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Short Communication

Neighborhood immigrant density and population health among native-born Americans

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ABSTRACT

The healthy immigrant effect—whereby immigrants are on average healthier than the native-born—have been well studied. However, little is known about the relationship between immigration and the health of the native-born. This study fills this important research gap by examining the association between neighborhood immigrant density and several population health measures among native-born Americans. We used data from the Los Angeles County Health Survey to analyze four individual-level health behaviors and outcomes, including regular fast food consumption, fruit and vegetable consumption, body mass index, and hypertension. We conducted multilevel logistic regressions to assess the association between neighborhood immigrant density and the four health behaviors and outcomes. The results showed that neighborhood immigrant density was negatively associated with regular fast food consumption (OR = 0.33; 95% CI, 0.18–0.59), BMI (β = −2.16, 95% CI, −3.13 to −1.19), and hypertension (OR = 0.58; 95% CI, 0.38–0.89), and positively associated with fruit/vegetable consumption (OR = 1.64; 95% CI, 1.01–2.66) among native-born Americans. In conclusion, native-born Americans who lived in a neighborhood with a high density of immigrants had healthier behaviors and better health outcomes compared to those who lived in a neighborhood with a low density of immigrants.

1. Introduction

The "healthy immigrant effect," whereby immigrants have better health than natives with comparable socioeconomic status (SES), has been documented for various health behaviors and outcomes such as diet, mental illness, and cardiovascular diseases (Duffey et al., 2008; McDonald and Kennedy, 2004; Corlin et al., 2014). For example, a study showed that foreign-born Mexicans consumed nearly twice as much energy from healthy foods such as legumes, soybeans, fruits, and vegetables as US-born Mexicans, while US-born Mexicans consumed 56 kcal more per day from unhealthy fast food compared to foreign-born Mexicans (Duffey et al., 2008). In addition, US-born immigrants had a faster acculturation of unhealthy behaviors, such as smoking and physical inactivity, compared to foreign-born immigrants (Gordon-Larsen et al., 2003). The "healthy immigrant effect" also holds at the community level as, for example, low-income immigrants living in a community with a high percentage of immigrants have a higher average life expectancy compared to those who live in a community with more natives (Chetty et al., 2016). Some of the favorable health outcomes among immigrants can be attributed to healthier behaviors among immigrants such as the low prevalence of smoking and the preference for a healthy diet (O'Loughlin et al., 2010).

In this study, we hypothesize that the "healthy immigrant effect" may have a "spillover" benefit on the native-born Americans living in communities with a high immigrant density. In other words, these healthy immigrants may influence their native-born neighbors in the same community. Although immigration may reduce social solidarity and social capital in the short term (Putnam, 2007), it has a positive impact on neighborhood population health in the long run through possible pathways such as changing the peer effect in smoking and healthy eating, making healthy ethnic foods more accessible, and lowering the crime rate (Osypuk et al., 2009; Lally et al., 2011). However, previous studies have not assessed the association between neighborhood immigrant density and health behaviors and outcomes among native-born Americans. This study aims to fill this research gap.

Using a large population health survey conducted in Los Angeles

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County, we examined whether living in communities with a high density of immigrants was associated with healthy behaviors such as less fast food consumption and more fruit and vegetable intake, as well as lower risks for developing obesity and hypertension. We used a multilevel approach to assess the extent to which neighborhood immigrant density may impact these health behaviors and outcomes. The findings may provide important evidence that can be used to inform public health practices as well as immigration policies.

2. Methods

2.1. Study population

The study sample was from the 2005 and 2007 adult respondents in the Los Angeles County Health Survey (LACHS). LACHS is a population-based random digit-dial telephone survey of Los Angeles County households (Simon et al., 2001). This dataset includes ZIP code information, which allows researchers to study population health questions at both individual and neighborhood level. We combined the LACHS data with zip-code-tabulated-area-level characteristics form a new dataset. We have recently used this combined dataset to study the association between immigrant acculturation and health behaviors (Shi et al., 2015; Zhang et al., 2015). For this study, the non-uniform spatial distribution of the foreign-born population in Los Angeles County provides us with the variation we need for analyzing the association between immigrant density and health outcomes.

2.2. Measures on dietary behaviors and health outcomes

The dependent variables we examined in the study included dietary behaviors and health outcomes. Dietary behaviors were measured by fast food consumption and fruit and vegetable intake. Fast food consumption was measured by responses to the following question, "how often do you eat any food, including meals and snacks, from a fast-food restaurant, like McDonald's, Taco Bell, Kentucky Fried Chicken or another similar type of place?" The respondents were asked to select their consumption levels from five choices, "1 = '4 + times/week', 2 = '1–3 times/week', 3 = ' < 1time/week but ≥1time/month', 4 = ' < 1time/month', 5 = 'never'." In our analysis, we recoded the frequency of fast food consumption as a binary outcome: 1 = regular fast food consumption, defined as eating any food from fast food restaurants at least once per week (choices 1 or 2); 0 = not regular fast food consumption defined as eating fast food less than once per week (choices 3, 4, or 5).

Fruit/vegetable intake was derived from the LACHS question about the daily intake of fruits and vegetables. Those who reported five or more servings of fruits and vegetables were coded 1 and those who reported four or fewer were coded as 0 since five or more servings of fruits and vegetables was the level of intake recommended by the United States Centers for Disease Control and Prevention (CDC) (Guenther et al., 2006).

Health outcomes were measured by body mass index (BMI) and self-reported hypertension diagnosis. BMI was calculated from self-reported height and weight. It was used in the model as a continuous variable. Hypertension was coded 1 if the respondent answered "yes" to the survey question about "whether a health care professional had told him/her that he/she had hypertension," and 0 if the answer was "no".

2.3. Measures on immigrant density and food environment

Geographic clusters used in our multilevel analyses here were defined by zip-code-tabulated areas (ZCTA) in the analysis. We obtained ZCTA characteristics data—including median household income and percent of residents who were foreign-born—from the US Census (www.census.gov). We also obtained the number of fast food restaurants within each neighborhood from the California Department of Public Health, originally derived from the Dun & Bradstreet restaurants database (https://www.dnb.com/) (Singleton et al., 2015).

Immigrant density in this study was defined as the area-level density of foreign-born immigrants (i.e., first-generation immigrants). Food environment was measured by the number of fast food restaurants (e.g., McDonald's, Taco Bell, Kentucky Fried Chicken, Burger King, and other chain restaurants) per 100,000 residents within a neighborhood. Area-level economic characteristics were controlled in the model using median household income as a proxy. Median household income was log transformed to adjust for its skewed distribution. We also merged about 30% of adjacent ZCTAs because the number of respondents in those areas was too small to provide statistical power in our analysis, ending up with 271 areas as the geographic clusters in our multilevel analyses (Shi et al., 2015). For the merged areas, we calculated the area-level household income, immigrant density and fast food density using weighted averages of the zip-code level estimates.

The covariates in the model included individual-level demographic and socioeconomic variables, including age, gender, race/ethnicity, educational attainment, and household income. Household income was categorized into four categories using federal poverty level (FPL).

2.4. Statistical analysis

Since BMI is a continuous variable, we applied multilevel linear regression to examine the link between area-level immigrant density and BMI, with the geographic areas described above as the cluster variable and the covariates described above as the control variables. For hypertension, fast food consumption, and fruit and vegetables intake, we used multilevel logistic regressions to examine their link with area-level immigrant density, with the geographic areas described above as the cluster variable and the covariates described above as the control variables. The statistical analysis was performed using STATA.

3. Results

Table 1 presents the descriptive statistics of the study sample. About one third of the respondents reported regular fast food consumption, 17% of respondents ate five or more servings of fruits and vegetables per day, 31% of respondents had hypertension, and the mean BMI of the respondents is 26.85. The average age of the study sample was about 51 years old. More than 40% of the respondents had a college degree, and more than half had a household income of above 300% federal poverty level. The majority of the respondents (about 60%) were non-Latino whites.

Table 1 also shows the neighborhood characteristics. Specifically, there were on average 23.2 (SD: 10.8; median: 23; interquartile range: 13) fast food restaurants per 10,000 residents at the neighborhood level. About one third of respondents were born in foreign countries and they had lived in the U.S. for a median of 20 years (interquartile range = 19). The average median household income across different neighborhoods was $24,624.

Table 2 presents the ORs estimated from multilevel regression analysis. Neighborhood immigrant density had a negative association with regular fast food consumption among native-born Americans (OR = 0.33; 95% CI, 0.18–0.59), controlling for all other variables in the model. Similarly, living in a neighborhood with a high percentage of immigrants was associated with a lower likelihood of having hypertension (OR = 0.58; 95% CI, 0.38–0.89). Moreover, people living in a neighborhood with a high percentage of immigrants were more likely to eat a recommended serving of fruits and vegetables (OR = 1.64; 95% CI, 1.01–2.66). Lastly, our results show that neighborhood immigrant density was negatively associated with BMI ($\beta = -2.16\ kg/m^2$, 95% CI, −3.13 to −1.19).

Table 1
Descriptive statistics of the four samples of US-born residents in Los Angeles County.

Individual-level variables	Analysis sample for regular fast food consumption	Analysis sample for > 5 fruits & vegetable/day	Analysis sample for body mass index	Analysis sample for hypertension
N	4244	9166	8968	9451
> 1 time of fast food consumption/week	34.83%			
> 5 servings of fruits/vegetable/day		17.13%		
Body mass index			26.85 (5.58)	
Hypertension				30.94%
Age	52.84 (18.21)	50.88 (17.84)	50.87 (17.94)	50.77 (17.84)
Female	52.97%	51.25	49.33%	51.34%
Educational attainment				
Below high school	7.73%	7.47%	7.52%	7.67%
Finished high school	18.71%	19.84%	19.86%	19.80%
Some college	30.84%	31.58%	31.32%	31.44%
College graduation	42.72%	41.11%	41.30%	41.09%
Household income				
< Federal poverty line (FPL)	11.55%	7.62%	10.72%	11.00%
100%–200% FPL	16.38%	19.92%	16.01%	16.12%
200%–300% FPL	15.17%	17.70%	16.87%	17.00%
Above 300% FPL	56.90%	54.77%	56.40%	55.88%
Race/ethnicity				
Non-Latino Whites	60.77%	59.31%	62.29%	61.97%
Latino	21.89%	20.08%	20.55%	20.76%
African American	12.32%	12.89%	12.82%	12.90%
Asian American	5.02%	4.04%	4.34%	4.36%
Others	2.45%	2.44%	3.19%	3.21%
Area-level variables (mean/SD)				
Median household income	$24,624 ($15,966)			
Percent foreign-born	33.06% (14.55%)			
# of fast food restaurants per 10,000 residents	23.2 (10.78) (McDonald and Kennedy, 2004)			

Note: 1. Standard errors in parentheses. 2. Median = 23, interquartile range = 13.

4. Discussion

This study examined the association between immigrant density (measured as percent foreign born at the neighborhood level) and health behaviors and outcomes among native-born Americans. For health behaviors, native-born Americans may eat less fast food and more fresh fruits and vegetables if they live in a neighborhood with a higher immigrant density. As to health outcomes, there were significant associations between a higher neighborhood immigrant density and a lower BMI and a lower risk of hypertension for native-born Americans. Overall, we observed that high immigrant density in a community was a protective factor against unhealthy behaviors and poor health outcomes for native-born Americans. A previous study showed that non-Latino whites living in an area with a higher percentage of Asians had a lower BMI and 28% lower odds for obesity (Kirby et al., 2012). Findings from our study were consistent with the previous study and provided more generalized evidence on the impact of neighborhood immigrant density on population health.

There are several explanations to the associations between neighborhood immigrant density and health behaviors and outcomes. The increased fruit and vegetable consumption in a neighborhood with a higher density of immigrants, for example, may be caused by the increased access to ethnic food outlets, the enhanced social norm on fruit/vegetable consumption, and food price reduction attributable to immigrant labor supply (Balkan and Tumen, 2016). It has been found that ethnicity has a stronger effect on the choice of food retailors than a narrowly defined “economic rationality” for immigrants (Wang and Lo, 2007). The immigrant-driven growth of ethnic food outlets may, in turn, benefit the native-born Americans living in the area and improve their dietary behaviors. Also, given the documented evidence that Mexico-born Americans consumed more fruits and vegetables than native-born Americans (Batis et al., 2011), there is a stronger social norm towards the consumption of fruits and vegetables in a neighborhood with a high density of Mexico-born Americans or other immigrants.

Our study has several limitations. First, we used self-reported measures for our outcome variables, which could be subject to measurement errors such as underreporting weight and over-reporting height as well as misclassifying undiagnosed hypertension as not having hypertension (Gorber et al., 2007). That being said, the validity of self-reported hypertension was found to be high across different population groups (Giles et al., 1995). For neighborhood-level variables, we used the density of fast food restaurants and median household income as control variables, but we were not able to include more detailed neighborhood variables such as the density of ethnic food outcomes due to limited data. In addition, we used cross-sectional data in our analysis, so there might be potential mechanisms for the reverse effect. For example, it is possible that some immigrants chose to live in neighborhoods that are healthier such as those ethnic enclaves with US-born immigrants from the same country of origin. Finally, we do not have access to the most recent data to examine the associations and the findings from Los Angeles County may not be generalizable to other parts of the country. Knowing the obesity increase in parts of Asia and Latin America in recent decades (Abarca-Gómez et al., 2017), we need to be aware of the possible changing health norms among new cohorts of immigrants in Los Angeles County and United States in general, which could change what it means to live among immigrants today. In follow-up studies, we plan to obtain datasets that represent larger geographic areas with more neighborhood-level health environment measures as well as objective measures of individual-level health outcomes (e.g., hypertension-related health care expenditure from datasets such as Medical Expenditure Panel Survey).

Few studies have explored the association between immigrant density and the health of native-born Americans. Our results showed that native-born Americans living in neighborhoods with a higher immigrant density were more likely to eat a recommended level of fruits and vegetables, go to fast food restaurants less frequently, have a lower body mass index, and a lower risk for hypertension. Our findings add to the discussion about the role of immigration in the receiving country's population health and is consistent with the existing evidence about the

Table 2
Multilevel models of fast food consumption, fruits/vegetable consumption, body mass index and hypertension.

	Regular fast food consumption (odds ratio)	Fruits/vegetable > 5 servings per day (odds ratio)	Body mass index (regression slope)	Hypertension (odds ratio)
	95% confidence interval in parentheses			
N	4244	9166	8968	9451
Key independent variable				
Percent foreign-born	0.330 [0.183, 0.596]	1.638 [1.007, 2.663]	−2.160 [−3.128, −1.192]	0.582 [0.383, 0.886]
Individual-level variables				
Age	1.009 [0.988, 1.031]	0.992 [0.973, 1.010]	0.334 [0.299, 0.369]	1.153 [1.130, 1.176]
Age squared	1.000 [0.999, 1.000]	1.000 [1.000, 1.000]	−0.003 [−0.003, −0.003]	0.999 [0.999, 0.999]
Gender: reference = male	0.569 [0.498, 0.651]	2.031 [1.809, 2.280]	−1.398 [−1.619, −1.177]	0.839 [0.760, 0.925]
Educational attainment: reference = below high school				
Finished high school	1.056 [0.795, 1.404]	1.015 [0.739, 1.395]	−0.603 [−1.081, −0.124]	1.097 [0.883, 1.362]
Some college	0.947 [0.718, 1.250]	1.757 [1.302, 2.370]	−0.585 [−1.053, −0.118]	0.976 [0.790, 1.205]
College graduation	0.743 [0.555, 0.995]	2.347 [1.729, 3.186]	−1.528 [−2.018, −1.039]	0.829 [0.665, 1.033]
Household income: reference = above 300% federal poverty line (FPL)				
Below FPL	0.919 [0.724, 1.166]	0.808 [0.640, 1.020]	0.735 [0.323, 1.146]	1.582 [1.319, 1.898]
100%–200%FPL	1.011 [0.828, 1.235]	0.863 [0.720, 1.034]	0.449 [0.109, 0.788]	1.349 [1.162, 1.566]
200%–300%FPL	1.239 [1.017, 1.508]	0.854 [0.725, 1.006]	0.125 [−0.191, 0.441]	1.133 [0.987, 1.301]
Race/ethnicity: reference = non-Latino Whites				
Latino	1.144 [0.943, 1.387]	0.719 [0.598, 0.864]	1.212 [0.880, 1.544]	0.998 [0.854, 1.166]
African American	1.061 [0.851, 1.325]	0.660 [0.538, 0.809]	1.269 [0.898, 1.640]	1.889 [1.615, 2.209]
Asian American	1.201 [0.886, 1.629]	0.809 [0.612, 1.070]	−1.112 [−1.666, −0.558]	1.087 [0.833, 1.419]
Other	0.698 [0.446, 1.092]	0.844 [0.607, 1.172]	0.053 [−0.578, 0.685]	0.978 [0.748, 1.278]
Neighborhood-level variables				
Fast food restaurant density (no./1000 residents)	1.004 [0.998, 1.011]	0.999 [0.993, 1.004]	0.008 [−0.003, 0.018]	1.000 [0.995, 1.005]
Median income	0.511 [0.423, 0.617]	1.220 [1.051, 1.415]	−1.518 [−1.824, −1.213]	0.743 [0.651, 0.848]

health benefit of desegregation (Shen, 2018). Further studies are needed to examine the causal effects of neighborhood immigrant density on population health.

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Declaration of competing interest

None.

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