Out of the Desert, into the Swamp?

Spatial Assimilation and Exposure to Food Environments among Hispanics

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Abstract

One of the significant demographic shifts in the U.S. in recent decades has been the growth, diversification, and geographic dispersion of the Hispanic population. In this paper, we ask how the spatial dispersion and residential integration of Hispanics is related to their food environments. We find that Hispanics who live in more integrated, middle-income neighborhoods, and those in new destinations, are less likely to live in close proximity to "Hispanic" food outlets and grocery stores/supermarkets, but are also more likely to live in a location with a lower density of fast food restaurants and convenience stores. On balance, however, the ratio of fast food/convenience stores to grocery/supermarkets is greater in more integrated and affluent neighborhoods. Overall, the results suggest that as Hispanics become more spatially and socially integrated, they become more likely to live in residential neighborhoods that contain fewer stores and which are spatially separate from business districts.

Extended Abstract

One of the greatest demographic shifts in the U.S. over the last few decades has been the growth, diversification, and geographic dispersion of the Hispanic population (Lichter and Johnson 2009). Most Hispanics still reside in traditional areas of residence, or U.S. states such as Texas and California and metropolitan areas such as Houston and Los Angeles, but the last few decades have also seen increased Hispanic migration to places that traditionally have had very small Hispanic populations (Fry 2008). This phenomenon has involved regional shifts of the Hispanic population to new destination states, metropolitan areas, and small towns and rural areas (Lichter and Johnson 2006). Additionally, some U.S.-born Hispanics have begun to move into more racially-integrated, middle-income neighborhoods (Iceland and Scopilliti 2008; Iceland and Nelson 2008).

In this paper, we ask how the spatial dispersion and residential integration of Hispanics is related to their food environments. We specifically examine the extent to which Hispanics have access to nearby supermarkets and specialty Latino food outlets (i.e., the extent to which they live in "food deserts" and "ethnic food deserts"), and the extent to which they live in places that are flooded with unhealthy food options (i.e., "food swamps"). Past research suggests that as Hispanics spend more time and generations in the United States, they move into more integrated (Iceland and Scopilliti 2008; Iceland and Nelson 2008) and higher income neighborhoods (South, Crowder and Chavez 2005; South, Crowder and Pais 2008). Although evidence is mixed (Lichter et al 2010; Hall 2013), some research also suggests that Hispanics in new destinations tend to live in more integrated, lower-poverty neighborhoods than those living in established destinations (Park and Iceland 2011; Frank and Akresh 2016). However, less is known about how the spatial assimilation of Hispanics is related to food environments.

Food environments are important in part because local accessibility to stores and restaurants may shape diet and diet-related health outcomes (Walker, Keane and Burke 2010; Chen, Jaenicke and Volpe 2016). Hispanics are at particularly high risk for obesity and diet-related chronic health conditions (Ogden et al. 2014; Geiss et al 2014; Menke et al. 2015), and diet-related health conditions such as obesity worsen for Hispanics with increasing time and generations in the United States (Creighton, et al. 2012; Antecol and Bedard 2016; Goel et al 2004). Although the causal effect of food environments on diet among Hispanics remains unclear (Caspi et al. 2012), spatial assimilation into neighborhoods with greater accessibility to healthy food options may protect Hispanics from negative health assimilation. On the other hand, if spatial assimilation is associated with less access to outlets that sell traditional Latino foods and more access to fast-food restaurants and convenience stores, then Latino's spatial assimilation may actually contribute to unhealthy dietary acculturation and weight gain. This possibility would be consistent with other research showing positive correlations between the percentage immigrant in a neighborhood and healthy eating (e.g., Park et al 2011; Osypuk et al, 2009).

Access to food environments may also provide insights about Hispanics' position within the spatial hierarchies within American communities. According to place stratification theory, people with the highest status tend to be sorted into environments with the greatest access to amenities, including a variety of food outlets and grocery stores. In general, residents of low income or ethnic minority neighborhoods have disproportionately poor access to healthy food outlets and easy access to unhealthy outlets (Powell, Chaloupka, and Bao 2007). Most studies identify predominantly white neighborhoods as having the best quality food environments (e.g. good supermarket access and less fast food or convenience store access) and black neighborhoods as having the worst, while Hispanic neighborhoods are inconsistently placed

somewhere in the middle (Lisabeth, et al. 2010). Predominantly-Hispanic tracts have a higher count of small grocery stores than white or black tracts, but more convenience stores and fast food restaurants than white neighborhoods (Zenk et al 2009). Access to food outlets is important for quality of life because people must eat every day. If it takes considerable time to find and purchase desirable foods, or if people have less selection than they prefer, then this could significantly raise the daily complications of putting healthy and palatable food on the table. For Latino immigrants, having access to traditional Latino foods may be an important part of maintaining and reenacting cultural traditions and ethnic roots.

As just discussed, some work has focused on how food environments differ across major racial and ethnic groups. However, it remains unclear how they vary among Hispanics. In this paper, we explore how food environments are related to multiple indicators of Hispanic's spatial and social integration, namely (1) residence in established, "new" and "emerging" Hispanic destination counties; (2) the level of residential segregation from non-Hispanics within the county, (3) the average degree of U.S. experience in their community, and (4) the level of affluence in their neighborhood. Results provide insights about how Hispanic's food environments are likely to change as this group continues to disperse to new destinations and to more integrated and middle-class residential neighborhoods.

Data Sources

We analyzed data on U.S. counties, census tracts, and blockgroups to explore how the characteristics of the residents and the location of a tract is related to the local food environment. Demographic data on blockgroups, tracts, and counties were taken from the 2008-2012 American Community Survey. Metropolitan and non-metropolitan distinctions came from the

USDA's 2013 urban rural continuum. Our sample is restricted to 38,017 tracts that are located in counties where Hispanics made up at least 5% of the population with at least 500 Hispanics in 2010. All analyses are weighted by the number of Hispanics living in the tract, thereby giving greater weight to tracts that contain larger numbers of Hispanics.

To measure food environments, we relied on the 2010 InfoGroup business database. These data provide nationwide geographic coverage of store/restaurant coordinates in the United States, which we geocoded to blockgroup boundaries. We followed the data cleaning steps described by Jones and colleagues (2017) to reduce the problems of mis-classification, geocoding accuracy, and business duplication problems that are common to business list data sources. Infogroup data provides the name of each business in its database as well as its Standard Industrial Classification (SIC) code. We relied on the six-digit SIC codes to classify stores and restaurants, and supplemented the classification with store name lists. We used SIC codes and chain name lists according to convention (Jones et al 2017) to classify grocery stores (includes supercenters like Walmart), fast food, and convenience stores (includes gas stations) where SIC codes were insufficient.

Chain name lists were not available for Hispanic stores/restaurants, so we identified a word list of business names for these establishments from the popular crowd-sourced social media website, YELP. This and other social media sites have been used before to identify niche stores within communities (Gomez-Lopez et al 2017). The YELP data have crowdsourced labels for stores and restaurants that identify which business are Hispanic or Latin American. We considered the following labels when flagging whether a business was Hispanic: Mexican, Latin American, Cuban, Dominican, Puerto Rican, Peruvian, Salvadoran, Argentinian, Brazil, Colombian, and Venezuelan. We excluded restaurants labeled as "Tex-Mex" as well as

Hispanic-themed fast food national chain restaurants (e.g. Taco Bell) using a chain list of past/current chains. Next, we determined the probability that the words in the business's title belonged to a Hispanic business. We then extracted the words that had a 100% probability of being part of a Hispanic business's name. From that word list, we excluded very short words (e.g. 'pio' and 'vea') as well as proper nouns (e.g. Angeles and Susie's) that might appear in the titles of non-Hispanic stores in the larger InfoGroup dataset. The final count included 970 words. Finally, we applied the word list search to the InfoGroup data, in the same procedure as the chain name lists used for the other categories.

Food Environment Exposure Areas and Measures

To characterize food environments, we counted the number of stores and restaurants of particular types within specified nearby "exposure areas" in and surrounding each blockgroup, and then aggregated these up to the tract level. We summarized the food environment data at the tract level rather than blockgroup level because other variables required for our analysis (e.g., Hispanic's social integration) are available for tracts but not blockgroups.

For the preliminary analyses presented here, we specifically defined local food environment exposure areas for those living in a given blockgroup as *their blockgroup and all neighboring blockgroups*. Neighbors were identified using a first order Queen's contiguity spatial matrix, where blockgroups must share a border. In future analyses, we plan to use alternative definitions of exposure areas based on 10 and 20 minute walking and driving times from the population-weighted centroid of the blockgroup.

For each blockgroup, we defined *food deserts* as having exposure areas with zero stores, separately for the for groceries and supermarkets/supercenters, and Hispanic stores/restaurants. We defined *food swamps* using both absolute and relative measures. The absolute measure is a

count of the density of convenience and fast food businesses in the exposure area. The relative measure is a ratio of the number of convenience and fast food businesses to each grocery, supermarket, or Hispanic store/restaurant (these categories were made mutually-exclusive in this step). We then used the upper quantile from the national distribution as a cut-off to describe exposure areas where there are many 'swampy' stores in absolute terms (i.e. 50 swamp businesses per square mile) and relative (i.e. 5 or more swamp businesses to every 0/1 grocery or Hispanic business) to healthier or more traditional alternatives.

We aggregated these blockgroup level measures to the tract level by taking the weighted average of all blockgroup measures across the census tract, whereby the weight is the proportion of Hispanics in each blockgroup within the census tract.

Hispanic Spatial and Social Integration

We created four measures indicating different dimensions of Hispanics' spatial and social integration for each census tract. First, to measure dispersion away from places where Hispanics have historically lived, we used an indicator of residence in "established", "new" and "emerging" Hispanic destination counties. This indicator is based on Lichter and Johnson's (2016) classification of counties across destination types. New destinations have at least 500 Hispanics (and also make up at least 10% of the population) in 2010 and experienced at least a 200% growth rate in that subpopulation between 1990 and 2010. Emerging destinations are similar to New destinations, but Hispanics make up between 5 and 10% of the population in 2010 rather than more than 10%. Established destinations have at least 10% Hispanic in 1990, 2000, and 2010.

Second, to measure the degree to which Hispanics are residentially integrated with non-Hispanics, we relied on the dissimilarity index of the evenness of Hispanics versus non-

Hispanics across census tracts within the county. We reverse scored the dissimilarity index to produce an indicator of residential integration.

Third, to measure the average degree of U.S. experience of the local Latino community, we included the "maturity index", similar to measures developed by Bachmeier (2013) and Brazil (2017) to characterize the overall integration of the Hispanic population in the local area. The index of the maturity of the local Hispanic population was a tract-level factor score (alpha = 0.66) based on the percent of Hispanic population that speaks English very well, the percent of Hispanics who are US-born, and the percent of the Latin-American foreign-born by duration of residence in the US (i.e. less than 10 years and 20 years or more).

Fourth, to measure the degree of Hispanic's residential attainment, we included a measure of tract affluence. The index of social affluence was a factor score (alpha = 0.58) based on the percent with at least a bachelor's degree, logged median household income, and percent in a professional occupation.

Controls

Because food environments differ by the size and composition of local markets, we controlled for the following indicators of the size and urbanicity of the county in which the tract is located: metropolitan area status (=1), population (logged), population density (per square mile, logged), density of all stores and restaurants (per square mile, logged) and racial/ethnic composition (percentage Hispanic and percentage black or African American). We additionally controlled for each tract's land area (square miles, logged) and nine broad geographic regions: New England, Mid Atlantic, E/N Central, W/N Central, South Atlantic, E/S Central, W/S Central, Mountain and Pacific.

The means and standard deviations for all of the analytic variables are shown in Table 1. Most of the independent variables are moderately or weakly correlated. Among the indicators of spatial or social assimilation, no pairwise correlation coefficient is greater than .22. Among the controls, the logged county population is positively associated with metropolitan status (r = 0.57) and negatively related to Hispanic residential integration (-0.67) and county store/restaurant density (-0.58). No other pairwise correlation coefficient among the independent variables is greater than 0.50.

Table 1. Means and Standard Deviations for Destination Tracts

	Mean	St. Dev.
Established destination	0.523	(0.50)
New destination	0.142	(0.35)
Emerging destination	0.076	(0.27)
Food environment (prop. of Hispanics with…)		
No Hispanic store/restaurant	0.350	(0.42)
No Grocery or Supermarket/center	0.086	(0.23)
High density of 'Swamp' stores/restaurants	0.314	(0.40)
Food swamps (relative measure)	0.196	(0.34)
Hispanic integration (dissimilarity index), county	0.570	(0.10)
Hispanic maturity index	-0.115	(0.84)
Social affluence index	-0.397	(0.81)
Metro status, county	0.944	(0.23)
Population density, county (logged)	7.176	(1.32)
Total population, county (logged)	13.856	(1.50)
Prop. Hispanic, county	0.371	(0.20)
Prop. Black, county	0.105	(0.09)
Store/restaurant density, county	0.371	(0.20)
Land area (logged)	8.270	(1.35)
Region		
New England	0.010	(0.10)
Mid Atlantic	0.083	(0.28)
E/N Central	0.054	(0.23)
W/N Central	0.015	(0.12)
South Atlantic	0.151	(0.36)
E/S Central	0.007	(0.08)
W/S Central	0.226	(0.42)
Mountain	0.111	(0.31)
Pacific	0.347	(0.48)
N (tracts)	38,017	

Preliminary Results

As shown in Figure 1, Hispanics' food environments vary by destination type. As expected, those in new and emerging destinations are much more likely to live in a "Hispanic food desert" than those in established destinations. Roughly one-third of Hispanics in established destinations do not live near a store or restaurant that sells Hispanic/Latino food. This increases to 46 percent among those in new destinations and 57 percent among those in emerging destinations. Additionally, those in established destinations tend to live in places with a greater density per square mile of fast food restaurants and convenience stores than those in new or emerging destinations. However, this is because there are simply more stores in established destinations. When expressed as a ratio to groceries and Hispanic food stores/restaurants, the number of fast food restaurants and convenience stores is actually greater in new and emerging destinations than established destinations (this is also true when the ratio is redefined without Hispanic businesses). Finally, we see no differences by destination type in the percentage living in a grocery store/supermarket desert.

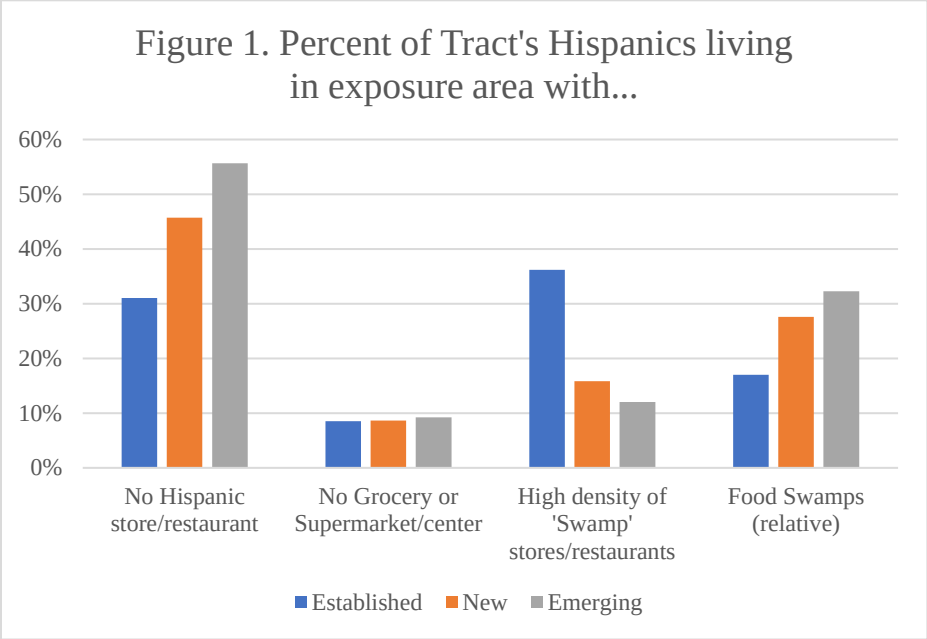

Table 2 displays models predicting living in a Hispanic food desert (on the left) and a grocery and supermarket desert (on the right). For each dependent variable, Model 1 includes only the indicators of Hispanic integration, and Model 2 adds the control variables. Turning first to the Hispanic food deserts models, all of the indicators of social and spatial integration were associated with a greater likelihood of living in a Hispanic food desert. These associations were reduced but remained significant after adjusting for county population size, population density, racial/ethnic composition, and region. For example, in new destination tracts there were 5 percentage points more Hispanics, and 13 percentage points more Hispanics in emerging tracts, who lived in a Hispanic food desert area than those in established destinations.

Table 2. OLS Proportion of Hispanics Living in Food Desert Type

	Hispanic Store/Rest. Desert		Grocery and Supermarket Desert	
	Model 1a	Model 2a	Model 1b	Model 2b
Destination (Ref = Established)				
New	0.127***	0.052***	-0.007	-0.020**
	(0.01)	(0.01)	(0.00)	(0.01)
Emerging	0.231***	0.126***	0.000	-0.009
	(0.01)	(0.01)	(0.00)	(0.01)
Hispanic integration (dissimilarity index)	0.449***	0.247***	0.272***	0.006
	(0.03)	(0.05)	(0.02)	(0.03)
Hispanic maturity index	0.068***	0.081***	0.034***	0.029***
	(0.00)	(0.00)	(0.00)	(0.00)
Social affluence index	0.060***	0.058***	0.015***	0.022***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.089***	0.696***	-0.058***	0.219***
	(0.02)	(0.06)	(0.01)	(0.03)
R-squared	0.088	0.121	0.037	0.064
N	38017	38017	38017	38017

* p<0.05, **p<0.01, ***p<0.001
Model 2 includes control variables

Interestingly, living in a grocery/supermarket desert was also associated with Hispanic residential integration, the "maturity" (i.e., U.S. experience) of the Hispanic community, and the

affluence of the neighborhood. Moreover, the latter two of these associations, involving maturity of the Hispanic community and neighborhood affluence, remained significant even after the controls were added to the model. Similar to the pattern seen in Figure 1, destination type was not associated with living in a grocery/supermarket desert. Overall, however, neighborhood affluence and integration – not segregation and neighborhood poverty – were associated with living in a grocery/supermarket desert. This raises questions about the meaning of "food deserts" as it is often conceptualized in the food environment literature. Proximity to grocery stores and supermarkets may be helpful to those without cars, but it may also be associated with living in less desirable nonresidential neighborhoods with less green space, more traffic, and fewer opportunities for interactions with neighbors.

Table 3 displays models predicting living in a "food swamp". The two models on the left predict the absolute measure of food swamps while the two models on the right predict the relative measure. Turning first to the absolute measure, all of the indicators of Hispanic social and spatial integration were *negatively* associated with living in areas with high density of convenience stores and fast food restaurants. These associations were diminished somewhat but remained significant even after the controls were added to the model. In contrast, the indicators of spatial and social integration were *positively* associated with the relative measure of food swamps, meaning that living in more integrated, more affluent neighborhoods and regions was associated with living in places with a greater share of convenience stores and fast food restaurants relative to grocery stores and Hispanic outlets. The effects were the same even when Hispanic outlets were not included in the ratio definition, with the exception that new destinations were not significantly different from established destinations.

Table 3. OLS Proportion of Hispanics Living in Food Swamp Type

	High Density of Swampy Stores		Food Swamp (relative measure)	
	Model 1c	Model 2c	Model 1d	Model 2d
Destination (Ref = Established)				
New	-0.170***	-0.099***	0.089***	0.035***
	(0.01)	(0.01)	(0.01)	(0.01)
Emerging	-0.211***	-0.139***	0.139***	0.086***
	(0.01)	(0.01)	(0.01)	(0.01)
Hispanic integration (dissimilarity index)	-1.093***	-0.205***	0.428***	0.192***
	(0.03)	(0.04)	(0.03)	(0.03)
Hispanic maturity index	-0.098***	-0.066***	0.057***	0.056***
	(0.00)	(0.00)	(0.00)	(0.00)
Social affluence index	-0.006	-0.025***	0.039***	0.038***
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.964***	0.512***	-0.049***	0.227***
	(0.02)	(0.04)	(0.01)	(0.04)
	0.176	0.335	0.077	0.118
	38017	38017	38017	38017

* p<0.05, **p<0.01, ***p<0.001
Model 2 includes control variables

Conclusions

Overall, the results suggest that as Hispanics move to more assimilated, integrated, middle income neighborhoods and as they move to new destinations, they are less likely to have access to “Hispanic” restaurants and grocery stores. Additionally, they are less likely to have a grocery store or supermarket nearby, and they are more likely to live in a location with a lower density of fast food restaurants and convenience stores. This is likely due to there being fewer stores in general in or near their neighborhoods; on balance, the ratio of fast food/convenience stores to grocery/supermarkets is greater in more integrated and affluent neighborhoods. This

suggests that as Hispanics become more spatially and socially integrated, they may become more likely to live in residential neighborhoods that are separated from business districts.

What this means for Hispanic's diet and health remains unclear to us. We suspect that living in a Hispanic food desert may accelerate Hispanic's dietary acculturation, but it is unclear whether this and other accompanying changes in food environment would be related to a less healthy diet. We also suspect that the relationship between food environments and diet will vary depending on having access to a private vehicle. However, to explore these ideas, it will be necessary to examine data that link individual's diet and eating behaviors with the food environment measures.

We are planning to make several improvements and additions to this particular paper before the PAA meetings. First, we will draw upon both place stratification and spatial assimilation theories to develop research expectations about how food environments are likely to vary among Hispanics by level and type of spatial assimilation, and how food environments are likely to differ between Hispanics and non-Hispanics. In our analyses, we will continue to explore how Hispanic's food environments vary across Hispanic communities by level of social and spatial integration. However, we will also compare Hispanics' food environments of those of other major racial/ethnic groups. We will specifically explore whether Hispanic spatial and social integration is associated with food environments that are more or less similar to those experienced by blacks and whites. Comparisons with whites and blacks will be important for adjudicating between spatial assimilation and place stratification theories.

Second, we are interested in thinking through the way proximity to food outlets can be both an amenity and a health hazard. People tend to want to live in places where they have access to stores and restaurants, but they may not want to live in the heart of business zones.

Thus, there may be an optimal distance from stores and restaurants, whereby a variety of food outlets are located near, but not within, residential neighborhoods. In our analyses, we are planning to employ accessibility measures of food environments to help explore these ideas. Accessibility areas are defined in terms of the areas that can be reached within a given length of time and mode of transportation (e.g., within 10 minutes on foot). Accessibility measures provide a more behaviorally relevant indicator of food environments because they account for factors such as traffic, street grids, and the time it takes to navigate the local environment rather than being based purely on distance. We can use accessibility measures to measure food environments in both the immediate neighborhood and in the ring surrounding the neighborhood, so they will be helpful for examining food environments that are nearby but not within residential communities.

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