas where healthy food options are convenient for consumers. Further research is needed to evaluate how Seniors, as well as other groups of people living in other urban and non-urban settings, navigate their built environments to meet their basic needs.

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Table 1

Characteristics of Brooklyn Study Population (n=257): 2005–2006

Mean age ^a ± SD ^b	72 ± 9.1
Women n (%)	209 (81.3)
Race/Ethnicity n (%)	
White	58 (22.6)
Black	99 (38.5)
Latino	100 (38.9)
Marital status n (%)	
Married/living with partner	45 (17.5)
Divorced/Separated	59 (23.0)
Single	35 (13.6)
Widow	117 (45.5)
Missing	1 (0.4)
More than one adult in household n (%)	92 (35.8)
Residential Neighborhood type n (%)	
Predominately black	62 (24.1)
Mixed	121 (47.1)
Predominately white	74 (28.8)
Mean distance (miles) to primary food store ± SD	0.83 ± 1.1
Primary shopper n (%)	
Self	23 (90.7)
Relative	19 (7.4)
Friend or Other	5 (2.0)
Shop in residential census tract n (%)	43 (16.7)
Shop in same type of census tract as residential n (%)	
Predominately Black	29 (46.8)
Racially Mixed	68 (56.2)
Predominately White	66 (89.2)
Mean daily servings ± SD	
Black	5.3 ± 2.4
White	5.4 ± 2.3
Latino	4.7 ± 2.1
Mean daily servings ± SD	
Predominately Black Residential	5.5 ± 2.6
Racially Mixed Residential	5.2 ± 2.2
Predominately White Residential	4.7 ± 2.1

^a
n=255^b
standard deviation

Table 2

Brooklyn Seniors' Produce Purchasing Behaviors by Race/Ethnicity (n=257): 2005–2006

	BLACK %	WHITE %	LATINO %	P-value
Purchased in Past Month, Produce Type, %				
Eggplant	44.4	63.8	77.0	<0.0001
Mushrooms	27.3	70.7	31.0	<0.0001
Berries	61.6	74.1	42.0	0.0002
Green Beans	85.9	79.3	63.0	0.0007
Corn	95.0	75.9	90.0	0.0011
Asparagus	39.4	62.1	62.0	0.0019
Squash	54.6	56.9	75.0	0.0063
Cauliflower	47.5	72.4	54.0	0.0091
Nectarines	45.5	58.6	64.0	0.0273
Peppers	83.8	84.5	94.0	0.0584
Figs	26.3	43.1	35.0	0.0893
Cherries	55.6	72.4	65.0	0.0939
Beets	56.6	63.8	70.0	0.1441
Carrots	90.9	93.1	84.0	0.1486
Potatoes	97.0	89.7	94.0	0.1679
Pears	68.7	81.0	76.0	0.2056
Peaches	59.6	72.4	68.0	0.2194
Leafy Greens	99.0	96.6	95.0	0.2653**
Plums	52.5	65.5	58.0	0.2810
Tomatoes	88.9	93.1	94.0	0.3879
Apples	84.9	86.2	90.0	0.5378
Melons	76.8	82.8	77.0	0.6342
Oranges	80.8	86.2	84.0	0.6610
Broccoli	89.9	86.2	87.0	0.7387
Bananas	89.9	93.1	92.0	0.7613
Grapes	85.9	90.0	88.0	0.7733
Peas	82.8	82.8	81.0	0.9346
Pomagranate	22.2	24.1	24.0	0.9446
Reason for Produce Types Not Purchased, %				
Do Not Like Type(s)	45.5	41.4	39.0	0.6494
Type(s) Not available	12.1	15.5	9.0	0.4622
Type(s) Too Expensive	24.2	15.5	31.0	0.0933
Not Familiar With Type(s)	16.2	13.8	7.0	0.5688
Low Quality for Type(s)	30.3	12.1	14.0	0.0038
Other	50.5	62.1	32.0	0.0006
Satisfaction with Quality of Produce Purchased, %				
Very Satisfied	41.4	51.7	63.0	0.0096
Somewhat Satisfied	47.5	39.7	28.0	0.0177
Not Very Satisfied	6.1	8.6	8.0	0.8032
Completely Unsatisfied	3.0	0.0	0.0	0.0887**
Satisfaction with Price of Produce Purchased, %				
Very Satisfied	23.2	13.8	28.0	0.1227
Somewhat Satisfied	48.5	58.6	44.0	0.2061
Not Very Satisfied	21.2	25.9	21.0	0.7445
Completely Unsatisfied	6.1	1.7	4.0	0.4253**
Distance Travel to Primary Food Store, %				
Less than 5 city blocks (lt 1/4 mile)	28.3	37.9	34.0	0.4326
6 – 9 city blocks (1/4 – 1/2 mile)	19.2	29.3	33.0	0.0796
10–14 city blocks (1/2 – 3/4 mile)	8.1	13.8	5.0	0.1507
15–20 city blocks (3/4 – 1 mile)	12.1	5.2	6.0	0.1843
More than 20 city blocks (gt 1 mile)	32.3	13.8	22.0	0.0265

* Categories are not mutually exclusive

** Some cell counts less than 5

Table 3

Associations between distance to primary food store, residential and food store location neighborhood type, individual characteristics and servings per day of fruits and vegetables: Brooklyn 2005–2006

	Mean Difference	Standard Error	P-value
Intercept	7.589	1.452	<0.0001
Distance to Primary Food Store (10th of a mile)	0.029	0.135	0.8301
Live in Black Neighborhood	0.668	0.618	0.2817
Live in Racially Mixed Neighborhood	0.523	0.437	0.2333
Shop in Black Neighborhood	0.770	0.595	0.1980
Shop in Racially Mixed Neighborhood	0.166	0.382	0.6643
Black	−0.827	0.474	0.0828
Latino	−1.334	0.429	0.0022
Male	1.022	0.386	0.0088
Age (years)	−0.036	0.018	0.0475
Divorced/Seperated	0.201	0.473	0.6712
Single	0.082	0.527	0.8768
Widow	0.192	0.440	0.6642

* Mixed models were used to calculate the linear effect of enviromental (live in black neighborhood; live in racially mixed neighborhood; shop in black neighborhood; show in racially mixed neighborhood) and individual level factors (race, ethnicity, age, marital status) on servings per day of fruits and vegetables.