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# Hispanic immigrant women's perspective on healthy foods and the New York City retail food environment: a mixed-method study

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## Abstract

Much has been written about the role of dietary acculturation in the epidemic of obesity among Hispanic immigrants in the United States. Yet little is known about the role of beliefs and preferences in immigrants' dietary practices and their relationship to the retail food environment in which the practices occur. We conducted a mixed-methods convergence study of these issues. Twenty eight foreign-born Hispanic adult women, recruited from families enrolled in a childhood asthma study and mainly living in New York City took part in 60–90 minute, semi-structured interviews regarding their dietary beliefs, preferences, and practices. The findings were then used to formulate hypotheses for analyses of food frequency questionnaire (FFQ) data collected from the 345 New York Hispanic women enrolled in the asthma study. Generalized estimating equations were used to determine whether characteristics of the retail food environment within 0.5 Km of the home predicted diet, adjusting for individual and neighborhood socio-demographic characteristics. In the interviews, healthy food was rarely discussed in terms of nutritional content. Instead, considerations of freshness, as indicated by time since harvest or slaughter and thus local sourcing; purity, as indicated by the absence of preservatives and processing; and naturalness, as indicated by chemical free farming practices, were the primary axes around which healthy food was defined. Quantitative results were consistent with the qualitative findings: 1) the presence of a farmers' market within the home neighborhood was associated with consumption of more total servings per day of fruit, vegetables, and juice, and 2) the presence of a farmers' market and/or a livestock market was associated with consumption of more servings per day of meat. Proximity to



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supermarkets or medium-sized grocery stores was not associated with consumption. The results suggest that the availability of fresh produce and meat from local farms may influence diet among Hispanic women in urban neighborhoods.

**Keywords**

Mixed method research; Dietary Acculturation; Neighborhood food environment; Hispanics; diet; USA; immigrants; women

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The epidemic of overweight and obesity in the United States has most severely affected racial and ethnic minority populations. Hispanics, along with Black Americans, and Native Americans, face higher risks of obesity than Caucasians (Flegal, Carroll, Ogden, & Curtin, 2010). Among Hispanics in the United States, first-generation immigrants have a lower body mass index (BMI) than second- and third-generation immigrants, and among first generation immigrants, longer duration of residence in the U.S. is associated with increased body size (Goel, McCarthy, Phillips, & Wee, 2004; Gordon-Larsen, Mullan Harris, Ward, & Popkin, 2003; Kaplan, Huguet, Newsom, & McFarland, 2004; Lauderdale & Rathouz, 2000; Park, Neckerman, Quinn, Weiss, & Rundle, 2008; Popkin & Udry, 1998). Thus a large body of literature on obesity among Hispanics in the US has focused on the effects of acculturation—the process of adopting the cultural norms, and practices of the host society (Gordon-Larsen, et al., 2003; Himmelgreen, et al., 2004; Sundquist & Winkleby, 2000). Immigrants to the US are thought to adapt to an obesogenic environment in which dietary and physical activity norms encourage a positive energy balance resulting in weight gain (Goel, et al., 2004; Gordon-Larsen, et al., 2003; Kaplan, et al., 2004; Lauderdale & Rathouz, 2000; Ulijaszek & Lofink, 2006). Consistent with acculturation theory, Hispanic immigrants have been shown to have healthier diets than their U.S.-born counterparts, and dietary quality tends to decline with increased years in the country and with measures of greater acculturation status (Ayala, Baquero, & Klinger, 2008).

In recent years, the significance of place in understanding the effects of acculturation has been recognized in a growing body of research describing how neighborhood characteristics shape obesity and dietary patterns among Hispanic immigrants (Morland, Diez Roux, & Wing, 2006; Osypuk, Diez Roux, Hadley, & Kandula, 2009; Park, et al., 2008; Reyes-Ortiz, Ju, Eschbach, Kuo, & Goodwin, 2009; Yeh, Viladrich, Bruning, & Roye, 2009). Environments influence human behavior and the behavioral actualization of culture is shaped in part by the setting in which it occurs: “Cultural factors may not act as independent confounders, but may be influenced by the local food environment” (Morland, et al., 2006, p. 337). Residence in areas with large numbers of immigrants, and among others from one’s own ethnic group, is likely to be associated with access to groceries and restaurants selling familiar home-country foods (D. O. Lee, 1995), has been linked to healthier diets (Osypuk, et al., 2009; Reyes-Ortiz, et al., 2009). It is theorized that such neighborhoods may provide both normative and material support for maintenance of home-country dietary patterns, and in effect, retard the process of dietary acculturation. Conversely, Yeh and colleagues (2009) suggest that neighborhood factors such as the availability and accessibility of retail food outlets shape the process of selective acculturation, in which some pre-immigration health-related behaviors are maintained while new behaviors are adopted.

While the idea that neighborhood food environments affect diet among Hispanics is beginning to be discussed in the acculturation literature, and researchers in public health and economics have put substantial effort into developing models and theories for how the food environment (also termed food access or food availability) influences shopping and consumption patterns, an underdeveloped component in both bodies of research has been the

role of individual food preference and beliefs (Booth, et al., 2001; Brug, Kremers, Lenthe, Ball, & Crawford, 2008; Robinson, 2008; Rose, Bodor, Hutchinson, & Swalm, 2010; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Most research on dietary acculturation has analyzed data on consumption patterns and has not studied the role of beliefs, tastes, and preferences (Ayala, et al., 2008). Within the acculturation literature, to our knowledge, only three small-scale qualitative studies on mixed groups of Hispanic immigrants (Cason, Nieto-Montenegro, & Chavez-Martinez, 2006; Gray, Cossman, Dodson, & Byrd, 2005; McArthur, Anguiano, & Nocetti, 2001) and one study on a group of Asian immigrants (Harrison, et al., 2005) have been previously conducted on the food beliefs and preferences of immigrants.

A similar gap exists in public health research on neighborhood food environment in general. In a recent review, Rose and colleagues (2010: p. 1170) identify the two dominant foci of the literature as being the documentation of "disparities between groups in their access to retail food outlets" and the examination of "the connection between the neighborhood environment" and dietary intakes or weight outcomes. A notably under-studied factor, even in the most multi-dimensional models used in these studies, is the role of individuals' food tastes and preferences. Theoretical models of food environment effects on diet usually cite tastes, beliefs, and preferences as central individual-level determinants of diet, but do not describe how these factors may link food access to dietary behaviors (Booth, et al., 2001; Story, Kaphingst, Robinson-O'Brien, & Glanz, 2008). Rose and colleagues (2010) explain that this factor is often poorly specified: research data on individual's actual preferences are rarely available, and measures such as age, race-ethnicity, and education are often used as proxy for likely preference.

Economic theory suggests that, given tastes and preferences, individuals seek to maximize their utility from food, subject to the constraints of the neighborhood food environment, competing time needs, income, food costs and costs of other needs (Rose, Bodor, Hutchinson, & Swalm, 2010). Studies of body size, diet and spatial access to supermarkets and produce markets assume that the presence of such outlets influences the subjective perception that healthy foods are available which, in turn, influences diet (Brug, Kremers, Lenthe, Ball, & Crawford, 2008). Objective measures of the availability of healthy foods and residents' perceptions of such availability may not be synonymous and may vary by population demographic characteristics (Brug, et al., 2008). The paucity of data on tastes and preferences represents, thus, a significant gap in the field's understanding of the effects of the food environment on dietary consumption in general and, more specifically, in understanding the role of the food environment in dietary acculturation. In an effort to address this challenge we conducted a mixed-methods study to better specify the role of Hispanic immigrants' beliefs about, and preferences for, healthy foods in linking food access to dietary patterns.

## Methodology- Data Collection and Analysis

We conducted a mixed-methods convergence study (Morgan, 1998) of Hispanic immigrants' dietary beliefs, preferences, and practices regarding healthy foods. Qualitative interviews were first conducted to collect information on beliefs and preferences regarding healthy foods. The findings from the qualitative data were then used to develop a set of hypotheses for quantitative analyses of associations between dietary intake data and neighborhood access to specific types of retail food outlets. A finding that dietary patterns were associated with neighborhood access to retail food outlets reflecting the women's stated preferences is taken as confirmatory of the qualitative findings (Morgan, 1998). This study was approved by the Columbia University IRB.

## Sample

Participants in the qualitative interviews were recruited from among the mothers or other female guardians (most often grandmothers) of children taking part in a study of risk factors for asthma, described extensively elsewhere (Jacobson, et al., 2008). In brief, 1,026 families recruited from 50 Head Start Centers, a federal program that provides education, health, and nutrition services to low-income children (age 3–5), in northern Manhattan, Bronx, and Brooklyn provided survey data on the child's asthma symptoms and risk factors. Of these, 547 families participated in a sub-study involving a home visit during which further questionnaire data were collected and environmental samples were taken. As part of the home visit protocol, the guardians of the children in the study were asked to complete a Study of Women's Health Across the Nation (SWAN) Food Frequency Questionnaire (FFQ); 355 female guardians, who self-reported their ethnicity as Hispanic, provided FFQ data. The Spanish version of the questionnaire, which has been validated in Hispanic populations (Block, Wakimoto, Jensen, Mandel, & Green, 2006), was administered to Hispanic respondents. Recruitment and data gathering occurred between November 2003 and August 2006. Height and weight data were gathered from the children but not from their guardians.

In 2007 we attempted to recruit 45 female Hispanic guardians from the asthma study population to take part in the qualitative study reported in this paper. Our goal was to recruit 15 immigrant women each from Mexico, Puerto Rico (P.R.) and the Dominican Republic (D.R). We successfully recruited and interviewed 14 women from Mexico and 14 from D.R., but only 4 women born in Puerto Rico. For a large proportion of the Puerto Rican women, the contact information provided to the asthma study at the time of their enrollment was no longer current by the time of our recruitment. Because of the small number of respondents, interviews of women born in P.R. were excluded from the qualitative analysis. Ten of the fourteen women of Mexican origin reported that they grew up in the "countryside"; only one reported being from a city. Seven out of the fourteen Dominican women reported that they are from the "countryside," though most of them appeared to have lived for at least some time in the capital city, Santo Domingo. Six reported Santo Domingo as their point of origin. Almost all of the women lived in high poverty neighborhoods in New York City.

The availability and mix of retail food outlets in New York City is influenced by city zoning policies controlling the placement of building and their size and usage, land use patterns, population density, and the presence of transit stops (Neckerman, et al., 2010; Rundle, et al., 2009). A neighborhood's average building height represents a convenient proxy for the combined density of population and commercial activities, and is associated with a number of more specific measures (e.g. population density, zoning, land use) that tend to vary together across neighborhoods in New York City. The home address for each woman from the asthma study population was geocoded using Geosupport software, and the average number of floors per building was calculated for her Census Tract using MapPLUTO tax lot data (New York City Department of City Planning, 2010). Women were then classified by place of birth and tertile groupings of average building height per their Census Tract of residence. Women were recruited from these nine cross-classified cells in the order in which they were enrolled into the original asthma study. Among the women born in the D.R., four were from high rise, five were from mid-rise and five were from low-rise Tracts. Among the women born in Mexico, five were from high rise, five from mid-rise and four from low-rise Tracts. The mean age of the women was 31 years old and on average they had 9 years of education.

## Data Collection

### Qualitative Data

All interviews, each lasting approximately 60 to 90 minutes, were conducted in Spanish according to the preference of the interviewees. The audio recordings of interviews were professionally transcribed and translated into English. The semi-structured interviews were designed to elicit respondents': 1) beliefs/values about diet, physical activity, and body size, 2) behaviors/practices around diet, physical activity and body size, and 3) views about whether and how neighborhood built environments they encounter in their neighborhoods influenced their dietary and physical activity patterns. This paper focuses on aspects of diet and the environment.

### Quantitative Data

**Individual-level Data—**Socio-demographic and food frequency questionnaire (FFQ) data for the Hispanic female guardians were collected at enrollment in the asthma study. 345 Hispanic female guardians of the children completed the FFQ and provided complete socio-demographic data. Based on the analyses of the qualitative interviews, FFQ data on total consumption of fruits, vegetables, and fruit juices combined and total servings of meat were analyzed.

**Neighborhood-level Data—**Home addresses were geo-coded using Geosupport software and neighborhood socio-demographic characteristics were measured using areal weighting for 0.5 Km radial buffers around each respondent's home. US Census 2000 Summary File 3 (SF3) data at the Block Group level were used to measure neighborhood socio-demographic characteristics including: proportion of population below the poverty line (proportion poverty), proportion Hispanic, and proportion of Spanish-speaking families that were linguistically isolated (families in which all members fourteen years and older have at least some difficulty speaking English). Spatial access to retail food outlets was defined as the presence or absence of outlets or the number of outlets within 0.5 Km from the home, a distance thought to be walkable for woman taking care of small children. Retail location data for 2005, purchased from Dun and Bradstreet, were used to determine the presence or absence of supermarkets and number of fruit and vegetable stores (small groceries selling produce and packaged goods), medium-sized grocery stores, and meat markets (butcher's shops selling meats slaughtered off-premises), using classification methods developed previously (Janevic, Borrell, Savitz, Herring, & Rundle, 2010; Rundle, et al., 2009). Data on locations of farmers' markets in 2006 were obtained from the NYC Coalition Against Hunger, Council on the Environment of NYC, and the Farmers' Market Federation of New York. Data on locations of livestock markets (markets selling small animals slaughtered and butchered on premises) in 2004 was obtained from the New York State Department of Agriculture and Markets. Retail outlet locations were geocoded using Geosupport.

## Data analysis

### Qualitative Analyses

The interview texts were examined for patterns, connections, similarities, or contrasting points. We developed a list of local categories of meaning, abstracting central concepts, identifying key terms and phrases, and exploring how these concepts and phrases function in each text. These categories were then synthesized into broader themes, and examined for commonality and contrasting patterns to develop a description of the phenomenon as experienced by the range interview subjects. We have indicated with the quotes anonymized identification (ID) numbers and country of origin (Mexico or Dominican Republic (DR)) for each informant.

### Quantitative Analyses

Generalized estimating equations (GEE) were used to predict the sum of servings of fruit, vegetables, and juice per day and the sum of servings of meat consumed per week. Data on total servings of fruit, vegetables, and juice were natural log transformed and data on total servings of meat were square root transformed to generate more normal data distributions. GEE models used the respondent's Community District as the clustering unit; Community Districts represent named neighborhoods in New York City such as Central Harlem or Washington Heights and their local Community Boards have influence over local development, zoning and licensing. Multivariable GEE modeling began with analyses of individual-level predictors of diet; evaluating Hispanic ethnicity, age, nativity, language spoken at home, current college enrollment, and employment outside the home. Analyses controlled for the total estimated calorie intake. Self-reported Hispanic ethnicity— Mexican, Dominican, Puerto Rican, or Other Hispanic—was used for statistical analyses. Variables reflecting neighborhood characteristics were then added to the models, including proportion of residents living in poverty, proportion of Hispanic residents, and proportion of Spanish-speaking households that are linguistically isolated. These variables were considered because of the literature showing that neighborhood poverty and racial/ethnic composition predict obesity and BMI in New York City (Park, et al., 2008; Rundle, et al., 2008). Proportion Hispanic and proportion linguistically isolated were highly co-linear; because prior analyses (Park, et al., 2008) suggested neighborhood linguistic isolation more strongly predicted BMI than proportion Hispanic, we focused on this variable. Retail food environment variables were then added to the GEE models that included the individual level and neighborhood demographic characteristic covariates described above. For models predicting the sum of servings of fruit, vegetables, and juice, the food environment predictors were supermarkets, fruit and vegetable markets, medium-size grocery stores, and farmers' markets. For models predicting servings of meat consumed, the food environment predictors were supermarkets, medium-size grocery stores, farmers' markets, livestock markets, and meat markets. Additional analyses (not shown) also controlled for whether or not the child had asthma and the child's BMI percentile; neither of these variables predicted dietary consumption or confounded the analyses. As parental obesity was not a focus of the original asthma study height and weight data were not collected from the mothers of the children.

## Results

Table 1 describes the socio-demographic characteristics, the neighborhood food environment and neighborhood poverty rate of the women included in the qualitative interviews. Quotes from the transcribed interviews used below include an ID number that can be found in Table 1.

## Qualitative Analyses

Scholars in recent years have critiqued western societies' reductionist understanding of the relationship between food and health (Dixon, 2009; Scrinis, 2008). The term "nutritionism" refers to this "reductive focus on nutrient composition as the primary means of evaluating the quality of foods and their relationship to bodily health" (Scrinis, 2008, p. 41), which has become "the dominant paradigm within nutrition science itself, and frames much professional- and government-endorsed dietary advice" (Scrinis, 2008, p. 39). In their conceptualizations of healthy foods, the immigrant women in our study tended to elide this nutritionistic paradigm. Whether through the Special Nutritional Program for Women, Infants and Children (WIC), a government assistance program which provides nutritional education and financial support for food purchases for low income pregnant or breast feeding mothers and their children, children's schools, or pediatricians, many of the

interviewed mothers had had some exposure to nutritional counseling and described efforts to alter their cooking and consumption habits in line with "what they say about not giving them so much salt, or so much sugar…" ID 25 (Mexico). But while weight control was understood to be necessary to achieving health, there was a clear taxonomic difference between this understanding and their conceptualizations about healthy foods. Respondents rarely discussed healthy food in terms of nutritional content (e.g., vitamins, proteins, fats), but discussed instead, particular qualities of food production and consumption that made food healthy. Nearly all focused on the concepts of purity and freshness, qualities said to be typical of the foods they ate in their countries of origin. These foods were, in turn, consistently described as healthier than the foods regularly available to them in the US.

> Well, I think that over there, people eat healthier… with the reason being that things are fresher. Here, you go to the meat market, you buy meat for two weeks and you don't know… There, every Sunday and you buy it there. ID 14 (DR)

> It's healthier in Mexico […] Because in Mexico everything is prepared fresh. If you go shopping for beef, for instance, they will have killed the animal within a short period […] If you want to fix some pumpkin, you go cut it from the plant and you'll be cooking it right away […] if you want some beef, you hear that so-and-so has fresh beef today … You go to buy it there […] And if you want, for example […] if you want some bread, the baker has just baked it. ID 22 (Mexico)

Pure foods were those produced "naturally," without the use of hormones or chemicals. As one respondent explained her experience in the Dominican Republic prior to emigration, "If you want plaintain, you get it right there and you know that it's natural, that nothing was put in it to make it grow faster. All that is there is natural." ID 7 (DR). Fresh foods were those having little temporal and spatial distance between production and consumption, embodied in recently harvested fruits and vegetables and newly slaughtered and butchered meats.

> In our countries we have food right there… For instance, my mother has everything in her backyard. She has peppers, tomatoes, eggplants, tallota [Dominican term for root vegetables such as yucca]… all the vegetables she needs… and the fruit! The bananas […] when the children want bananas: "let's go get some… there." Everything is fresh. ID 10 (DR)

> I think it's better over there because over there everything is more fresh… If you want to eat a fruit you cut it from the tree and that's how you eat it… And here you don't. Here…they cut the fruit when it's green and it ripens on the way… and when it gets here…it tastes different… I feel that it's better over there because over there if you want a piece of meat there are places over there where they'll say, "They're killing the animal right now…and a short while after…they're making the meat… To me…that's better because it's fresh. ID 24 (Mexico)

Women of rural origin were more likely to describe diets comprised of home-grown foods; those from urban settings tended to discuss locally-sourced foods. But the belief in the virtues of freshness and purity and those qualities as descriptors for the foods of the home country cut across national as well as urban/rural differences in the respondents' place of origin. There were no notable differences in the patterns of responses by national origin.

The views about healthy foods or healthful qualities of food expressed by the low-income immigrant women who make up our sample were congruent with the tastes and consumption preferences usually identified with wealthier and the least obese/overweight segments of the US population. The responses echoed current elite consumer trends: the "locavore" movement, which promotes (among other factors) the freshness of locally sourced foods, the organic foods movement, which promotes natural farming practices, and the "Slow Food" movement, which promotes a return to the production and use of traditional foods. While

most respondents regularly shopped in large supermarkets, using bodegas or corner markets only for incidental purchases of non-perishable items, they indicated a clear preference for farm-to-table foods: produce sold at farmers' markets, and meats sold at livestock markets which were the nearest replications of home country foods and retail venues.

Respondents reported using Farmers' markets, where "the people who sell fresh things come over" ID 28 (Mexico), whenever possible. One woman explained:

> Vegetables and things like that … practically fresh … They're not frozen… That's how they bring them … directly from the farm […] I think that fresh items would be healthier […] I don't know if it loses … uh … nutrition … or what … the food that's frozen, […] what's eaten that's natural …for me… in my opinion […] It's healthier. ID 8 (DR)

Similarly, nearly all respondents reported that they routinely buy poultry and (less often) other meats in *viveros*, livestock markets where poultry and small animals such as goats and rabbits can be purchased: "you choose which chicken you want … and they kill it there … and that's it … they give you the meat freshly killed." ID 17 (Mexico), This preference was, explained one respondent, despite the price difference: "Prices for chicken in the supermarket are low, but we don't like it […] Because the chicken was killed way in advance." ID 19 (Mexico).

While no respondent used the term "organic," many described home country food production practices in similar terms, using descriptors such as "natural" and "pure."

> Vegetables don't have so many… hmmm… pesticides… Also… they're foods that don't have preservatives… like here… ID 16 (Mexico).

> Because here, everything has vitamins, hormones. Not so over there … Food over there is better than here. Fruit here doesn't really taste like anything. Fish doesn't have any taste either here […] If you drink a glass of milk that has just been milked, you'll notice the difference right away. Why? Because over there they don't feed their cows with hormones. Over there it's pure grass […] it's not good, so many hormones and things […] they fatten the chickens with hormones and sooner or later that will harm the human body […] It's a very, very significant difference […] And it's not just me … A lot of people say it. That food, not just in Santo Domingo, in all of Latin America, is very different. Because they don't use hormones so much as they do here. ID 9 (DR)

Stored (refrigerated, frozen, canned, or otherwise processed) foods were assessed similarly: unhealthy because they are not fresh and because they contained "chemicals." As one respondent explained:

> Over there, for instance, Dad will grow the corn, then we take it off the cob. […] It's much more nutritious because you're making it right there, within short while … You do everything within a single day … it's not something that you have … you go, buy it ready-made and then come to put it in the fridge again […] [such food] contains a lot of […] a lot of chemicals, or something of the sort. […] the fridge is also something that's plugged in and it contains gas as well […] I often won't give my children things that I see are more than three days old. ID 22 (Mexico)

Several respondents attributed weight gain and minor illnesses to increased consumption of processed foods in the U.S.: "When they get here, they tend to gain a lot of weight for that reason." ID 21 (Mexico). Another explained:" I noticed it in my siblings and I […] we

didn't get sick as often as here … I see they get sick here […] Maybe it's also due to the fact that in Mexico all products are more natural than here." ID 16 (Mexico).

Slow Food emphasizes for Western industrialized nations "the need to decelerate the food consumption so that alternative forms of taste can be (re)acquired" (Murdoch & Miele, 2004, p. 241). Our respondents appeared to already hold such tastes considered "alternative" in the U.S., developed through the diets of their home countries in the years prior to immigration. They preferred foods from farmer's markets and livestock markets not only because they deemed them healthier but because they taste noticeably better. A respondent described fruit and vegetables "from the farm" as "tastier and sweeter," and explained "I've also have compared the beans from the supermarket […] and they're not the same." ID 28 (Mexico). Another described supermarket vegetables: "I buy these eggplants to make them into a stew, with coconut and they were fofas … Do you know that word, fofo? […] They were flabby, like void … empty [… ] my husband said: 'This doesn't taste like anything.'" ID 9 (DR). Stored foods were also said to be inferior in flavor: "if it stays like that for a long time… the flavor isn't the same." Another explained, "It's like they have a different taste […] 'different' flavor […] I don't know … they must add some other things so that it doesn't go bad…" ID 17 (Mexico).

But while our respondents share the tastes and consumption preferences associated with the "Whole Foods" segment of the US population, they do not share a similar food environment. For wealthier Americans, the food retail environment has already begun to move away from "standardized foods typified by supermarkets" (Phillips, 2006, p. 41), to include locally sourced foods with an emphasis on freshness, organic production practices, and direct farm-to-table access: "food from somewhere" rather than "food from nowhere" (Campbell, 2009). While our respondents' stated food preferences match these food trends, such retail practices serve a premium niche market (Guptill & Wilkins, 2002; Markowitz, 2008) and have not penetrated low-income urban neighborhoods such as those in which the respondents live.

The respondents' diets appeared to be undergoing an opposite transformation, acquiring the tastes and patterns of consumption prevalent in the obesogenic environment of the US. One respondent described the shift:

> What happens is that there [in the DR], I would go out in the morning, and I would go to the local market, and I would go to a man that sold fruit, that would…would be in front of my house… In my country, there was everything, and I came here, and I said, "What's this?"… It's like, I don't know… It's like, maybe it's because here, people live a life that's way too fast… Let's go to McDonalds because it's fast. Just one trip in the car and we've got something to eat. ID 1 (DR)

Two major factors were cited most commonly by the respondents as deterrents to their ability to match their consumption practices to their stated tastes and preferences: economics and the environment. Whereas in the U.S., poverty-associated diets are marked by high consumption of energy-dense processed foods and fast-food restaurant meals, several respondents noted that in their countries of origin, such diets were available only to the wealthy: "It's different there because yes, there is that kind of food…for those who have money… But for us poor people…that don't have any… We aren't going to be able to eat like rich people over there…" ID 24 (Mexico). Thus, as another respondent explained: "over there the economy is not like here… So the food is—I don't know how to put it—it's poorer, perhaps healthier." ID 27 (Mexico). The economics of food in the US, however, functions in reverse:

> To eat nutritious here is harder and more expensive […] You buy fruit and it's more expensive. You buy canned goods and they're 99 cents. […] The frozen ones] are cheaper […] good nutrition is more expensive. ID 4 (DR)

In direct contrast to the food environments of their countries of origin, moreover, those of the low-income urban neighborhoods in which they now live supported the consumption of "unhealthy" foods : "…here we have McDonald's, Pizza, Chinese… and these foods, you know… they are things that are almost more temptations than food." ID 27 (Mexico). Maintaining their pre-immigration dietary habits of fresh foods free of processed foods was, therefore, a challenging endeavor. "it's difficult because here. At every corner you have a store that sells food that's bad for them, in excess…" ID 16 (Mexico). The result, lamented one respondent, was the development of new habits of consumption that contradict their beliefs and preferences for foods they consider healthy. "the children are accustomed to eating lots of things like canned food… pizza… Food that's not made at home […] it's not good food. It just makes you fat, but it doesn't nourish you." ID 24 (Mexico).

For most respondents, the consumption of junk food, sodas, fast foods, and the practice of snacking were newly acquired habits developed post-migration.

> I don't know if it was because we were poor, or because we were in the countryside that we weren't familiar with snacks. We would eat our meals, and nobody would say 'I don't eat this,' because that was it. Mom would cook, she would put the food on the table and we all ate it, nobody had anything to say… If you didn't eat it, I don't know what you would eat… perhaps you had to eat the breeze. ID 10 (DR)

While the interviews were conducted in Spanish, many of the foods and food practices the respondents deemed unhealthy were notably indicated in English, or more precisely, in Hispanicized English forms. For example, respondents generally referred to frozen foods by the term "frizados," a manipulation of the English term "frozen," suggesting that such storage practices are marked as a non-traditional, acculturative phenomenon. Similarly, the practice of between-meals eating, which most respondents reported being a post-immigration practice, was consistently indicated by the English term "snack" or its Hispanicized form, "esnack."

Across national and urban/rural differences in place of origin, respondents overwhelmingly expressed a strong preference for fresh, "naturally" produced foods—fruits and vegetables "from the field" and freshly slaughtered meats—and expressed aversion to stored, packaged, and processed foods. Their partiality for the former and distrust of the latter were based on taste as well as perceived health benefits, and appeared to have been developed through the diets of their home countries prior to immigration to the US. The respondents consistently reported using fresh market venues that most nearly replicated the local markets of their countries of origin: seasonal farmers' markets whenever they were available, and the many livestock markets scattered throughout the city, whenever it was possible to get to them. But their preference for the fresh, natural, local foods, identified as healthy foods, appear to be unsupported by the food environments of the low-income urban settings in which they now live.

## Quantitative analyses

As shown in Table 2, most respondents were of Mexican origin, spoke Spanish at home, and were not employed; they reported a low consumption of fruits, vegetables, and juices per day (mean 2.8 servings) and about two thirds had a supermarket in their neighborhood. Table 3 provides results from multivariable models on associations between individual-level characteristics and consumption of total servings of fruit, vegetables, and juice and servings of meat. Compared with women reporting their ethnicity as Mexican, those reporting Dominican ethnicity ate significantly more total servings of fruit, vegetables, and juice per day; however ethnicity was not associated with servings of meat consumed. Compared with those not attending college, those attending college reported a higher consumption of fruit,

vegetables and juice, a difference that approached statistical significance (p=0.08). Meat consumption was lower among older respondents.

Based on the findings regarding preferences and beliefs, for our confirmatory analyses we hypothesized that access to farmers' markets would be associated with increased consumed servings of fruit, vegetable, and juice and that consumption would not be associated with the presence of supermarkets, medium-sized grocery stores, and fruit and vegetable markets. We also hypothesized that servings of meat consumed would be associated with access to farmers' markets and livestock markets, which sell fresh meat, but not with the presence of supermarkets, medium-sized grocery stores or meat markets. As shown by the model beta coefficients in table 4, after adjustment for the individual level covariates included in table 3, our findings were consistent with our hypotheses. Placing the beta coefficients in context, on average, respondents with a farmers' market in their neighborhood consumed 0.26 more combined servings of fruit, vegetables and juices per day ($p<0.001$) than respondents who did not have a farmers market in their neighborhood. Similarly, respondents with a farmers' market and/or a livestock market in their neighborhood consumed 0.15 more servings of meat per day (p=0.01) than respondents who did not have such a retail outlet in their neighborhoods. In addition, higher neighborhood linguistic isolation was significantly positively associated with consumption of fruit, vegetables and juice per day, and higher neighborhood poverty was significantly negatively associated with consumption of fruit, vegetables and juice per day. Neither neighborhood percent poverty nor linguistic isolation predicted meat consumption and these variables were dropped from the final model predicting meat consumption.

## Discussion

Hispanic immigrant women interviewed for this study identified a strong preference for fresh foods—recently harvested produce and freshly killed meats—and expressed strong objections to stored and packaged foods. Freshness, as indicated by immediacy of consumption after harvest or slaughter and thus local sourcing; purity, as indicated by the absence of preservatives and processing; and naturalness, as indicated by organic farming practices, were the primary axes around which the immigrant women in this study formulated their notions of healthy food. Similar findings have been reported previously in three qualitative studies on mixed groups of Hispanic immigrants (Cason, et al., 2006; Gray, et al., 2005; McArthur, et al., 2001) and a group of Asian immigrants (Harrison, et al., 2005). These preferences were confirmed in the quantitative analyses associating spatial access to different retail outlets with fruit and vegetable and meat consumption patterns. The presence of farmers' markets was associated with total consumption of fruits, vegetables and juices and the presence of famers' markets and livestock markets was associated with consumption of meats. These results are consistent with Rose's food access model (2010) in which food preferences link neighborhood food access to food purchasing. Our analyses show that Hispanic immigrants have dietary preferences and beliefs regarding healthy foods that reflect the food environment experienced in their countries of origin. These beliefs and preferences shape their current shopping preferences, but the actualization of such preferences and beliefs is constrained by the food environments in which they now live. These results suggest that dietary preferences and tastes represent a pivotal construct in a framework integrating theories of dietary acculturation, urban planning, and economic theories to explain how neighborhood food environments affect dietary patterns among immigrants.

Similar to much of the research on neighborhood health effects, the quantitative effect sizes are modest. It is worth noting, however, that the estimated differences in consumption are likely to understate the true differences in diet associated with differences in spatial access.

Measurement error in both the FFQ data and the neighborhood access data is expected to bias the results towards the null and cause underestimates of the effects of access. Although the SWAN questionnaire was developed to include food items from multiple Hispanic populations and has among the strongest validity statistics of available Hispanic FFQs, there is some error in dietary estimation from this instrument (Block, et al., 2006). Error in the neighborhood access measures may result from unmeasured heterogeneity in farmers markets' hours or months of operation and in the availability of fresh meat for sale at the markets.

## Policy Implications

The women in this study, recruited from areas of New York City with high obesity rates, reported low consumption of fruits, juices, and vegetables despite the fact that most lived near a supermarket. Because they offer a wider range of healthy foods at lower costs than smaller stores, supermarkets are considered an important source of affordable and nutritious foods and have been a prime focus of policy efforts to promote healthy eating (Eisenhauer, 2001; Laraia, Siega-Riz, Kaufman, & Jones, 2004; Liu, Wilson, Qi, & Ying, 2007). While food environments with greater variety of affordable healthy food options are thought to lead to healthier food choices (Morland, et al., 2006) and lower risk of obesity (Rundle, et al., 2009), access to supermarkets remain limited in many low-income and minority communities (Morland, Wing, & Diez Roux, 2002; Smoyer-Tomic & Amrhein, 2006). Under the Food Retail Expansion to Promote Health (FRESH) initiative, NYC has made changes to zoning and construction regulations and created tax incentives to encourage the development of new supermarkets in neighborhoods that currently lack adequate access to healthy foods (The City of New York, 2009). While such measures are positive steps, our results suggest that they may not fully address the needs and preferences of Hispanic immigrants. Indeed, while "supermarkets have become the most obvious solution to food access issues, they are often neither the only solution nor the best solution" (Eisenhauer, 2001, p. 131). Given the epidemic of overweight and obesity in communities throughout the nation, including those areas rich with supermarkets, it may be that such interventions aim too low. Designed to recalibrate disparities, they ultimately aim only to bring poor neighborhoods on par with normative middle-class American neighborhoods where supermarkets are common but overweight and obesity are also quite prevalent.

Our findings suggest the need for interventions that remove environmental and economic barriers such as availability and cost that prevent immigrants' embedded healthy tastes and preferences from being actualized and thus maintained. Increased development of direct marketing programs such as farmers' markets and community-supported agriculture (CSA), and expansion of community gardens may be indicated. Also, current approaches to direct market programs may need modification. CSA programs which typically require up-front payment may need to be modified to allow payment by food stamps and WIC vouchers. Both farmers' markets and CSA programs may, additionally, benefit from a reconsideration of their menus of products. The availability of traditional foods has been linked to the maintenance of traditional diets (Cason, et al., 2006; Gray, et al., 2005; Satia-Abouta, 2003). Targeted production and marketing of a wider variety of produce, including specific produce commonly used in ethnic cuisines, may increase profitability for farmers and further encourage fresh market usage by immigrant consumers. Finally, while increased proximity and financial access to farm-to-table programs may enable immigrant households to more easily obtain the necessary ingredients for preparing healthy meals, the disproportionate time barrier low-income families face in actualizing such shopping and cooking practices cannot be discounted (Rose, 2007). Measures to improve access to healthy and affordable convenience foods or prepared meals should also be considered (Neff, Palmer, McKenzie, & Lawrence, 2009; Rose, 2007).

Finally, individual-level interventions that aim to shape consumption behavior in immigrant populations may be more effective if they build upon existing knowledge and beliefs, incorporating the ideas outlined above about freshness, purity, and naturalness, rather than operating exclusively within the narrow frame of nutritionism. Nutrition counseling provided by schools, physicians, or social workers might thus include encouragement to try farmers' markets or CSA programs. Individual-level interventions should also include the acknowledgement of an embedded tradition of healthy food beliefs and practices that immigrants often bring from their countries of origin, and encourage the retention of the best elements of those practices. As Lee and colleagues (2002) have shown about the comprehensive national campaign to conserve native local foods and promote the retention of the vegetable-centered tradition of Korean diet, such efforts can result in positive health effects.

Research Highlights

- Hispanic immigrants in NYC rarely discussed healthy food in terms of nutritional content
- They equate healthy food with freshness, local sourcing, and organic farming methods, said to be typical of home-country foods
- This healthy food preference is not supported by the food environment of the low-income urban settings in which they live.
- Respondents, thus, distrust supermarkets and grocery stores and prefer famers' markets and live animal markets
- Higher consumption of fruits, vegetables and juices was associated with having a farmers market in the neighborhood.

Research Highlights

- Hispanic immigrants rarely discussed healthy food in terms of nutritional content
- Healthy food was equated with freshness, local sourcing, and organic farming methods
- Respondents distrusted food from supermarkets and grocery stores
- Respondents preferred to shop at farmers' markets and live animal markets
- Assess to farmers' markets and live animal markets predicted dietary consumption

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**Table 1**

Selected characteristics of the subjects taking part in the qualitative interviews

| ID | Place of Birth | Rural/ Urban Origins | Years of Education | Language Spoken at Home | Presence of supermarket, famer's market or livestock market in the neighborhood[1] | Neighborhood poverty rate[2] |
|---|---|---|---|---|---|---|
| 1 | Dominican | Urban | 16 | Spanish | FM, LM | 28% |
| 2 | Dominican | Urban | 12 | Unknown | None | 40% |
| 3 | Dominican | Urban | 16 | English | None | 42% |
| 4 | Dominican | Rural | 12 | Spanish | None | 35% |
| 5 | Dominican | Rural | 6 | Spanish | FM | 48% |
| 6 | Dominican | Rural | 16 | Spanish | None | 33% |
| 7 | Dominican | Urban | 12 | Spanish | None | 47% |
| 8 | Dominican | Rural | 12 | Spanish | None | 48% |
| 9 | Dominican | Rural | 10 | Spanish | SM | 35% |
| 10 | Dominican | Rural | 14 | Spanish | SM | 33% |
| 11 | Dominican | Urban | 12 | Spanish | SM, LM | 45% |
| 12 | Dominican | Urban | 14 | Spanish | FM | 31% |
| 13 | Dominican | Rural | 4 | Spanish & English | SM, FM | 35% |
| 14 | Dominican | Not reported | 12 | Spanish | SM, FM, LM | 25% |
| 15 | Mexico | Rural | 4 | Spanish | SM, FM | 43% |
| 16 | Mexico | Rural | 11 | Spanish | SM, FM, LM | 44% |
| 17 | Mexico | Rural | 3 | Spanish | SM, LM | 40% |
| 18 | Mexico | Rural | 9 | Spanish | None | 34% |
| 19 | Mexico | Not reported | 2 | Spanish | SM | 34% |
| 20 | Mexico | Rural | 12 | Spanish | FM | 45% |
| 21 | Mexico | City | 7 | Spanish | SM | 35% |
| 22 | Mexico | Rural | 4 | Spanish | SM, FM, LM | 43% |
| 23 | Mexico | Rural | 6 | Spanish | SM, LM | 36% |
| 24 | Mexico | Rural | 6 | Spanish | None | 47% |
| 25 | Mexico | Rural | 6 | Spanish | SM, LM | 42% |
| 26 | Mexico | Rural | 6 | Spanish | SM, LM | 42% |

| ID | Place of Birth | Rural/ Urban Origins | Years of Education | Language Spoken at Home | Presence of supermarket, famer's market or livestock market in the neighborhood[1] | Neighborhood poverty rate[2] |
|---|---|---|---|---|---|---|
| 27 | Mexico | Not reported | 12 | Spanish | None | 41% |
| 28 | Mexico | Not reported | 6 | Spanish | SM, FM, LM | 45% |

[1] Presence of a supermarket (SM), farmers' market (FM) or livestock market (LM) within 0.5 Km of the respondent's home address assessed as described in the methods section using data from Dun and Bradstreet, NYC Coalition Against Hunger, Council on the Environment of NYC, and the Farmers' Market Federation of New York New York State Department of Agriculture and Markets.

[2] Assessed within 0.5 Km of the respondent's home address using US Census 2000 data as described in the methods.

## Table 2

Descriptive statistics of the full study population: Hispanic women with children in Head Start.

| **Categorical individual level variables** | **N (%)**<br>**Total sample size = 345** |
|---|---|
| Hispanic Ethnicity | |
| Mexican | 141 (41%) |
| Dominican | 97 (28%) |
| Puerto Rican | 41 (12%) |
| Other Hispanic | 66 (19%) |
| Currently attending college | |
| No | 261 (76%) |
| Yes | 84 (24%) |
| Work status | |
| Not-Employed | 261 (76%) |
| Employed | 84 (24%) |
| Language at Home | |
| English | 83 (24%) |
| Spanish | 262 (76%) |
| Continuous individual level variables | Mean, median, (standard deviation) |
| Years of education | Mean 10.45, median 12, (3.69) |
| Age | Mean 32.35, median 31.22 (7.42) |
| Servings of fruit, vegetables and juice per day | Mean 2.81, median 2.70 (1.19) |
| Servings of meat per week | Mean 9.96, median 8.50 (6.57) |
| Categorical neighborhood level variables | |
| Presence of a supermarket | 217 (63%) |
| Presence of a farmers market | 118 (34%) |
| Presence of a livestock market | 93 (27%) |
| Continuous neighborhood level variables | Mean, median, (Standard Deviation) |
| Number of fruit and vegetable markets | Mean 2.15, median 2.00, (2.03) |
| Number of medium size grocery stores | Mean 2.68, median 2.00, (2.26) |
| Number of meat markets | Mean 2.78, median 2.00, (2.18) |
| Proportion of residents living in poverty | Mean 0.39, median 0.40, (0.08) |
| Proportion of Spanish speaking families that are linguistically isolated (no one 14 or older speaks English without difficulty) | Mean 0.36, median 0.38, (0.05) |

## Table 3

Associations between socio-demographic variables and dietary consumption.

| | Servings of fruit, vegetables and juices[1] | | Servings of meat[2] | |
|---|---|---|---|---|
| **Individual level predictor variables** | **Beta coefficient** | **P-value** | **Beta coefficient** | **P-value** |
| Hispanic Ethnicity | | | | |
| Mexican | Ref | | Ref | |
| Dominican | 0.23 | p<0.001 | 0.05 | p=0.63 |
| Puerto Rican | −0.15 | p=0.21 | 0.11 | p=0.43 |
| Other Hispanic | 0.05 | p=0.49 | −0.06 | p=0.67 |
| Currently attending college | | | | |
| No | Ref | | Ref | |
| Yes | 0.11 | p=0.08 | −0.12 | p=0.14 |
| Work status | | | | |
| Not-Employed | Ref | | Ref | |
| Employed | 0.04 | p=0.44 | 0.13 | p=0.07 |
| Language at Home | | | | |
| Spanish | Ref | | Ref | |
| English | 0.05 | p=0.51 | 0.02 | p=0.87 |
| Years of school (per year) | −0.01 | p=0.23 | −0.01 | p=0.21 |
| Age (per year) | 0.004 | p=0.27 | −0.02 | p <0.001 |

[1]Servings per day of fruit, vegetables and fruit juice were summed and natural log transformed to produce a normal distribution and the resulting variable served as the dependent variable in GEE analyses. Reported beta coefficients are from a single multivariable model that included each of the predictor variables and the reported beta coefficients are mutually adjusted for other variables in the table and total consumed calories.

[2]Servings of meat products per week were summed and square root transformed to produce a normal distribution and the resulting variable served as the dependent variable in GEE analyses. Reported beta coefficients are from a single multivariable model that included each of the predictor variables and the reported beta coefficients are mutually adjusted for other variables in the table and total consumed calories.

**Table 4**

Associations between neighborhood access to food retail outlets and dietary consumption.

| | Servings of fruit, vegetables and juices[1] | | | Servings of meat[2] | |
|---|---|---|---|---|---|
| **Food environment predictor variables** | **Beta coefficient** | **P-value** | **Food environment predictor variables** | **Beta coefficient** | **P- value** |
| Presence of a supermarket | | | Presence of a supermarket | | |
| No | Ref | | No | −0.11 | p=0.20 |
| Yes | −0.01 | p=0.86 | Yes | | |
| Medium size grocery stores (per store) | −0.01 | p=0.28 | Medium size grocery stores (per store) | 0.02 | p=0.26 |
| Fruit and vegetable markets (per market) | −0.01 | p=0.55 | Meat markets (per market) | −0.02 | p=0.31 |
| Presence of a farmers' market | | | Presence of a farmers' market or livestock market | | |
| No | Ref | | No | Ref | |
| Yes | 0.10 | p<0.001 | Yes | 0.19 | p=0.01 |

[1] Servings per day of fruit, vegetables and fruit juice were summed and natural log transformed to produce a normal distribution and the resulting variable served as the dependent variable in GEE analyses. Reported beta coefficients are from a single multivariable model that included each of the food retail predictor variables, and further adjusted for the individual level variables in table 3, total consumed calories and neighborhood linguistic isolation and poverty rate.

[2] Servings of meat products per week were summed and square root transformed to produce a normal distribution and the resulting variable served as the dependent variable in GEE analyses. Reported beta coefficients are from a single multivariable model that include each of the food retail predictor variables, and further adjusted for the individual level variables in table 3, and total consumed calories.