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Is Socioeconomic Incorporation Associated with a Healthier Diet? Dietary Patterns among Mexican-American Children

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Abstract

With each successive generation in the United States, Mexican-origin families lose their initial dietary advantages. Focusing on children's diets, we ask whether greater socioeconomic status (SES) can help buffer Mexican-origin children in immigrant families from negative dietary acculturation or whether it exacerbates these dietary risks. Pooling data from the 1999 to 2009 waves of the continuous National Health and Nutrition Examination Survey, we test whether the association between generational status and Mexican-origin children's nutrition varies by the family's SES. When predicting children's overall dietary quality using the Healthy Eating Index (2010) and predicting unhealthy dietary patterns, we find stronger evidence of segmented assimilation, whereby greater family average SES is associated with better diets across generations of Mexican-origin children. High-status Mexican-origin parents appear able to buffer their children against generational dietary declines documented in the acculturation literature.

Keywords

United States; Mexican-American; Immigration; Acculturation; Socioeconomic Status; Nutrition; Children

Introduction

Across all U.S. ethnic groups, Mexican-origin children have the highest obesity prevalence (Ogden et al., 2012). This reveals challenges for Mexican-origin immigrant families' health. Furthermore, the risks of obesity are stratified among Mexican-origin children according to their generation status, meaning the number of generations their family has been in the United States. Mexican-origin immigrant children with immigrant parents (i.e., the "first generation") and Mexican-origin U.S.-born children of immigrant parents (i.e., the "second generation") are more likely to be overweight than their peers in Mexico and Mexican-origin U.S.-born children of U.S.-born parents (i.e., the "third generation") (Van Hook et al.,

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2012). We seek to understand for whom these risks of childhood obesity are the greatest within the Mexican-origin population.

Immigration theory and research note that immigrants' well-being is strongly linked to their structural incorporation into American society, meaning the extent to which immigrants receive similar treatment to native-born individuals, with equal outcomes for equal endowments (Gordon, 1964). Indicators of structural incorporation include whether immigrants hold high-status, well-paying jobs (Portes, 1981) that translate into a higher family socioeconomic status (Gordon, 1964), have legal standing in the U.S. (Bean et al., 2011; Landale et al., 2015), and experience racial integration (Frank et al., 2010).

Segmented assimilation theory argues that assimilation is associated with better outcomes among groups that are the most structurally incorporated and poor outcomes among the least incorporated (Portes & Zhou, 1993; Rumbaut, 1994). Although originally developed to explain variations across national origin groups, the theory also led to research examining within-group inequalities (e.g., Acevedo-Garcia et al., 2010; Telles & Ortiz, 2008; Waters, 1994). As such, the health of Mexican-origin children may be stratified across generations according to their family's socioeconomic status (SES).

We explore whether Mexican-origin children's nutrition follows the patterns anticipated by segmented assimilation theory. We focus on children's nutrition because poor nutrition is a risk factor for childhood obesity (Davison & Birch, 2002; Savage et al., 2007; Ventura & Birch, 2008) and because immigrant families' diets frequently decline with increasing exposure to the United States (Akresh, 2007; Ayala et al., 2008; Batis et al., 2011; Brown, 2005; Dixon et al., 2000; Duffey et al., 2008; Guendelman & Abrams, 1995; Van Hook et al., 2015). This general pattern, termed "negative dietary acculturation," also occurs among Mexican-origin immigrants (Batis et al., 2011; Van Hook et al., 2015).

Our research question is whether Mexican-origin families with greater socioeconomic resources can buffer their children against these generational, nutrition declines. To our knowledge, this study is the first to explore whether SES modifies the association between children's nutrition and generational status. Most prior studies exploring generational differences in dietary quality simply control for family SES. But given the historical concentration of Mexican-origin immigrant families at the bottom of the socioeconomic distribution (Bean & Stevens, 2003; Van Hook et al., 2013), generational differences documented in prior research are strongly influenced by the number of children with very low SES and their dietary patterns. Yet a Mexican American middle class has been emerging recently (Myers, 2007; Vallejo, 2012), especially among later generations.

We compare families' SES by generation status rather than individuals' duration of U.S. residence because immigrants' upward social and economic mobility generally occurs across generations (Bean & Stevens, 2003; Vallejo, 2012). This is especially true for educational mobility given that few immigrant adults return to school after arriving in the United States, while their children can obtain more years of schooling than their parents (Vallejo, 2012). Given this lengthy timeline for upward mobility, generational status in the

U.S. is likely important for understanding the association between SES and dietary practices among Mexican-origin children.

Background

To develop our hypotheses, we draw on prior research demonstrating variation in the strength of the SES-health gradient for immigrants and other groups. Given prior research demonstrating a strong association between youth weight and family SES (Miech et al., 2006; Goodman, 1999; Gordon-Larsen et al., 2003; Martin et al., 2012; Wang & Zhang, 2006), a naïve expectation would be that Mexican-origin families' relatively low SES contributes to unhealthy diets and high childhood obesity prevalence. Yet the standard, predicted associations between family SES and U.S. children's weight and nutrition may not work well for Mexican-origin children. Termed the Hispanic or immigrant health paradox (Markides & Eschbach, 2005), the relationship between SES and health is often weaker for immigrants than the U.S.-born population (Goldman et al., 2006), such that low SES immigrants are often healthier than natives with more resources. Consistent with this research, Balistreri and Van Hook (2009) found that the association between parents' education and children's post-kindergarten gains in body mass index (BMI) was weaker for Hispanic children relative to non-Hispanic White children. Further, greater family income predicted lower kindergarten BMIs for third-generation Hispanic (and White) children, but greater kindergarten BMIs for first- and second-generation Hispanic children.

We suspect that Mexican-origin children's diet quality also may not fit the "standard" pattern, wherein children's dietary quality is hypothesized to generally improve with higher parental educational attainment (Tabacchi et al., 2007) and greater family income (Drewnowski & Specter, 2004a). As discussed in the next section, first- and second-generation Mexican-origin children in low SES families likely have better diets than their low-SES, third-generation counterparts. We question whether this generation gap is smaller among high SES families and, if so, what dietary shifts occur to narrow this gap. Is it that high-SES, Mexican-origin children, regardless of generation, have relatively nutritious diets? Or do high-SES, first-generation Mexican-origin children assimilate more rapidly to a lower-quality American diet than their low-SES, first-generation peers?

Research Expectations

Based on theory and a limited body of prior research, we develop hypotheses about the relationship between generational status and children's diet and how it varies by family SES. We conceptualize and measure family SES as a unifying, single dimension, akin to social class, that encompasses both parents' education and family income because these SES indicators are fundamentally linked and mutually reinforcing. First, increases in education lead to greater earnings (Becker, 1964; Card, 1999) and, thus, greater family income (DeNavas-Walt et al., 2006). In fact, the correspondence between educational attainment and earnings has increased since the mid-1970s, as the economy increasingly pays a premium for high-skilled workers (Morris & Western, 1999). Second, parents' education and income jointly create and reinforce class-based differences in normative expectations, cultural values, and lifestyles, including dietary patterns (Bourdieu, 1984; Lamont, 1992).

Moreover, for immigrant families, greater SES is associated with more contact with non-Hispanic Whites in peer, work, and family settings (South et al., 2005a; South et al., 2005b) by decreasing their residential segregation (Brown, 2007; Iceland & Wilkes, 2006).

Nevertheless, we recognize that parents' education and income may influence children's diets in unique ways. For example, greater educational attainment leads to both general (Becker, 1993) and specific health-related knowledge (Link et al., 1998), greater cognitive capabilities (Baker et al., 2011), a cultural orientation to pursuing information (Lareau, 2003), and a sense of control for accomplishing goals (Mirowsky & Ross, 2003). However, family income provides parents with the ability to purchase health-related goods, such as groceries, meals out, physical activity equipment, housing in better neighborhoods, and more (Cawley, 2004; Drewnowski & Specter, 2004b). Yet even these unique effects of parents' education and family income are mutually reinforcing because parents' education informs purchasing decisions. For example, families with more income can eat more meals away from home, but parental education can guide their choices on where to eat and which menu options are healthier. Thus, we expect parents' education and family income to jointly influence children's diets, as measured by the family's SES.

We next outline how SES may modify the relationship between generational status and diet.

The *Null Hypothesis – No Moderation by Family SES* – predicts consistent differences in children's diets across generations regardless of the family's SES. Prior research demonstrates that U.S. exposure is associated with unhealthy shifts in diet among immigrants and their families (Akresh, 2007; Ayala et al., 2008; Batis et al., 2011; Brown, 2005; Dixon et al., 2000; Duffey et al., 2008; Guendelman & Abrams, 1995). Immigrant families often retain their cultural preferences for non-American foods, which tend to include more fruits and vegetables and less meat, sugar, and fat. Under the null hypothesis, each subsequent generation is predicted to have a worse diet regardless of SES because children in later generations are more immersed within America's dietary culture. Figure 1a shows the expected patterns under the Null Hypothesis; generational status has a consistent relationship with Mexican-origin children's diets, regardless of the family's SES.

Hypothesis 1 – Family SES Produces Segmented Assimilation – suggests that the association between generational status and children's diet quality significantly varies by SES, such that family SES buffers against the risks of negative dietary acculturation for children in later generations. Past research demonstrates that Mexican-origin children of immigrants have better diets than those with U.S.-born parents despite their lower SES (Batis et al., 2011; Van Hook et al., 2015). Reflecting this, Figure 1b displays a relatively high-quality diet for the first generation at even the lowest family SES levels. This first-generation dietary advantage is predicted to persist across the socioeconomic distribution because it is presumed to largely reflect the parents' cultural orientation to traditional, healthier Mexican foods.

With assimilation into the U.S., subsequent generations' affinity for traditional Mexican foods is predicted to decline. Children of immigrants often want to fit in with their U.S. peers by wearing the same clothing, speaking the same language, and eating the same foods

(Guendelman et al., 2011; Nguyen, 2007). Although both first- and second-generation children are children of immigrants, we expect that second-generation Mexican-origin children find stereotypical American foods like burgers, fries, and soda more appealing than their first-generation peers because of differences in their early life exposures. Born in Mexico, first-generation children likely have more early-life exposures to traditional Mexican foods, which would foster durable preferences for those foods (Birch & Fischer, 1998). With each successive generation born in the U.S., we suspect children are more exposed in early life to “American” foods and less exposed to traditional Mexican foods.

The question is whether some Mexican-origin families swim upstream and maintain a healthier diet for their children even if the foods consumed are more “American.” Segmented assimilation theory suggests that high-SES families can better retain their dietary advantages relative to low-SES families, especially given differences in the cultural practices they assimilate to. Mexican-origin children in low SES families are more likely to assimilate to a low-quality diet prevalent among poor and less educated Americans, whereas their peers in high SES families are more likely to assimilate to a higher-quality diet prevalent among middle-class Americans (Darmon & Drewnowski, 2007). These patterns are depicted in Figure 1b: the relationship between family SES and dietary quality is flatter for first-generation Mexican-origin children than for it is for later generations but at a consistently high level of dietary quality; low SES only predicts a lower-quality diet among second- and third-generation Mexican-origin children. Accordingly, generational declines in nutritional quality are much greater among children in low SES versus high SES families.

Hypothesis 2 – Family SES Accelerates Negative Dietary Acculturation: – recognizes the unconventional relationship between SES and immigrants health to predict that gains in family SES accelerate negative dietary acculturation for first- and second-generation Mexican-origin children. The pressure to “fit in” is likely even stronger for children in immigrant families exiting extreme poverty and joining the American middle class because their higher SES puts them in greater contact with non-Hispanic Whites as they move to new neighborhoods and schools.

These SES-differentiated patterns to “fit in” could be further amplified because their parents are also susceptible to these social pressures. Prior research notes that upwardly mobile immigrant adults often attempt to strip themselves of ethnic cultural markers for acceptance into White, middle-class educational and work settings (Alba & Nee, 2003; Vallejo, 2012). Yet immigrant parents’ limited exposure and awareness of “American” food options means that these high-SES immigrant parents are more likely purchase and permit unhealthy “American” foods. Such shifts in high-SES parents’ dietary preferences and behaviors would accelerate first- and second-generation Mexican-origin children’s negative dietary acculturation given the importance of parents’ overt control and role-modeling for children’s diets (Bruss et al., 2005; French et al., 2001). Under Hypothesis 2, we do not expect significant differences between the first- and second-generation Mexican-origin in high SES families given that they both have immigrant parents susceptible to pressures to “fit in.”

Overall, our second hypothesis expects a negative relationship between family SES and Mexican-origin children’s diet quality for the first- and second-generation, but a positive or

null association for the third-generation. This is depicted in Figure 1c. As with Hypothesis 1, among lower SES families, we hypothesize that children's nutritional quality is significantly lower among the second- and third-generation relative to first-generation children, while the gaps in nutritional quality are smaller in high SES families. Under this scenario, high family SES is not protective for first- or second-generation children but a risk factor.

In sum, we examine whether and how family SES moderates the association between generational status and Mexican-origin children's dietary quality. Theoretically, we anticipate change across subsequent generations in the United States as families' SES improves. Empirically, however, we have cross-sectional data with children of various generations in different families and variation in their current SES. This is standard in nationally-representative studies investigating generational differences in health. Thus, our analysis offers an initial test of whether Mexican-origin families' structural incorporation is associated with improvements or deteriorations in children's dietary quality. We investigate both "healthy" and "unhealthy" dietary patterns. First, we utilize a validated measure of overall dietary quality that allows for different cultural approaches to achieve a healthy diet. Second, we examine the extent children's diets are comprised of "empty calories" from solid fats, added sugars or alcohol.

Methods

Data and Sample

We tested these ideas using the demographic and day 1 dietary recall data of the continuous National Health and Nutrition Examination Survey (NHANES), a nationally representative, repeated cross-sectional study conducted by the Centers for Disease Control and Prevention. We use 10 years of cross-sectional data collected between 1999/2000 and 2009/2010. NHANES is the only dataset that allows us to examine this complex question because it is the only large, nationally-representative sample with detailed dietary information. Unfortunately, NHANES does not specifically provide data on the child's parents; instead it has limited information on the NHANES-designated "householder," the primary owner/renter of the dwelling unit. We rely on the householder's information to capture parental traits given that 85% of Hispanic children in the 2013 American Community Survey (ACS) are children of the householder (authors' calculations).

We restrict our analysis to children aged 5–17 who were Mexican-origin ($N = 5,478$). Because 9% of Hispanic children in the 2013 ACS are grandchildren of the householder (authors' calculations), we restrict our sample to youth living with a householder aged 55 or younger ($N = 5,152$) to better ensure that the householder is the child's parent. We also drop 331 youth due to reporting extreme total kilocalorie values on the dietary recall ($Kcal < 500$ or > 8000), and 22 youth who were pregnant. To appropriately handle missing data, we multiply imputed 10 data sets using Stata 13.0. Our final sample includes 4,799 Mexican-origin youth.

Diet Quality

NHANES dietary interviewers administer a 24-hour dietary recall in either English or Spanish. Children age 12 and older complete the dietary recall on their own, while children age 6–11 are assisted by a proxy. Proxy respondents report dietary data for children age 5 or younger and for those who cannot self-report.

We characterize the information collected in the 24-hour dietary recall using the 2010 Healthy Eating Index (HEI-2010). HEI-2010 is a validated summary indicator of the nutritional quality of each child's diet. It ranges from 1 to 100 and indicates the degree to which children's reported intake conforms to the guidelines recommended by the Center for Nutrition Policy and Promotion (CNPP) issued through the Department of Agriculture (USDA) and the Department of Health and Human Services (DHS). We construct the HEI-2010 index for the 1999/2000 – 2009/2010 NHANES data, using the SAS code provided by the National Cancer Institute through the U.S. National Institutes of Health (<http://riskfactor.cancer.gov/tools/hei/tools.html>).

We also examine children's "unhealthy" eating patterns by utilizing a transformed measure of the 2010 HEI empty calorie subscale. The empty calorie subscale captures the extent a person's total caloric intake derives from solid fats, added sugars, and alcohol. For our analyses, we reverse-code and rescale the original HEI empty calorie subscale; the original subscale ranges from 0 to 20 and higher values indicate a better diet with lower empty calorie consumption. Our transformed measure ranges from 0 to 5 and higher values indicate greater empty calorie consumption.

Generational Status

We subdivide Mexican-origin children into three groups, based on their own and the householder's nativity. We identify foreign-born children of immigrants (i.e., first generation youth), U.S.-born children of immigrants (i.e., second generation youth), and U.S.-born children of U.S.-born parents (i.e., third generation). In the analysis, second-generation youth are the reference category to more easily test whether they resemble their peers with immigrant parents (i.e., the first generation) or their peers born in the United States (i.e., the third generation).

Family Average Socioeconomic Status (SES)

We construct a composite measure of family SES by calculating the mean of a standardized measure of the householder's years of education and a standardized measure of the family's income-to-poverty ratio. To create the standardized measure of the householder's educational attainment, we transform the original educational credential categories into their equivalent years of schooling before standardizing it. To create the standardized measure of family income, we use the NHANES-calculated family income-to-poverty ratio, which is the ratio of the total income the family received in the year prior to NHANES's data collection to the official poverty threshold for the prior year for a family of their size. Because we standardize these measures within the Mexican-origin sample, one must recognize that the meaning of "low," "medium," and "high" SES in this study approximate being "poor," "working class" and "middle class" in a third-generation, non-Hispanic White sample. To

better illuminate generational differences in families' average SES, we present descriptive statistics for householders' educational attainment, families' income-to-poverty ratio, and whether the family lives in extreme poverty (DeNavas-Walt et al., 2006).

Controls

In multivariate models, we include controls for the child's age, sex (female=1) and whether the dietary recall day occurred on a Saturday or Sunday (weekend=1). In addition, we control for the householder's gender (female=1), age, and marital status (where married/partnered householders are the omitted category).

Data Analysis

Using Stata 13.0, we adjust all analyses for clustering and the stratified sampling design and use the NHANES interview weight. We estimate weighted means to describe the sample (Table 1) and OLS regression models to predict the overall HEI-2010 and the re-scaled empty calorie HEI subscale (Table 2). We begin with an additive model that includes both family socioeconomic status and generation. Next, we add interactions between SES and the child's generational status to assess whether the relationship between generation and these dietary indicators varies by SES. To better interpret the significant interaction effects, we graph the predicted values of each dependent variable by SES and generation while holding all other variables at their mean levels.

Results

Table 1 provides the weighted descriptive statistics for our full sample and for each generation. Seventeen percent of our sample is in the first generation ($n=904$), 46% in the second ($n=2,198$), and 38% in the third ($n=1,697$). In the full sample, the children's average age is 10.7 years and 48% are female. The mean level of overall dietary quality, measured by HEI-2010, is 44.04 for the full sample, and significantly higher ($p<.05$) among first- (45.74) and second-generation (45.06) Mexican-origin children relative to those in the third (42.03). The overall mean on the empty calories scale is 2.59. Third-generation Mexican-origin children consume significantly more empty calories than both first- and second-generation Mexican-origin children ($p<.05$); the mean on the empty calories scale is 2.41 for the first generation, 2.50 for the second, and 2.79 for the third. It is worth noting that, on average, all Mexican-origin children have more nutritious diets than a comparable sample of third-generation, non-Hispanic White children, whose mean scores on the HEI and empty calories scales are 41.13 and 2.97, respectively (not shown).

With each subsequent generation, Mexican-origin families' average SES is significantly greater ($p<.05$), such that third-generation Mexican-origin children have, on average, the highest SES (0.57) followed by second-generation Mexican-origin children (-0.20) and lastly first-generation Mexican-origin children (-0.43). These average SES differences correspond with significant differences in householder's education: 50% of first-generation and 39% of second-generation Mexican-origin children live with householders with less than a 9th grade education. In contrast, 45% of third-generation Mexican-origin children live with householders who attended college. Family income for first-generation Mexican-origin

children is, on average, at the official poverty line (i.e. 1.05), but over twice the poverty line (i.e., 2.24) for third-generation children and 40% higher than the poverty line for second-generation children (1.42). Finally, 19% of first-generation Mexican-origin children live in extreme poverty, whereas only 13% of second-generation and 8% of third-generation children do. While SES typically improves across generations, the average SES of third-generation Mexican-origin children is lower than that for third-generation, non-Hispanic Whites. Among third-generation White children, 62% live with a householder who attended college, average family income is nearly three times the poverty line, and only 3% live in extreme poverty. These distributional differences should be kept in mind when interpreting the findings below.

Our multivariate regression models predicting HEI-2010 are reported in the first two columns of Table 2. Similar to previous research, diet quality is lower for each subsequent generation in the additive model, Model 1. Compared with second-generation Mexican-origin children, dietary quality is significantly higher for the first generation ($b=2.42, p<.001$), and significantly lower for the third generation ($b=-3.38, p<.001$). Interestingly, the family's average SES does not significantly predict Mexican-origin children's overall dietary quality.

We next explore whether SES modifies the association between generation and overall dietary quality. Model 2 adds the interaction between generation and family SES. Among families with the very lowest SES, we continue to see dietary differences by generation whereby the first generation has the most nutritious diets ($b = 1.96, p<.01$) and the third generation has the least nutritious diets ($b = -3.80; p<.001$). Yet among higher SES families, the dietary differences across generations narrow, particularly for children in the third generation ($b = 1.45, p<.05$). Interestingly, the results indicate that there is no association between the family's average SES and children's dietary quality for first- and second-generation Mexican-origin children. Instead, regardless of family SES, first- and second-generation Mexican-origin children have relatively high-quality diets. The results are largely consistent with segmented assimilation theory (Hypothesis 1).

To better demonstrate these interaction effects, we graph predicted values in Figure 2 based on Model 2 for HEI. Despite the appearance of a slightly downward slope for the first-generation in Figure 2, the results indicate that there is no association between the family's SES and the child's dietary quality for either the first- or second-generation. We conducted several supplemental tests (not shown) to verify this null result: we truncated the upper-tail of the SES distribution to ensure that the regression line is not overly influenced by the few first-generation children in high-SES families; we allowed for discontinuities across the top and bottom of the SES distribution by including splines for SES with a node at the median; and we created SES quartiles for categorical comparisons. The supplemental results confirm that there is no significant difference in the link between SES and diet between the first and second generation. In sum, nutritional quality declines across generations among children in families with low family average SES, but not among children in families with higher SES.

Regarding the control variables in models predicting overall dietary quality, Mexican-origin girls have, on average, healthier diets than Mexican-origin boys, and younger children have

healthier diets relative to older children. As we might expect, children eat fewer healthy foods on the weekend relative to a weekday. Finally, children with a female (versus male) householder eat healthier, but neither the householder's age nor marital status is statistically significant.

We next explore generational patterns in Mexican-origin children's consumption of empty calories in the last two of columns of Table 2. We first describe the additive results in Model 1. Compared with second-generation Mexican American children, first-generation children consume fewer empty calories ($b = -0.18, p < .05$), while the third generation consumes more ($b = 0.30, p < .001$). Again, in the additive model, family SES is not statistically significant.

Model 2 examines whether the association between the consumption of empty calories and generational status varies by family SES. We find evidence that it does. Figure 3 graphs the predicted values for our empty calorie scale, where higher values indicate greater empty calorie consumption. While empty calorie consumption is greatest among third-generation Mexican-origin children with the lowest family SES ($b = 0.34, p < .001$), the generational differences in excess calories is smaller among high-SES families ($b = -0.16, p < .05$). These results align with segmented assimilation theory (Hypothesis 1): low-SES, Mexican-origin children in the third generation consume more empty calories than their low-SES, first-generation peers. Yet at high SES levels, Mexican-origin children's consumption of empty calories is similar across generations. Interestingly, we see no significant differences in the consumption of empty calories between first- and second-generation Mexican-origin children. Moreover, family SES is not a significant predictor of children's empty calorie consumption for the first or second generation despite the appearance of upward sloping lines in Figure 3.

Given the slopes' appearance, we further tested these null SES findings for the first and second generations using the supplemental tests mentioned above. The spline models and models using a truncated SES distribution support the null findings for the first and second generations, but the categorical SES specification suggests a different conclusion. Specifically, first-generation youth with a modestly higher SES (i.e., those in the second SES quartile) eat significantly more empty calories than their first-generation peers with very low SES, (i.e., those in the first SES quartile; $p < .01$), but there are no significant differences across these SES quartiles among second-generation youth. Thus, the categorical models offer tentative support for Hypothesis 2 at the bottom of the SES distribution for first-generation Mexican-origin children.

Similar to the patterns for predicting overall dietary quality, girls consume significantly fewer empty calories than boys, as do younger children relative to older children. In addition, children consume significantly more empty calories on the weekend versus a weekday. Only one householder trait is statistically significant. In the additive model (Model 1), Mexican-origin children living with a separated/divorced householder consumer significantly more empty calories relative to those living with a married/currently partnered householder.

Conclusions

This study makes three important contributions. First, it recognizes and exploits the variation within Mexican-origin families' SES to explore whether and how the links between generational status and children's diets vary by family SES. Although Mexican-origin families' SES is still generally lower than White families' SES, there is increasing socioeconomic diversity within the Mexican-origin population.

Second, it tests whether greater SES buffers against or accelerates Mexican-origin children's negative dietary acculturation. In general, we find evidence of segmented assimilation whereby negative dietary acculturation is concentrated among children in families who are the most disadvantaged, regardless of whether we predict overall nutritional quality (HEI-2010) or unhealthy eating (the empty calories scale). Furthermore, the patterns tend to work similarly for children in the first and second generations – the children of immigrant parents – but contrast with patterns for the third generation – children with U.S.-born parents. For both outcomes, we find significantly lower diet quality among third-generation Mexican-origin children in low-SES families relative to first- and second-generation Mexican-origin children, but no significant generational differences among high-SES families. There is, however, tentative evidence suggesting that greater SES can increase empty calorie consumption among first-generation Mexican-origin children: For this generation, children in the second SES quartile consume more empty calories than their peers in the first SES quartile.

One explanation for our findings supporting segmented assimilation theory is that poor children's nutritional risks could be very different in the U.S. versus Mexico. Obesity and obesity-promoting diets are on the rise in Mexico (Rivera et al., 2004), but in the early 2000s (the years of our study), obesity risks were higher among high-SES families in Mexico (Hernandez et al., 2003). At that time, Mexican children whose families were the most likely to migrate (i.e., those living in rural areas with poorer, less educated parents) tended to be much leaner than other children living in Mexico and Mexican-origin children living in the United States (Van Hook et al., 2012). Thus, it seems plausible that poor Mexican immigrants' preferences for more nutritious foods initially protect their children after migration to the United States. Across generations, these preferences are lost and the constraints facing poor Americans, such as food insecurity (Munger et al., 2014), low parental education (DeNavas-Walt et al., 2006), and living in disadvantaged neighborhoods (Dubowitz et al., 2008; Keita et al., 2009), likely lead to worse diets among the most disadvantaged Mexican-origin families.

Third, although data limitations make it impossible to follow immigrant families over time, our cross sectional analyses suggest that increases in SES are not uniformly associated with better nutrition for Mexican-origin children. Instead, family SES is generally unrelated to children's overall nutrition or empty calorie consumption among first- and second-generation Mexican-origin children. Yet for the third-generation, greater family SES is associated with better overall nutrition and lower empty calorie consumption. This suggests that social mobility for children in the third generation is associated with better nutrition.

In additional analyses (see Appendix Table 1), we estimated whether the findings for third-generation Mexican-origin children were driven more by family income or householder education. Neither the interactions with the householder's education (Model 4) nor those with the family's income-to-poverty ratio (Model 5) were statistically significant when predicting healthy eating (i.e., HEI-2010) or empty calorie consumption. Thus, the specific SES components seem less pertinent than the family's overall SES.

We conceptualize family SES as a unitary measure, akin to social class, but recognize that this could be problematic for immigrant families (i.e., those in the first- or second-generation). Although education frequently leads to greater earnings and family incomes (Becker, 1964), education may be less likely to translate into improved incomes for immigrants given their foreign credentials are often undervalued in the United States (Ragan & Bratsberg, 2002). We see evidence of this in our data. The correlation between our standardized measures of householder educational attainment and family income-to-needs ratio increase across generation, such that the weighted correlation is 0.28 for the first generation, 0.34 for the second generation, and 0.46 for the third generation. In supplemental analyses we allow these SES components to diverge by examining how children's diets are related to various combinations of householders' education level and families' poverty status. (Results not shown but available upon request). Results were generally consistent with the results presented here, but models using the family's average SES proved to be better-fitting models (based on the BIC value; Raftery, 1999).

This study is not without limitations. First, we cannot verify that the householder is the child's parent, nor do we have any information about other adults in the household, such as the child's other parent. Without information from both parents (or from the householder and their spouse), we misclassify some children as being in the third generation when they should be classified as being in the second generation. Thus, we have measurement error in generation status for some cases. Yet the risk to the analysis is that we are underestimating any significant differences in how family SES modifies the association between generation and Mexican-origin children's dietary quality. Second, the dietary data is self-reported amongst the older children (age 12+) and reported with the assistance of a proxy among the younger children (ages 5–11). In supplemental analyses, we control for whether the child's dietary data were proxy-assisted or proxy-reported, but the key findings are unchanged. (not shown but available upon request). Recent research with adults, however, has called into question the validity and reliability of self-reported dietary measures versus direct measurements (Dhurandhar et al., 2014). Third, we cannot directly test for generational patterns within the same families; instead we infer generational change from cross-sectional data. Fourth, we cannot account for the family's legal status, which is likely important for a host of health-related outcomes among first- and second-generation Mexican-origin children. Fifth, there are likely some social selection effects at work. Specifically, the results could be biased by the unobserved traits of low SES parents of third-generation Mexican-origin children. We cannot account for why some of the parents of the third-generation have such low levels of educational attainment and income, and the reasons for their relatively low SES (e.g., having health problems, a disability, or drug addiction) could account for the observed patterns. Finally, we cannot identify causality with these data, nor can we explore potential mechanisms because NHANES does not measure acculturation

directly. For third-generation Mexican-origin children, having a high SES could transform their lived experiences across multiple contexts (e.g., peers, schools, and neighborhoods), which could then lead to better nutrition.

Despite these limitations, the study makes important advances. We respond to the growing social and economic diversity within the Mexican-origin community by asking whether the documented patterns of dietary decline with increasing exposure to the U.S. are universal. Original conceptualizations of the role of acculturation for health predicted that immigrants' and their families' health would decline as they spent more time in the United States (Markides & Coreil, 1986; Rumbaut, 1994). Yet acculturation theories have moved beyond linear conceptualizations of the acculturation process (Abraído-Lanza et al., 2006; Acevedo-Garcia & Bates, 2008; Hunt et al., 2004; Murphey et al., 2014; Viruell-fuentes et al., 2012). We question whether greater SES can buffer children against these dietary declines or whether it might actually accelerate them. For both of our measures of dietary quality, our results largely suggest the former, namely that high-status parents of third-generation Mexican-origin youth can help buffer their children against dietary decline. Thus, as segmented assimilation theory would predict, immigrant families that successfully navigate and become incorporated into American society have more advantageous outcomes, while those that struggle face additional risks, including with regard to their children's health.

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Appendix

Appendix Table 1

OLS Models Predicting Healthy Eating Index (2010 HEI) and Empty Calories with Interactions between Generation and Socioeconomic Status among Mexican-Origin Children

	Healthy Eating Index (2010 HEI)			Empty Calories		
	Model 3	Model 4	Model 5	Model 3	Model 4	Model 5
<i>Generation (Ref = Second Generation)</i>						
First Generation	1.90 **	2.00	2.50 *	−0.13	−0.16	−0.10
Third Generation	−3.42 ***	−2.08 *	−4.47 ***	0.27 ***	0.21 *	0.39 ***
<i>Householder Educational Attainment (Ref = Some college or above)</i>						
Less than 9th grade	−1.18	−0.47	−1.23	−0.06	−0.09	−0.06
9th–12th (No diploma)	−1.83 **	−0.82	−1.79 **	0.14	0.12	0.14
High School Degree	−1.79 **	−0.17	−1.76 **	0.16 *	0.02	0.16 *
<i>First Generation</i>						
× Less than 9th grade	--	0.43	--	--	−0.06	--
× 9th–12th (No diploma)	--	−0.27	--	--	0.11	--
× High School Degree	--	−2.15	--	--	0.22	--
<i>Third Generation</i>						
× Less than 9th grade	--	−2.01	--	--	0.31	--
× 9th–12th (No diploma)	--	−1.75	--	--	−0.06	--
× High School Degree	--	−2.42	--	--	0.22	--
<i>Income-to-Poverty Ratio</i>						
Income-to-Poverty Ratio	−1.40 *	−1.42 *	−1.30 *	0.15 *	0.16 *	0.16 *
-squared	0.28 *	0.28 *	0.21	−0.03 *	−0.03 *	−0.02
<i>Income-to-Poverty Ratio</i>						
× First Generation	--	--	−0.66	--	--	−0.02
× Third Generation	--	--	0.56	--	--	−0.07
Child Female (=1)	1.27 ***	1.27 ***	1.26 ***	−0.10 **	−0.10 **	−0.10 ***
Child's Age	−0.49 ***	−0.48 ***	−0.49 ***	0.03 ***	0.03 ***	0.03 ***
Weekend Day (=1)	−1.60 ***	−1.61 ***	−1.63 ***	0.19 ***	0.19 ***	0.19 ***
Female Householder (=1)	0.78	0.76	0.76	−0.04	−0.04	−0.04
Householder Age	0.01	0.01	0.01	0.00	0.00	0.00
<i>Householder Marital Status (Ref = Married/Living with partner)</i>						
Widowed	−0.32	−0.03	−0.33	0.38	0.36	0.38
Separated/Divorced	−1.02	−0.99	−0.92	0.15	0.15	0.14
Never Married	0.75	0.80	0.90	−0.09	−0.09	−0.10

	Healthy Eating Index (2010 HEI)						Empty Calories					
	Model 3		Model 4		Model 5		Model 3		Model 4		Model 5	
Intercept	51.88	***	51.02	***	52.01	***	1.92	***	1.97	***	1.88	***

Source: 1999/2000–2009/2010 NHANES; Mexican-origin children age 5–17 with householders aged 55 or less, N = 4,799

*

p<.05;

**

p<.01;

p<.001.

Research Highlights

- Across generations in the U.S., the diets of Mexican-origin children worsen
- Does higher socioeconomic status (SES) buffer or accelerate this dietary decline?
- High SES, third-generation Mexican-origin children retain dietary advantages
- Low SES, third-generation Mexican-origin children have the least nutritious diets
- Findings align with Segmented Assimilation theory

a. Null Hypothesis – No Moderation by Family SES

Note: Dotted line indicates where there is little data support in the resource distribution.

b. Hypothesis 1 – Family SES Produces Segmented Assimilation

Note: Dotted line indicates where there is little data support in the resource distribution.

c. Hypothesis 2 – Family SES Accelerates Negative Dietary Acculturation

Note: Dotted line indicates where there is little data support in the resource distribution.

Figure 1.
Hypotheses

Figure 2.
Predicted Values for Overall Dietary Quality (2010 HEI) by Generation and Average SES

Figure 3.
Predicted Values for the Revised 2010 HEI Empty Calories Subscale by Generation and Average SES

Weighted Means and Proportions for Final Analytic Sample of Mexican-Origin Children

Table 1

	All Children (N =4,799)		1st Generation (N =904)		2nd Generation (N =2,198)		3rd Generation (N =1,697)	
	Mean/ Proportion	SD	Mean/ Proportion	SD	Mean/ Proportion	SD	Mean/ Proportion	SD
Healthy Eating Index (HEI; 0–100)	44.04	19.68	45.74	18.38	45.06	19.21	42.03	15.43
Empty Calories (0–5)	2.59	2.12	2.41	1.82	2.50	1.88	2.79	1.93
<i>Immigrant Generation</i>								
1st Generation	0.17		1.00		0.00		0.00	
2nd Generation	0.46		0.00		1.00		0.00	
3rd Generation	0.38		0.00		0.00		1.00	
<i>Average Socioeconomic Status (SES)</i>								
Average Socioeconomic Status (SES)	0.05	1.92	−0.43	0.93	−0.20	1.15	0.57	1.69
<i>Householder Educational Attainment</i>								
Less than 9th grade	0.28		0.50		0.39		0.05	
9th–12th (No diploma)	0.24		0.23		0.27		0.21	
High School Degree	0.22		0.14		0.18		0.29	
Some College	0.26		0.12		0.15		0.45	
<i>Family Income-to-Poverty Ratio</i>								
Family Income-to-Poverty Ratio	1.67	2.70	1.05	1.40	1.42	1.89	2.24	2.80
Living in Extreme Poverty (=1)	0.12		0.19		0.13		0.08	
<i>Child's Gender (female=1)</i>								
Child's Gender (female=1)	0.48		0.44		0.48		0.51	
<i>Child's Age (years)</i>								
Child's Age (years)	10.71	5.11	12.06	4.96	10.29	5.48	10.62	4.52
<i>Weekend Day (=1)</i>								
Weekend Day (=1)	0.43		0.53		0.43		0.39	
<i>Female Householder (=1)</i>								
Female Householder (=1)	0.41		0.28		0.38		0.51	
<i>Householder Age</i>								
Householder Age	37.32	13.80	36.71	12.93	37.90	12.73	36.89	12.36
<i>Householder Marital Status</i>								
Married/Living with partner	0.78		0.86		0.81		0.70	
Widowed	0.01		0.01		0.01		0.01	
Separated/Divorced	0.14		0.07		0.10		0.20	
Never Married	0.08		0.06		0.07		0.09	

Source: 1999/2000–2009/2010 NHANES, Mexican-origin children in the United States age 5–17 with householders age 55 or less.

Notes:

^a indicates that means significantly differ from 2nd Generation children at $p < 0.05$ (two-tailed t);

^b indicates that means significantly differ from 3rd Generation children at $p < 0.05$ (two-tailed t)

OLS Models Predicting Healthy Eating Index (HEI-2010) and Empty Calories with Interactions between Generation and Socioeconomic Status among Mexican-Origin Children

Table 2

	Healthy Eating Index (2010 HEI)		Empty Calories	
	Model 1	Model 2	Model 1	Model 2
<i>Generation (Ref = Second Generation)</i>				
First Generation	2.42 ***	1.96 **	-0.18 *	-0.13
Third Generation	-3.38 ***	-3.80 ***	0.30 ***	0.34 ***
Average SES	0.50	-0.04	0.03	0.09
× First Generation		-0.70		0.08
× Third Generation		1.45 *		-0.16 *
Child Female (=1)	1.29 ***	1.28 ***	-0.10 **	-0.10 **
Child's Age	-0.52 ***	-0.51 ***	0.04 ***	0.04 ***
Weekend Day (=1)	-1.59 ***	-1.63 ***	0.19 ***	0.19 ***
Female Householder (=1)	1.02 *	0.99 *	-0.06	-0.06
Householder Age	0.03	0.02	0.00	0.00
<i>Householder Marital Status (Ref=Married/Living with partner)</i>				
Widowed	-0.38	-0.34	0.36	0.36
Separated/Divorced	-0.87	-0.71	0.14 *	0.13
Never Married	0.80	0.97	-0.09	-0.11
Intercept	49.00 ***	49.19 ***	2.18 ***	2.16 ***

Source: 1999/2000–2009/2010 NHANES; Mexican-origin children age 5–17 with householders age 55 or less, N = 4,799

* p<.05;

** p<.01;

*** p<.001.