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Dietary Assimilation among Mexican Children in Immigrant Households: Code-switching and Healthy Eating across Social Institutions

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Abstract

Immigrant health assimilation is often framed as a linear, individualistic process. Yet new assimilation theory and structural theories of health behavior imply variation in health assimilation as immigrants and their families interact with different U.S. social institutions throughout the day. We test this idea by analyzing how two indicators of dietary assimilation—food acculturation and healthy eating—vary throughout the day as Mexican children in immigrant households consume food in different institutional settings. Using individual fixed effects models and data from the National Health and Nutrition Examination Survey, we find that Mexican children in immigrant households (N=2,337) engage in “dietary code-switching,” eating more acculturated but not necessarily less healthy food in schools and more acculturated but less healthy food in restaurants compared to homes. Findings advance theory and knowledge about how social institutions condition dietary assimilation in particular and health assimilation more broadly.

INTRODUCTION

Assimilation is a context-dependent process; the importance of declining ethnic distinctions for the well-being of immigrants and their children depends on the social institutions that they encounter daily (Alba and Nee 2003). For example, children of immigrants in the United States often use different languages when interacting with the two most central social institutions in their lives: their families and schools. They typically speak English at school, where English language use improves academic success and acceptance by peers, but often speak their parent’s native language at home, where language retention strengthens family relationships (Barrow and Markman-Pithers 2016). Thus, as part of the assimilation process, children of immigrants often code-switch, or jump symbolic group boundaries, in different institutional contexts (Lamont and Molnár 2002; Smith 2014; Waters 1999).

Such institutional influences have been well-documented in studies of linguistic (Arriagada 2005; Tran 2010) and educational assimilation (Pong and Hao 2007). Yet, the importance of social institutions has been underemphasized in the health assimilation literature despite the

well-established notion that social institutions matter for immigrant assimilation (Portes and Zhou 1993) and for health (Cockerham 2005). In fact, the health assimilation literature has been critiqued for de-contextualizing the health of immigrants and their children and privileging the role of individual characteristics (Abraído-Lanza et al. 2006; Viruell-Fuentes 2007). Most studies on this topic—particularly quantitative studies using cross-sectional data—miss contextualized dynamics of the health assimilation process because they generally assess it across years or immigrant generations. Such studies often depict health assimilation as a smooth, continuous, linear process whereby immigrants and their children gradually lose distinctive health advantages due to the adoption of an unhealthy lifestyle over time or generations (Antecol and Bedard 2006).

We advance theory and knowledge about health assimilation by exploring it as a nonlinear, uneven process that depends on daily interactions with social institutions. Our study integrates ideas from new assimilation theory (Alba and Nee 2003) and structural theories of health (Bird and Rieker 2008; Cockerham 2005) to motivate an analysis that leverages within-person data to study how institutional contexts shape dietary assimilation. This outcome is a particularly important as a marker of health assimilation because it contributes to lifelong food preferences and eating practices (Kelder et al. 1994; Mikkila et al. 2004; Nicklaus et al. 2004) that shape long-term health (Nicklas et al. 2001; Reedy et al. 2014). Further, the adoption of unhealthy foods associated with the “default American lifestyle” (Mirowsky and Ross 2010) is generally assumed to accompany dietary assimilation (Akresh 2007; Mirowsky and Ross 2010; Pérez-Escamilla and Putnik 2007; Satia-Abouta et al. 2002).

Mexican children in immigrant households are our focal group of interest for two reasons: Mexican-origin children are the largest subgroup of U.S. youth with foreign-born parents (Child Trends 2014) and Mexican children in immigrant households have among the highest childhood obesity prevalence in the U.S. (Van Hook, Baker and Altman 2009). We study two dimensions of their dietary assimilation: (1) food acculturation (Batis et al. 2011), or the degree to which they eat foods commonly eaten by children with U.S.-born householders and avoid foods typically eaten in their family’s origin country, and (2) healthy eating, or the extent to which they eat healthy food (like vegetables) and avoid unhealthy food (like sugar).

We make novel use of nationally representative data on children’s food intake across two days to investigate whether and how the diets of Mexican children in immigrant households vary across different social institutions that influence what they eat—families, schools, and restaurants. We use within-child fixed effects models to compare what a child eats at home to what that same child eats in school and restaurants. This approach eliminates bias due to between-person differences in unobserved food preferences and selection into settings where children consume food. This important innovation allows us to make greater inferences about the ways institutional contexts shape the diets of children in immigrant households. Findings offer theoretical and empirical insights into how everyday interactions with social institutions shape dietary assimilation and health assimilation, more generally.

BACKGROUND

Social Institutions and the Eating Behavior of Children in Immigrant Households

Children's eating behavior provides a useful lens for studying institutional influences on health assimilation because it reflects an interactive process between children and social institutions (Holsten et al. 2012). Families, schools, governmental institutions, and the food industry structure children's food options (Nestle 2013; Story et al. 2008). Parents and other caregivers further influence children's food choices through modeling, control, and guidance about food and eating (Birch and Fisher 1998). Yet, even at young ages, children are not passive actors in this process (Holsten et al. 2012). The food options that parents and schools provide are strongly influenced by children's food preferences (Holsten et al. 2012). Indeed, previous studies cite children's food preferences as one of the most important factors influencing children's food choices (Bassett, Chapman and Beagan 2008). Thus, children's diets reflect a "co-construction of choice" (Holsten et al. 2012; Neumark-Sztainer et al. 1999) arising from a combination of children's autonomy and caregivers' control (Bassett, Chapman and Beagan 2008). This suggests that children assert agency within a set of structured constraints when it comes to food choices.

Children in immigrant households face a range of food options and varying pressures that influence what they eat. As an important cultural commodity that signifies ethnic and cultural identities (Bourdieu 1984; DeSousey 2010; Gabaccia 1998), food offers immigrant families a simple but meaningful way to "do ethnicity" (Ramírez et al. 2017). Immigrant families maintain culinary practices from their countries of origin due to food preferences and to retain and pass on cultural traditions (Best 2017). However, immigrant families also incorporate new U.S. foods into their diets (Azar et al. 2013; Gabaccia 1998). This pattern of simultaneous dietary maintenance and adaptation is made possible by two contradictory features of the U.S. food environment: its diversity and standardization. The extensive immigration history in the U.S. has created considerable multiethnic and regional culinary variety, making it difficult to identify a national U.S. cuisine (Gabaccia 1998). Yet, at the same time, ten food companies account for more than half of total U.S. food sales (Lyson and Raymer 2000). This mass industrialization of food production has made the U.S. food environment more standardized than ever before, engendering a distinct "Americanized" way of eating (Ritzer 2008) that forms part of the unhealthy default American lifestyle (Mirowsky and Ross 2010).

As children of immigrants navigate the U.S. food environment, we argue that social institutions shape their dietary assimilation in the form of food acculturation and healthy eating. Our argument is consistent with Alba and Nee's (2003) new assimilation theory, which interprets individual agency as context-bound. Choices depend on institutional context, which structures the options and incentives available to individuals by shaping expectations for behavior, reinforcing norms, and rewarding conformity with social approval and a sense of group membership. This framework aligns with structural theories of health behavior that view decisions and actions at the family, community, and governmental levels as shaping individuals' health-related choices (Bird and Rieker 2008; Cockerham 2005).

New assimilation theory also specifies how institutional characteristics shape assimilation pathways and consequences. Social pressure to acculturate and bureaucratic imperatives for standardization within institutions can promote assimilation by incentivizing conformity to dominant norms and behaviors to gain social acceptance (Alba and Nee 2003). Public institutions such as schools can also shift assimilation pathways and consequences through formal regulations. This was the case after the Civil Rights Act of 1964, which prohibited explicit racial and ethnic discrimination, thus offering more upward socioeconomic mobility to immigrants through schools and labor markets.

These theoretical insights about the import of institutional characteristics have rarely been applied to indicators of health assimilation such as dietary assimilation. We argue that children in immigrant households engage in dietary code-switching as they interact with different social institutions throughout the day, which may have implications for the healthiness of their diets. Sociological theories of code-switching emphasize how individuals use racially, ethnically, or class coded behaviors to cross symbolic status group boundaries (DiMaggio 1982; Smith 2014; Waters 1999). In daily interactions, individuals draw selectively and often unconsciously on a repertoire of cultural tools—tastes, behaviors, language, and styles—to match the culture of a status group and institutional setting to reap social benefits (DiMaggio 1982; Streib 2017).

Code-switching—in both language and other behaviors—has been widely documented among children of immigrants, who describe “passing back and forth between identities” in their daily lives (Waters 1999; Portes and Rumbaut 2001). From an early age, children compare themselves to peers and particularly to children in majority reference groups (Portes and Rumbaut 2001; Waters 1999). They often use socially visible markers such as phenotype, language, clothing, and food to evaluate themselves and others (Best 2017; Portes and Rumbaut 2001). Although code-switching is most commonly associated with language use, it is also easy to do with food consumption as children navigate different social institutions. Dietary code-switching may also have important consequences for healthy eating given that prior research finds evidence of unhealthy dietary assimilation (Akresh 2007).

For the remainder of the paper, we refer to the institutional contexts where children eat as food settings, or places where people eat or obtain food (Story et al. 2008). We focus on the three most common food settings for children: home, schools, and restaurants. As summarized in Table 1 and detailed below, we expect food acculturation and healthy eating to vary across settings because of different levels of social pressure to acculturate, food standardization, and government regulation of nutritional quality in each setting.

Homes

Homes are the most central context of most children’s lives and serve as our reference setting because children consume the majority of their food there (Mancino et al. 2010). Parents and caregivers in the home operate as dietary gatekeepers and role models, influencing children’s eating behavior through food purchases, meal preparation, monitoring, rules, and socialization (Birch and Fisher 1998). Homes may partially insulate Mexican children in immigrant households from the U.S. food environment because parents

may encourage consumption of Mexican food for reasons of convenience (if that is the food served at home) and cultural tradition (Greder, de Slowing and Doudna 2012). If immigrant parents or other co-resident immigrant adults retain preferences for Mexican food and eat it at home, Mexican children in immigrant households likely do not face social pressure to consume standardized American food at home.

This does not mean that children in immigrant households are fully isolated from standardized American food at home. Immigrant parents purchase food from American stores and may have limited access to Mexican products. Immigrant families, like many U.S. families, often face financial and time constraints that make standardized American food a convenient option to serve at home. In addition, Mexican immigrants likely come to the U.S. with some familiarity with standardized American food due to its increasing presence in Mexico (Popkin 2006). Furthermore, children of immigrants develop preferences for U.S. food outside the home and may pressure parents to serve those foods (Greder, de Slowing and Doudna 2012).

Government regulations only indirectly influence the nutritional quality of meals eaten at home.¹ Instead, parents monitor children's food consumption at home (Brown and Ogden 2004; Golan and Crow 2004), overseeing foods purchased, ingredients in home-cooked meals, and the quantity consumed. Although the healthiness of home meals varies widely, such as by family socioeconomic status (Martin, Van Hook and Quiros 2015), a higher frequency of home meals is generally associated with a healthier diet (Wolfson and Bleich 2015).

The combination of low pressure to acculturate, external forces leading parents to serve at least some standardized American food, and the lack of government regulation of home meals leads to two expectations about home meals. As shown in Column 1 of Table 1, we expect food acculturation to be low during home meals because of low pressure to acculturate and home meals to be moderately healthy because parents have some oversight over what children eat (Li et al. 2012). Additionally, there may be nutritional advantages of a traditional Mexican diet (Batis et al. 2011), which might increase the healthiness of home meals if they rely on such food.

Schools

Schools are second only to families as an organizing institution in children's lives (Duncan, Boisjoly and Harris 2001). Schools expose children to U.S. peers and serve as a primary site of social incorporation for children of immigrants (Pong and Hao 2007). Schools also impose uniformity on children and are heavily regulated by the government. Thus, children in immigrant households likely eat different foods in schools versus homes.

In school, children of immigrants may face strong social pressure to acculturate and conform to mainstream U.S. norms because classmates monitor what they eat (Salazar 2007) and

¹There is some nutritional regulation of families participating in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). WIC benefits can only be used to purchase food that complies with Food and Drug Administration (FDA) nutrition standards. Yet only pregnant women, breastfeeding women, and children aged 5 and under are eligible for WIC benefits (USDA Food and Nutrition Service 2018), which limits the scope and federal oversight of home meals.

because being different can lead to bullying (Peguero 2009). As a marker of ethnicity, food can create internal conflicts for children in immigrant households who may feel that members of dominant groups question their American identity (Guendelman et al. 2011; Salazar 2007). Guendelman et al. (2011) found that Asian American students reported that they would feel embarrassed if white peers saw them consuming foods from their parents' origin countries and that consuming typical American foods offered a way to assert an American identity. Thus, social pressure for children of immigrants to eat typical American food at school is likely high.

Structural forces also impose uniformity upon school foods. Limited budgets lead schools to purchase frozen, pre-processed meals from large-scale national distributors to minimize costs, maximize efficiency, and appeal broadly to American children. These factors produce highly standardized school cafeteria menus (Poppendieck 2010) that likely foster food acculturation among children in immigrant households.

Government regulations exist to ensure the healthiness of foods served in schools. The federal government's National School Lunch Program (NSLP) and the School Breakfast Program (SBP) require that school meals meet nutritional standards set by the U.S. Department of Agriculture (USDA). Although school meals exceed USDA recommended limits for less healthy items such as saturated fat and sodium, school meals meet consumption recommendations for most nutrients and food groups (Crepinsek et al. 2009). Additionally, NSLP participants are more likely to consume fruits, vegetables, and milk and less likely to eat dessert than non-participants (Condon et al. 2009).

As shown in Column 2 of Table 1, high social pressure to acculturate and highly standardized food offerings in schools leads to the expectation that food acculturation will be higher during school meals than during home meals. We also expect school meals to be fairly healthy—perhaps even healthier than home meals—due to high government regulation of nutritional quality.

Restaurants

As free-market institutions, restaurants generate a profit for owners by appealing to consumer tastes. Although restaurants vary in the types of foods served, we expect that overall, restaurants will promote food acculturation because they are public settings where social pressure to acculturate is high (Guendelman, Cheryan and Monin 2011). Social pressure may be lower in Mexican restaurants, but only 8% of U.S. restaurants specialize in Mexican cuisine (CHD Expert 2014).

Additionally, most restaurants depend on national food distribution systems that increase efficiency and control prices, but also lead to relatively standardized menu options (Ritzer 2008). For example, nearly every restaurant chain offers similar children's menu items (e.g., chicken nuggets). These market forces mean that restaurant meals likely consist of more standardized American fare than home meals do.

Restaurant meals are also likely to increase unhealthy eating. Restaurant food is not subject to government regulation of nutritional quality; restaurants must follow only basic food

safety standards. Although regulations now require more nutritional labeling of some restaurant food (Burton et al. 2006), restaurants are not barred from serving unhealthy food, which continues to sell well (Krukowski et al. 2006). Restaurant food is also engineered to maximize sales by adding sweeteners and salt (Ortiz, Zimmerman and Gilliam 2015). Evidence consistently shows that restaurant food contains more calories overall, more fat and saturated fat per calorie, and less fiber, calcium, and iron per calorie (Anzman-Frasca et al. 2017; Guthrie, Lin and Frazao 2002). Among U.S. children, food eaten away from home is also associated with poorer overall dietary quality (Mancino et al. 2010), higher energy density (Bowman and Vinyard 2004), greater caloric intake (Paeratakul et al. 2003) and soda consumption (French et al. 2001), and lower consumption of fruits and vegetables (Sebastian, Wilkinson Enns and Goldman 2009).

Column 3 of Table 1 shows our expectations for restaurant meals. The combination of moderate to high social pressure to acculturate, moderate to high food standardization, and limited government regulation of nutritional quality leads us to expect that restaurant meals will be associated with moderately higher food acculturation and lower levels of healthy eating compared to home meals.

DATA AND METHODS

Data and Analytic Sample

We used data from the 2003/04–2013/14 Continuous National Health and Nutrition Examination Survey (NHANES), a nationally representative, repeated cross-sectional study conducted by the Centers for Disease Control and Prevention. NHANES administered two 24-hour dietary recall interviews in English or Spanish 3 to 10 days apart (Blanton et al. 2006; Conway et al. 2003; Moshfegh et al. 2008), with the first recall conducted in person and the second by phone.

Respondents reported detailed information about all foods and beverages consumed over the two 24-hour periods, including the food or beverage, amount consumed (converted to grams), food sources, meal type, and the time of day for each meal. Trained interviewers used an extensive set of prompts to help respondents recall foods consumed. Children ages 12 and older completed the dietary recall on their own; children ages 6–11 completed the recall with the adult most familiar with the child's food intake. Interviewers provided respondents with measuring tools such as thickness sticks, bowls, cups, and spoons to help estimate the amount of food consumed. To convert the consumed amounts into grams, NHANES coders used the USDA Food and Nutrient Database for Dietary Studies, a database of approximately 13,000 foods and their weight in grams for typical portions (National Center for Health Statistics 2014). Although dietary recall data are susceptible to recall bias and social desirability bias from self- and proxy-respondents (Dhurandhar et al. 2015; Kirkpatrick and Raffoul 2017), they represent the best current method for obtaining dietary data from large samples (Subar et al. 2015).

From the dietary recall data, we created two analytic data files: a child-level sample and a child-meal-level sample. We restricted the child-level sample to Mexican children in immigrant households ages 6–18 who reported attending school during the school year

(N=2,350). NHANES does not include direct information about parental nativity, so we classified Mexican-origin children with a foreign-born head of household as children in immigrant households. Our analysis of the American Community Survey indicates that the large majority (86%) of Mexican-origin children's householders are parents. We excluded pregnant girls (N=9) and children with nonexistent or unreliable dietary recalls (i.e., fewer than 500 or more than 8000 calories in the day) (N=4), leading to a final sample of 2,337 children.

We constructed a child-meal sample to predict within-child variation in eating behavior across settings. We defined meals as any eating occasion: breakfast, lunch, dinner, and snacks. The child-meal sample included a record for each meal reported for each child. Each record summarized the food consumed from each meal, its source, and the setting in which it was consumed. The child-meal sample included 20,786 child-meals, with an average of 10.6 meals per child consumed across two dietary recall days. As shown in Table 2, 62% of records are "regular" meals—22% breakfasts, 20% lunches and 20% dinners—and the remaining 39% are snacks, for an average of 2.2 snacks per day.

Measures

Dependent variables.—We measured eating behavior with several variables. Two variables captured food acculturation. We used the Food Similarity Index (FSI) to estimate the similarity of the foods consumed in a given meal to the foods most commonly consumed by the child's same-aged U.S.-born peers with U.S.-born householders (i.e. third-plus generation children) (Van Hook, Quiros and Frisco 2015). To construct FSI, we rank ordered each food and beverage item (measured with USDA 5-digit categories) according to the proportion of children with U.S.-born householders that consumed it (i.e., 1 = most commonly consumed food, 2 = second most commonly consumed food, etc.). The top five most commonly consumed foods among all children with U.S.-born householders include soda, low-fat milk, pizza, ketchup, and white bread. For each meal, we calculated the average rank scores of the food consumed and reverse-coded the average so that higher values indicate greater similarity to the foods eaten by the average child with a U.S.-born householder. The final score was converted to a percentile and normed relative to same-aged third-plus generation peers, such that a value of 50 indicates that a particular meal was as American as the food eaten by the median child with a U.S.-born householder in the same age group. One advantage of using the FSI is that it builds in a comparison to third-plus generation children to assess food acculturation, eliminating the need to empirically model dietary differences for children from different immigrant generations, as is common in most cross-sectional research on health assimilation.

Our second indicator of food acculturation, "Mexican food," measured the consumption of traditional Mexican foods. To create this measure, we used a systematic two-step process. We first identified any potential Mexican foods, and then excluded foods (1) more identified with other Latino cultures and cuisines (e.g., *pupusas*), (2) "Tex-Mex" foods (e.g., nachos, fajitas), (3) foods available in supermarkets that are also widely consumed by other national origin groups (e.g., beans, rice), and (4) foods ubiquitous to all U.S. supermarkets (e.g., tortillas, salsa, tortilla chips). We then summed the total number of grams of Mexican food

children consumed per meal. Given the third and fourth restrictions, this measure is a conservative measure of Mexican food consumption.

We used four measures of healthy eating. Two measures captured consumption in grams of two USDA-recommended healthy food groups: vegetables and non-sweetened fruits (HHS and USDA 2015). Vegetable intake excluded potatoes, ketchup, tomato sauce, and other condiments, and fruit intake excluded fruits with added sugar. The other two measures captured consumption in grams of sugar-sweetened beverages and sugar, which the USDA discourages (HHS and USDA 2015).

Independent variables.—We determined the food setting of each meal based on whether the meal was eaten at home, the primary source of the food (e.g., school cafeteria, restaurant), and the timing of the meal. Home meals (reference) are those consumed at home. School meals are those consumed away from home during school hours (i.e., Monday through Friday between 8AM and 3PM) and purchased from the school cafeteria (which included food sold as part of the NLSP and SBP and competitive foods). Restaurant meals are those consumed away from home and purchased from a restaurant (table service or fast food). Other meals are all other meals consumed away from home. The other meals category included a diverse range of mostly public food settings, such as sports and entertainment facilities and street vendors.

To provide further depth about the association between food settings and dietary behavior, we also used a more detailed classification scheme for restaurant and school meals in a second set of models. For those models, we disaggregated restaurant meals into fast food and table service restaurant meals. We also identified meals consumed during school hours but not sourced from the school cafeteria (which were included in the other meals category in the classification scheme described above).

Control variables included whether the meal occurred on a weekday (=1), on the first day of the dietary recall (=1), and its type (i.e., breakfast, lunch [reference], dinner, or snack). Because we used a within-person modeling strategy (described below), we did not control for other child-level demographic variables such as sex, age, and household socioeconomic status that do not vary within individual children between the two days of dietary recall.

Analytic Strategy

We first produced descriptive statistics for the child and child-meal samples. We next estimated fixed effects models predicting each outcome as a function of food settings and control variables using the child-meal sample. Child fixed effects models are preferred to OLS regression models for two reasons. First, fixed effects models address problems of non-random assignment of observations to key independent variables (Allison 2005; Johnson 2005) – here the non-random assignment of children to eating in particular food settings (e.g., eating out at restaurants versus eating at home) based on difficult-to-measure underlying child and family-level traits (e.g. financial constraints). Second, fixed effects models remove bias that would result from the omission of difficult-to-measure time-invariant individual traits, such as food preferences, that vary across children (Allison 2005; Johnson 2005). Because the two dietary recall interviews occurred within 3 to 10 days of

each other, we confidently assume that important, but unobserved traits affecting children's eating behaviors, such as food preferences or welfare program participation, remained stable between the two interviews. Fixed effects models are also preferred to lagged dependent variable models because fixed effects results are robust to measurement error and omitted variables unlike lagged dependent variable models (Johnson 2005).

The child fixed effects models examined variation in children's eating behavior across settings. The food a child eats at home served as the reference for the food the child consumed in other settings. The model is as follows:

$$D_{im} = a + B_1 S_{im} + B_{im} Z_{im} + e_i \quad (\text{eq. 1})$$

where D_{im} is child i 's diet outcome at meal m , S_{im} is a set of dummy variables indicating the food setting, Z_{im} is the set of control variables, and e_i is an individual-level error term.

We conducted all analyses in Stata 14.0. Because there were few missing values (less than 1% of cases among those with valid dietary recalls), we used listwise deletion to handle missing values. We weighted all analyses using the dietary recall weight.

RESULTS

Descriptive Results

Panel A of Table 2 provides child-level descriptive statistics. A key point is that Mexican children in immigrant households eat the majority (67%) of their food during home meals, followed by "other" (16%), school (15%), and restaurant meals (2%). As shown in Panel B, the distribution of meals across food settings is nearly identical in the child-meal-level data.

Panel B also shows descriptive statistics for the dietary outcomes. Mexican children in immigrant households have a mean FSI of 52, which indicates that, on average, they eat foods that are similar to those of the median child with a U.S.-born householder. They also eat relatively little Mexican food (mean $\approx$ 25 grams) per meal, though there is substantial variation around the mean. For reference, a small corn tortilla is approximately 28 grams (USDA 2015). In terms of healthy eating at each meal, they eat approximately 8 grams of vegetables (about 1/3 cup of raw spinach), 37 grams of whole fruits (about 1/3 of a banana), 72 grams of sugar-sweetened beverages (about 2.5 ounces), and 25 grams of sugar (about 6 teaspoons).

Multivariate Results

Table 3 displays coefficients from fixed effects models predicting FSI (Column 1) and Mexican food consumption (Column 2). The FSI of school meals and restaurant meals is markedly greater than the FSI of home meals ($\beta = 19.29, p < .001$ and $\beta = 12.23, p < .001$), respectively). The FSI of school meals is also significantly greater than that of restaurant meals, as denoted by superscript "a" superscript (models available upon request).

Results in Column 2 of Table 3 show that Mexican children in immigrant households consume the most Mexican food at home. They eat approximately 27 fewer grams of Mexican food during school meals ($\beta = -27.67$, $p < .001$) and 18 fewer grams of Mexican food during restaurant meals ($\beta = -17.80$, $p < .001$). The difference between school and restaurant meals is also statistically significant, with children consuming fewer grams of Mexican food during school meals compared to restaurant meals.

Table 4 reports findings from models predicting the four indicators of (un)healthy eating in grams. For ease of discussion, we review results by setting (i.e. across models) rather than separately by outcome. Mexican children in immigrant households consume significantly more grams of fruit ($\beta = 16.57$, $p < .001$; Column 2) and fewer grams of sugar-sweetened beverages ($\beta = -57.27$, $p < .001$; Column 3) during school meals compared to home meals, but sugar consumption is approximately 1 teaspoon higher during school meals ($\beta = 4.06$, $p < .001$; Column 4; 4.2 grams = 1 teaspoon). The decrease in sugar-sweetened beverage consumption is quite large (over a third of a standard deviation), whereas the increases in fruit consumption and sugar consumption are more modest. There is no significant difference in vegetable consumption between home and school meals.

When comparing restaurant and home meals, Mexican children in immigrant households consume significantly more sugar-sweetened beverages ($\beta = 94.42$, $p < .001$; Column 3) and sugar ($\beta = 11.49$, $p < .001$; Column 4) during restaurant meals. Yet, there are no significant differences in vegetable (Column 1) and fruit (Column 2) consumption between restaurant and home meals. Superscript “a” indicates that restaurant and school meals also differ significantly with respect to healthy eating. School meals include more grams of fruit, fewer grams of sugar-sweetened beverages and less sugar than restaurant meals.

Finally, meals in other settings are less healthy relative to home meals. Mexican children in immigrant households consume less fruit ($\beta = -12.34$) and more sugar-sweetened beverages ($\beta = 31.97$, $p < .001$; Column 3) and sugar ($\beta = 1.58$, $p < .001$; Column 4).

Table 5 reports estimates from models using the more detailed indicators of school and restaurant meals. Both types of school meals are associated with lower Mexican food consumption ($\beta = -28.03$, $p < .001$ and $\beta = -15.15$, $p < .001$; Column 2), but only school cafeteria meals are associated with significantly higher FSI relative to home meals ($\beta = 19.34$, $p < .001$; Column 1). Non-cafeteria school meals are associated with lower vegetable ($\beta = -3.45$, $p < .05$; Column 3) and fruit consumption ($\beta = -11.15$, $p < .01$; Column 4) and higher sugar-sweetened beverages than home meals ($\beta = 29.94$, $p < .001$; Column 5), whereas school cafeteria meals are associated with higher fruit consumption ($\beta = 16.64$, $p < .001$; Column 4) and lower sugar-sweetened beverage consumption ($\beta = -57.39$, $p < .001$; Column 5).

Table 5 further shows that fast food restaurants drive the positive association between FSI and restaurant meals and the negative association between Mexican food consumption and restaurant meals reported in Table 4. However, meals from table service restaurants are associated with significantly higher consumption of Mexican food ($\beta = 27.86$, $p < .001$; Column 2). Both fast food and table service restaurants are associated with consuming more

sugar-sweetened beverages ($\beta=89.82$, $p<.001$ and $\beta=104.71$, $p<.001$; Column 5) and sugar ($\beta=10.21$, $p<.001$ and $\beta=14.41$, $p<.001$; Column 6).

Supplementary Analyses

We conducted sensitivity analyses to test whether results differ by age (Table A1), sex (Table A2), nativity (Table A3), socioeconomic status (as defined by receipt of free or reduced-price school lunch) (Table A4), and WIC receipt (Table A5). To estimate these models, we included an interaction between the characteristic of interest and food settings. Because fixed effects models implicitly control for time-invariant predictors, the main effects for the characteristics that we interacted with food settings are not directly estimated. Findings reveal few significant interactions, suggesting that results across these characteristics are generally consistent with results from Tables 3 and 4.

We also compared the associations between food settings and dietary outcomes of Mexican children in immigrant households to those of Mexican, black, and white children with U.S.-born householders (Table A6). The results indicate that patterns of healthy eating across food settings are largely similar for racial/ethnic-nativity groups (with some differences in the strength of the associations), but that patterns of food acculturation are not. FSI is greater and Mexican food consumption is lower for school meals compared to home meals among Mexican children in immigrant households, but these gaps are significantly smaller for Mexican, White, and Black children with U.S.-born householders. This suggests a stronger acculturating role of schools for Mexican children in immigrant households.

DISCUSSION

The growing population of children of immigrants in the U.S. has deepened interest in how health assimilation occurs. Yet, what is known about health assimilation has been largely gleaned from studies examining how health behaviors vary by individual characteristics such as duration of U.S. residence or immigrant generation. Much less attention has been paid to the ways that institutions shape health assimilation (Abraído-Lanza et al. 2006; Viruell-Fuentes 2007; Viruell-Fuentes, Miranda and Abdulrahim 2012).

Heeding calls to move beyond individualistic explanations and toward structural models of immigrants' health (Abraído-Lanza et al. 2006; Viruell-Fuentes, Miranda and Abdulrahim 2012), we integrate insights from new assimilation theory (Alba and Nee 2003) and structural theories of health behavior (Bird and Rieker 2008; Cockerham 2005) to better understand the role of social institutions in the dietary assimilation of Mexican children in immigrant households. We argue that three institutional characteristics—social pressure to acculturate, food standardization, and government regulation of nutritional quality—guide food acculturation and healthy eating. We make innovative use of nationally representative dietary recall data to conduct a within-person analysis of children's eating behavior that examines how food acculturation and healthy eating vary across home, school, and restaurants. In contrast to most previous studies that assess health assimilation across years or immigrant generations, our study reveals the contextualized dynamics of dietary assimilation as it takes place in the daily lives of Mexican children in immigrant households. Our findings make three important contributions, namely that social institutions are critically

important for dietary assimilation, that dietary assimilation is not a smooth, unidirectional process, and that unhealthy eating does not necessarily accompany food acculturation.

Consistent with our expectations, we find that school meals are more acculturated and include less Mexican food than home meals. This finding aligns with prior research demonstrating that immigrant families maintain cultural traditions at home (Foner 1997; Ramírez et al. 2017) and that schools and classmates incentivize conformity to mainstream U.S. norms and behaviors (Carrillo 2008; Hamm, Bradford Brown and Heck 2005). Of note is that only school meals sourced from the school cafeteria are associated with higher FSI; non-cafeteria school meals have no significant association with FSI. This pattern underscores the strong acculturating influence of the standardized offerings in school cafeterias. Conversely, all meals consumed during school hours—whether they are from the cafeteria or not—are associated with eating less Mexican food, suggesting that even children who bring their own food to school might seek to minimize consumption of Mexican food in front of peers.

School meals influence healthy eating in some positive ways. Relative to home meals, school meals are associated with greater fruit consumption and lower sugar-sweetened beverage consumption. However, there is no significant difference in vegetable consumption and a modest increase in sugar consumption during school meals versus home meals. In contrast, non-cafeteria school meals are associated with reduced fruit and vegetable consumption and increased sugar-sweetened beverage consumption relative to home meals. These contrasts highlight how the formal nutritional regulation in schools can potentially foster healthy eating among Mexican children in immigrant households even alongside food acculturation. Thus, these findings provide an important counterpoint to prior studies that suggest that unhealthy eating must accompany food acculturation (Akresh 2007; Batis et al. 2011). However, schools may still indirectly influence unhealthy food acculturation, as some immigrant mothers report, by influencing children's food preferences via exposure to peers' unhealthy eating or to unhealthy foods in schools (Greder, de Slowing and Doudna 2012).

Restaurant meals occupy a middle ground between schools and homes with respect to food acculturation. The FSI score of restaurant meals is significantly greater than home meals but lower than school meals. The consumption of Mexican foods is lower in restaurant meals than home meals but higher than school meals. However, this pattern is largely driven by fast food restaurant meals. In contrast, the FSI of meals from table service restaurants does not differ significantly from that of home meals, and Mexican food consumption is higher during meals from table service restaurants compared to home meals. This suggests that Mexican immigrant families frequent both restaurants serving traditional Mexican food and fast food restaurants serving standardized U.S. foods. This finding highlights the complexity of the health assimilation process by suggesting that children of immigrants code-switch not only across institution types but also within institution types.

With respect to healthy eating during restaurant meals, Mexican children in immigrant households consume more sugar-sweetened beverages and sugar in restaurants than at home. However, contrary to our expectations, there are no significant differences in fruit and vegetable consumption between restaurant and home meals. This too may reflect variation in

the types of restaurants that children patronize. Mexican restaurants may serve meals that include more beans, vegetables, and fruits than other restaurants (Batis et al. 2011). In addition, if Mexican immigrant householders incorporate pre-packaged and processed foods into home meals, it may reduce children's vegetable and fruit consumption at home.

Our findings illuminate the process of dietary assimilation and also raise important themes for understanding health assimilation more generally. First, dietary assimilation is fluid and context-dependent, as evidenced by the setting-based variation we observed. Just as food acculturation and healthy eating vary across homes, schools, and restaurants, other health behaviors such as smoking, sedentary activity, and physical activity could also vary across institutional contexts.

Second, findings show that dietary assimilation is not a unidirectional process signifying the abandonment of Mexican dietary customs. Instead, Mexican children in immigrant households engage in dietary code-switching, traversing symbolic boundaries as they move through different institutional settings throughout the day. The acquisition of different cultural competencies likely allows children in immigrant households to navigate different food settings and incorporate dietary elements from both the U.S. and their family's origin countries (Salazar 2007). Understanding how social institutions can help Mexican children of immigrants retain healthy components of both dietary traditions may be key in promoting successful healthy eating interventions among this population.

Finally, our study informs debates about whether food acculturation equates to unhealthy eating. Findings suggest that unhealthy eating does not always accompany food acculturation as prior research often suggests (Ayala, Baquero and Klinger 2008; Batis et al. 2011; Satia-Abouta et al. 2002; Satia 2010). Institutional factors matter. For example, the finding that school meals are highly acculturated but also include more fruits and less sugar-sweetened beverages shows how formal regulation can mitigate some negative effects of food acculturation. To further test this notion, we conducted supplementary analyses investigating whether the association between school meals and healthy eating changed following the 2013–2014 implementation of the Healthy Hunger-Free Kids Act, the first major reform of school nutrition standards in 30 years (USDA Food and Nutrition Service 2017). Results (available upon request) show that the positive association between school meals and fruit consumption significantly increased after HHFKA implementation, in line with other early evidence about this policy (Cohen et al. 2014; Schwartz et al. 2015). These results highlight the potential role of school meals in healthy eating interventions for this population.

Certain study limitations warrant mention. First, there are potential unobserved sources of variation. NHANES does not provide information about householder's duration of U.S. residence, whether the householder is the child's parent, whether the child lives in a multigenerational household, the people present during meals, the geographic location of the food setting, or the share of immigrants in children's schools or neighborhoods. Having more geographic detail would be particularly important as it would allow for further contextualization of food settings. Mexican children in immigrant households who live or attend school in immigrant enclaves may experience less variation in food acculturation

across food settings due to greater availability of and social acceptability around consuming Mexican food. If this is the case, then our findings about food acculturation are likely conservative. Second, we can only identify Mexican-origin children in the NHANES, so we cannot know if findings apply to children from other national origins. New assimilation theory leads us to expect similar patterns, but the degree of diet differentiation across food settings could depend on how dissimilar U.S. dietary practices are to immigrants' countries of origin. Finally, the cross-sectional nature of NHANES also means that we cannot assess how social institutions influence long-term eating behavior. However, childhood food preferences track into adulthood (Nicklaus et al. 2004), so findings provide valuable insight into formative stages of dietary development.

Despite these limitations, findings advance knowledge about how social institutions influence dietary assimilation. Institutions create incentives and constraints that promote code-switching across meals, which leads to diverse consequences of food acculturation for healthy eating. Institutions shape this process, and formal nutritional regulation helps ensure that food acculturation is not always synonymous with unhealthy eating. These insights demonstrate the critical interplay between individual health behaviors, social institutions, and the daily, micro-level dynamics that undergird the larger arc toward health assimilation across generations.

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Appendix

Table A1.

Age Group and Food Setting Interactions from Fixed Effects Models Predicting All Outcomes, Mexican Children in Immigrant Households, Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar					
	(1)		(2)		(3)		(4)		(5)		(6)					
Food setting (Ref=Home meals)																
School meals	21.92	1.311	***	−26.42 (3.01)	***	−0.63	1.602	18.12	3.425	***	−58.329	5.9721	***	4.527	0.823	***
Restaurant meals	12.352	2.305	***	−10.59 (5.30)	*	−4.011	2.8172	0.2325	6.024		105.38	10.502	***	13.82	1.448	***
Other meals	2.155	1.179		−6.34 (2.71)	*	−0.564	1.4416	−8.639	3.082	**	33.64	5.3743	***	3.952	0.741	***
Age group (Ref=6–11)																
12–14	--	--		--	--	--	--	--	--		--	--		--	--	
15–18	--	--		--	--	--	--	--	--		--	--		--	--	
Age group * Food setting interactions																
School * 12–14	−2.529	2.227		0.27 (5.12)		−7.288	2.7224	−8.005	5.821		−23.785	10.149	*	−5.869	1.399	***
School * 15–18	−2.189	2.441		−4.50 (5.61)		−3.444	2.984	−21.5	6.38	**	15.17	11.124		−4.718	1.534	**
Restaurant * 12–14	1.6005	3.896		−1.31 (8.95)		3.2973	4.7619	−10.56	10.18		42.813	17.752	*	−0.262	2.448	
Restaurant * 15–18	1.8889	3.321		−4.72 (7.63)		6.5779	4.059	−13.09	8.679		22.156	15.132		−1.596	2.086	
Other * 12–14	−1.977	2.035		1.72 (4.68)		−1.382	2.4881	−5.526	5.32		7.4613	9.2757		−1.405	1.279	
Other * 15–18	−4.162	1.904	*	−0.67 (4.38)		−1.068	2.3268	−14.94	4.975	**	14.803	8.6745		−2.68	1.196	*
Meal type (ref=Lunch)																

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar	
	(1)		(2)		(3)		(4)		(5)		(6)	
Breakfast	6.6108	0.822 ***	-24.74	(1.89) ***	-15.79	(1.0053) ***	6.8822	2.15 **	-84.621	3.7479 ***	2.764	0.517 ***
Dinner	-1.28	0.88	-1.17	(2.02)	-1.563	(1.0751)	-10.54	2.299 ***	-13.384	4.008 **	-0.066	0.553
Snack	7.6004	0.781 ***	-40.16	(1.79) ***	-17.73	(0.9544) ***	5.4704	2.041 **	-80.122	3.558 ***	-6.712	0.491 ***
Dietary recall characteristics												
Day 1	-1.116	0.569 *	2.70	(1.31) *	-1.988	(0.6953) *	-2.796	1.487	6.7202	2.5919 ***	-0.357	0.357
Weekend	0.2214	0.791	2.59	(1.82)	-0.728	(0.9672) *	0.0057	2.068	15.836	3.6059 ***	1.701	0.497 **
Constant	45.848	0.762 ***	45.16	(1.75) ***	21.89	(0.93) ***	37.614	1.992 ***	120.24	(3.47) ***	26.87	0.479 ***

N=20,786 person-meals

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014 Note: Standard errors in parentheses.

* p<.05;

** p<.01;

*** p<.001

Table A2.

Sex and Food Setting Interactions from Fixed Effects Models Predicting All Outcomes, Mexican Children in Immigrant Households, Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar	
	(1)		(2)		(3)		(4)		(5)		(6)	
Food setting (Ref=Home meals)												
School meals	21.67	(1.40) ***	-27.38	(3.21) ***	-1.43	(1.71)	9.02	(3.65) *	-65.88	(6.36) ***	1.47	(0.88)
Restaurant meals	14.57	(2.07) ***	-14.56	(4.77) **	3.01	(2.53)	-10.79	(5.42) *	135.70	(9.45) ***	12.38	(1.30) ***
Other meals	0.86	(1.15)	-7.59	(2.65) **	0.31	(1.41)	-12.29	(3.02) ***	43.16	(5.26) ***	2.25	(0.73) **
Female	--	--	--	--	--	--	--	--	--	--	--	--
Sex * Food setting interactions												
School * Female	-1.55	(1.85)	0.30	(4.25)	-3.20	(2.26)	5.84	(4.84)	9.07	(8.43)	1.41	(1.16)
Restaurant * Female	-2.04	(2.93)	4.07	(6.74)	-7.60	(3.58) *	9.16	(7.66)	-26.92	(13.36)	1.89	(1.84)
Other * Female	-0.76	(1.61)	2.98	(3.71)	-3.00	(1.97)	-3.61	(4.22)	-6.97	(7.36)	1.24	(1.01)
Meal type (ref=Lunch)												
Breakfast	6.72	(0.82) ***	-24.68	(1.88) ***	-15.59	(1.00) ***	7.56	(2.14) ***	-84.35	(3.73) ***	3.01	(0.51) ***
Dinner	-1.16	(0.88)	-1.14	(2.02)	-1.37	(1.07)	-10.01	(2.29) ***	-13.15	(4.00) **	0.12	(0.55)
Snack	7.68	(0.78) ***	-40.14	(1.79) ***	-17.58	(0.95) ***	5.84	(2.04) **	-79.89	(3.55) ***	-6.56	(0.49) ***
Dietary recall characteristics												
Day 1	-1.09	(0.57)	2.72	(1.31) *	-1.96	(0.69) **	-2.62	(1.49)	6.72	(2.59) **	-0.31	(0.36)
Weekend	0.24	(0.79)	2.58	(1.82)	-0.74	(0.97)	0.01	(2.07)	15.60	(3.61) ***	1.68	(0.50) **
Constant	45.73	(0.76) ***	45.11	(1.75) ***	21.73	(0.93) ***	37.00	(1.99) ***	120.21	(3.46) ***	26.68	(0.48) ***

N=20,786 person-meals

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014 Note: Standard errors in parentheses.

* p<.05;

** p<.01;

*** p<.001

Table A3.

Nativity and Food Setting Interactions from Fixed Effects Models Predicting All Outcomes, Mexican Children in Immigrant Households. Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar							
	(1)		(2)		(3)		(4)		(5)		(6)							
Food setting (Ref=Home meals)																		
School meals	23.15	(1.88)	***	-29.19	(4.33)	***	-3.73	(2.30)	7.47	(4.92)	-50.91	(8.58)	***	1.45	(1.18)			
Restaurant meals	11.59	(2.97)	***	-11.20	(6.82)		-5.69	(3.63)	-6.29	(7.76)	113.86	(13.53)	***	9.89	(1.87)	***		
Other meals	1.43	(1.60)		-6.61	(3.68)		-1.26	(1.96)	-21.45	(4.19)	***	45.93	(7.30)	***	3.33	(1.01)	**	
Foreign-born	--	--		--	--		--	--	--	--	--	--		--	--			
Nativity * Food setting interactions																		
School * U.S.-born	-3.05	(2.13)		2.63	(4.89)		0.96	(2.60)	6.16	(5.56)	-13.87	(9.70)		1.00	(1.34)			
Restaurant * U.S.-born	2.57	(3.41)		-1.75	(7.83)		6.57	(4.16)	0.16	(8.90)	11.12	(15.53)		4.53	(2.14)	*		
Other * U.S.-born	-1.28	(1.85)		0.71	(4.26)		0.08	(2.27)	9.84	(4.84)	*	-8.50	(8.45)		-0.60	(1.16)		
Meal type (ref=Lunch)																		
Breakfast	6.68	(0.82)	***	-24.64	(1.88)	***	-15.53	(1.00)	***	7.64	(2.14)	***	-84.64	(3.74)	***	3.00	(0.52)	***
Dinner	-1.19	(0.88)		-1.11	(2.02)		-1.32	(1.07)		-9.97	(2.29)	***	-13.33	(4.00)	**	0.12	(0.55)	
Snack	7.65	(0.78)	***	-40.12	(1.79)	***	-17.53	(0.95)	***	5.88	(2.04)	**	-80.02	(3.55)	***	-6.55	(0.49)	***
Dietary recall characteristics																		
Day 1	-1.07	(0.57)		2.72	(1.31)	*	-1.98	(0.70)	**	-2.71	(1.49)		6.75	(2.59)	**	-0.32	(0.36)	
Weekend	0.24	(0.79)		2.58	(1.82)		-0.75	(0.97)		0.04	(2.07)		15.64	(3.61)	***	1.69	(0.50)	**
Constant	45.75	(0.76)	***	45.09	(1.75)	***	21.70	(0.93)	***	36.98	(1.99)	***	120.34	(3.46)	***	26.68	(0.48)	***
N=20,786 person-meals																		

N=20,786 person-meals

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014 Note: Standard errors in parentheses.

*
p<.05;
**
p<.01;

p<.001

Table A4.

Receipt of Free- or Reduced-price School Lunch and Food Setting Interactions from Fixed Effects Models Predicting All Outcomes, Mexican Children in Immigrant Households, Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar					
	(1)		(2)		(3)		(4)		(5)		(6)					
Food setting (Ref=Home meals)																
School meals	21.97	(3.32)	***	-28.35	(7.61)	***	-5.34	(4.04)	-5.45	(8.36)	-62.06	(14.52)	***	-0.46	(2.05)	
Restaurant meals	17.86	(4.81)	***	-22.20	(11.02)	*	10.43	(5.84)	-15.34	(12.10)	173.87	(21.02)	***	15.09	(2.96)	***
Other meals	5.25	(2.79)		-4.02	(6.38)		-1.81	(3.38)	-20.47	(7.00)	**	39.85	(12.16)	**	-1.98	(1.71)
School lunch (Ref=No school lunch)																
Receives school lunch	--	--		--	--		--	--	--	--	--	--		--	--	
* Food setting interactions																
School * Receives school lunch	-0.17	(3.42)		-0.38	(7.83)		2.64	(4.15)	21.51	(8.60)	*	4.56	(14.94)		3.68	(2.11)
Restaurant * Receives school lunch	-4.40	(5.10)		9.91	(11.69)		-12.90	(6.20)	*	12.10	(12.83)	-64.13	(22.28)	**	-2.26	(3.14)

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar	
	(1)		(2)		(3)		(4)		(5)		(6)	
Other [*] Receives school lunch	-4.78	(2.94)	-2.32	(6.72)	0.67	(3.56)	7.93	(7.38)	-4.06	(12.82)	5.19	(1.81) ^{**}
Meal type (ref=Lunch)												
Breakfast	7.84	(0.88) ^{***}	-27.04	(2.02) ^{***}	-15.53	(1.07) ^{***}	5.84	(2.21) ^{**}	-75.64	(3.85) ^{***}	3.23	(0.54) ^{***}
Dinner	-0.40	(0.95)	-3.81	(2.17)	-1.45	(1.15)	-9.17	(2.38) ^{***}	-6.40	(4.14)	0.75	(0.58)
Snack	9.09	(0.84) ^{***}	-42.40	(1.93) ^{***}	-17.24	(1.02) ^{***}	7.19	(2.12) ^{**}	-70.26	(3.68) ^{***}	-5.62	(0.52) ^{***}
Dietary recall characteristics												
Day 1	-0.94	(0.62)	3.15	(1.41) [*]	-1.90	(0.75) [*]	-3.33	(1.55) [*]	8.19	(2.69) ^{**}	-0.27	(0.38)
Weekend	-0.18	(0.86)	1.84	(1.97)	-0.89	(1.04)	-0.13	(2.16)	13.97	(3.76) ^{***}	1.19	(0.53) ^{**}
Constant	44.68	(0.82) ^{***}	47.69	(1.88) ^{***}	21.45	(1.00) ^{***}	36.17	(2.07) ^{***}	109.90	(3.59) ^{***}	25.82	(0.51) ^{***}
N=20,786 person-meals												

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014 Note: Standard errors in parentheses.

^{*}
p<.05;

^{**}
p<.01;

^{***}
p<.001

Table A5.

Household WIC Benefits and Food Setting Interactions from Fixed Effects Models
Predicting All Outcomes, Mexican Children in Immigrant Households, Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar	
	(1)		(2)		(3)		(4)		(5)		(6)	
Food setting (Ref=Home meals)												
School meals	21.34	(1.23) ^{***}	-28.88	(2.83) ^{***}	-4.11	(1.49) ^{***}	13.19	(3.23) ^{***}	-61.12	(5.56) ^{***}	1.97	(0.77) ^{***}
Restaurant meals	13.64	(1.69) ^{***}	-9.27	(3.88) [*]	-0.24	(2.05)	-5.33	(4.43)	123.48	(7.62) ^{***}	13.32	(1.06) ^{***}
Other meals	-0.30	(0.97)	-8.22	(2.23) ^{***}	-0.90	(1.18)	-16.11	(2.54) ^{***}	39.56	(4.38) ^{***}	2.80	(0.61) ^{***}
Household WIC benefits in last 12 months	--	--	--	--	--	--	--	--	--	--	--	--
WIC [*] Food setting interactions												
School [*] WIC	-1.25	(1.98)	4.39	(4.55)	3.85	(2.40)	-3.01	(5.19)	5.94	(8.94)	1.06	(1.24)
Restaurant [*] WIC	-1.67	(3.57)	-15.90	(8.21)	-0.38	(4.33)	-5.32	(9.37)	8.94	(16.14)	0.84	(2.24)
Other [*] WIC	2.02	(1.81)	5.97	(4.15)	-0.94	(2.19)	6.48	(4.74)	6.73	(8.17)	0.70	(1.13)
Constant	45.59	(0.77) ^{***}	45.55	(1.76) ^{***}	21.65	(0.93) ^{***}	37.27	(2.01) ^{***}	117.96	(3.46) ^{***}	26.52	(0.48) ^{***}
N=20,786 person-meals												

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014

Note: Standard errors in parentheses.

^{*}
p<.05;

^{**}
p<.01;

^{***}
p<.001. Models include controls for meal type, day of dietary recall, and weekend.

Table A6.

Racial/Ethnic-Nativity Group and Food Setting Interactions from Fixed Effects Models
Predicting All Outcomes, Mexican, White, and Black Children Ages 6–18

	FSI		Mexican Food		Vegetables		Fruit		Sugar-Sweetened Beverages		Sugar							
	(1)		(2)		(3)		(4)		(5)		(6)							
Food setting (Ref=Home meals)																		
School meals	16.67	(0.94)	***	-18.82	(1.32)	***	1.64	(1.11)	8.57	(2.31)	***	-52.21	(4.96)	***	1.23	(0.68)	**	
Restaurant meals	11.44	(1.46)	***	-4.82	(2.04)	*	-2.46	(1.72)	-7.31	(3.57)	*	124.58	(7.68)	***	13.11	(1.05)	***	
Other meals	0.69	(0.80)		-8.50	(1.12)	***	0.44	(0.95)	-13.00	(1.97)	***	39.77	(4.23)	***	2.79	(0.58)	***	
Racial/ethnic-nativity group (Ref=Mexican children with immigrant householders)																		
Mexican children with U.S.-born householders	--	--		--	--		--	--	--	--		--	--		--	--		
White children with U.S.-born householders	--	--		--	--		--	--	--	--		--	--		--	--		
Black children with U.S.-born householders	--	--		--	--		--	--	--	--		--	--		--	--		
Racial/ethnic-nativity group * Food setting interactions																		
School * Mexican children with U.S.-born householders	-4.85	(1.63)	**	13.05	(2.28)	***	-1.79	(1.92)	6.75	(3.99)		-22.74	(8.58)	**	-0.04	(1.18)		
School * White children with U.S.-born householders	-7.85	(1.32)	***	16.91	(1.85)	***	3.53	(1.56)	*	4.64	(3.24)	-17.46	(6.96)	*	2.99	(0.96)	**	
School * Black children with U.S.-born householders	-8.00	(1.22)	***	16.68	(1.71)	***	-0.25	(1.44)	9.49	(3.00)	**	-18.34	(6.44)	**	1.32	(0.88)		
Restaurant * Mexican children with U.S.-born householders	-1.58	(2.16)		2.16	(3.02)		1.43	(2.54)	4.73	(5.29)		-0.28	(11.36)		1.92	(1.56)		
Restaurant * White children with U.S.-born householders	-1.21	(1.74)		2.10	(2.44)		-3.07	(2.05)	-4.78	(4.27)		10.64	(9.17)		-0.12	(1.26)		
Restaurant * Black children with U.S.-born householders	-0.75	(1.87)		-1.85	(2.63)		-1.47	(2.21)	0.52	(4.60)		-30.15	(9.88)	**	-0.51	(1.36)		
Other * Mexican children with U.S.-born householders	-1.67	(1.26)		6.53	(1.76)	***	-1.08	(1.48)	13.95	(3.08)	***	-8.34	(6.62)		1.23	(0.91)		
Other * White children with U.S.-born householders	-0.90	(0.97)		7.44	(1.36)	***	-2.54	(1.15)	*	9.52	(2.38)	***	7.33	(5.12)		2.25	(0.70)	**
Other * Black children with U.S.-born householders	-1.77	(1.01)		9.06	(1.42)	***	-1.74	(1.20)	11.74	(2.49)	***	-19.69	(5.34)	***	0.38	(0.73)		
Meal type (ref=Launch)																		
Breakfast	-1.33	(0.41)	**	-9.03	(0.58)	***	-14.96	(0.48)	***	15.92	(1.01)	***	-89.82	(2.39)	***	1.42	(0.30)	***
Dinner	-6.44	(0.42)	***	2.71	(0.59)	***	11.01	(0.49)	***	-9.37	(1.03)	***	8.67	(2.35)		-1.45	(0.30)	***
Snack	-2.33	(0.37)	***	-12.80	(0.52)	***	-14.46	(0.44)	***	-2.23	(0.92)	**	-66.45	(2.08)	***	-8.28	(0.27)	***
Dietary recall characteristics																		
Day 1	0.24	(0.26)		1.20	(0.37)	**	-2.38	(0.31)	***	-3.30	(0.64)	***	8.80	(1.44)	***	0.13	(0.19)	
Weekend	-0.90	(0.37)	*	1.25	(0.51)	*	0.50	(0.43)		-0.26	(0.90)		11.06	(2.01)	***	1.07	(0.26)	***
Constant	53.83	(0.38)	***	14.51	(0.53)	***	18.02	(0.44)	***	28.85	(0.92)	***	119.91	(2.11)	***	29.62	(0.27)	***

N=92,662 person-meals

N=92,662 person-meals

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014 Note: Standard errors in parentheses.

*
p<.05;
**
p<.01;

p<.001

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Table 1.

Institutional Characteristics of Food Settings and Their Expected Influence on the Eating Behavior of Mexican Children in Immigrant Households

	Food Setting		
	Home	School	Restaurants
A. Institutional Characteristics			
Social pressure to acculturate	Low	High	Moderate
Food standardization	Low to moderate	High	Moderate to high
Government regulation of nutritional quality	None	High	Low
B. Hypothesized Eating Behavior			
Food acculturation	Low	High	Moderate to high
Healthy eating	Moderate	High	Low

Note: Although analyses include a fourth food setting of “other,” we do not make hypotheses about this residual category because it includes heterogeneous food settings.

Table 2.

Sample Means and Proportions, Mexican Children in Immigrant Households, Ages 6–18

Panel A. Child-level Data		
Proportion of total grams consumed in food settings		
Home meals	0.67	(0.47)
School meals	0.15	(0.36)
Restaurant meals	0.02	(0.15)
Other meals	0.16	(0.37)
Demographic characteristics		
Male	0.48	
Age		
6–11	0.51	
12–14	0.23	
15–18	0.26	
N	2,337	
Panel B. Child-meal-level Data		
Dietary outcomes		
Food Similarity Index (FSI)	51.83	(37.04)
Mexican food consumed (grams)	24.79	(92.85)
Vegetables consumed (grams)	8.43	(40.07)
Fruit (with no added sugar) consumed (grams)	37.37	(97.70)
Sugar-sweetened beverages consumed (grams)	72.42	(165.40)
Sugar consumed (grams)	25.44	(23.12)
Food settings		
Home meals	0.72	
School meals	0.11	
Restaurant meals	0.03	
Other meals	0.14	
Meal type		
Breakfast	0.22	
Lunch	0.20	
Dinner	0.20	
Snack	0.39	
Dietary recall characteristics		
Day 1	0.54	
Weekend	0.28	
N	20,786	

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014

Note: Data are weighted. Standard deviations in parentheses for continuous variables.

Table 3.

Coefficients from Fixed Effects Models Predicting U.S. Food Similarity Index and Consumption of Mexican Foods, Mexican Children in Immigrant Households, Ages 6–18

	Food Similarity Index			Mexican Food		
	(1)			(2)		
Food setting (Reference=Home meals)						
School meals	19.29	(0.99)	***	−27.67	(2.48)	***
Restaurant meals	12.23	(1.57)	***	<i>a</i> −17.80	(3.94)	*** <i>a</i>
Other meals	0.87	(0.82)	<i>a</i>	−9.26	(2.06)	<i>a</i>
Meal type (ref=Lunch)						
Breakfast	7.21	(0.82)	***	−25.42	(2.05)	***
Dinner	−1.71	(0.88)		3.36	(2.22)	
Snack	6.97	(0.78)	***	−42.68	(1.96)	***
Dietary recall characteristics						
Day 1	−1.29	(0.52)	*	2.55	(1.31)	
Weekend	−0.01	(0.77)		2.79	(1.92)	
Constant	45.97	(0.77)	***	49.05	(1.93)	***
N=20,786 person-meals						

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014

Note: Data are weighted. Standard errors in parentheses.

*
p<.05;

**
p<.01;

p<.001,

a = significantly different from school meals at p<.05 level.

Table 4.

Coefficients from Fixed Effects Models Predicting Grams of Vegetables, Fruit, Sugar-Sweetened Beverages, and Sugar Consumed, Mexican Children in Immigrant Households, Ages 6–18

	Vegetables (1)	Fruit (2)	Sugar-Sweetened Beverages (3)	Sugar (4)
Food setting (Reference=Home meals)				
School meals	−1.46 (1.09)	16.57 (2.63)	−57.27 (4.17)	4.06 (0.59) ***
Restaurant meals	−0.68 (1.73)	−7.24 (4.18)	94.42 (6.63) *** <i>a</i>	11.49 (0.95) *** <i>a</i>
Other meals	−1.84 (0.90)	−12.34 (2.18)	31.97 (3.46) *** <i>a</i>	1.58 (0.49) ** <i>a</i>
Meal type (ref=Lunch)				
Breakfast	−14.27 (0.90) ***	9.44 (2.17) ***	−72.72 (3.44) ***	3.45 (0.49) ***
Dinner	−2.83 (0.97) **	−10.69 (2.35) ***	−6.06 (3.73)	0.04 (0.53)
Snack	−16.16 (0.86) ***	7.31 (2.08) ***	−70.32 (3.30) ***	−5.86 (0.47) ***
Dietary recall characteristics				
Day 1	−1.28 (0.58) *	0.02 (1.39)	7.94 (2.21) ***	0.48 (0.32)
Weekend	−1.82 (0.84) *	−2.97 (2.04)	17.69 (3.23) ***	1.28 (0.46) **
Constant	20.04 (0.85) ***	35.54 (2.05) ***	106.50 (3.24) ***	25.34 (0.46) ***
N=20,786 person-meals				

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014

Note: Data are weighted. Standard errors in parentheses.

* $p < .05$;

** $p < .01$;

*** $p < .001$.

a = significantly different from school meals at $p < .05$ level.

Table 5.
Coefficients from Fixed Effects Models Predicting All Outcomes Using Detailed Food Settings Categories, Mexican Children in Immigrant Households, Ages 6–18

	FSI (1)	Mexican Food (2)	Vegetables (3)	Fruit (4)	Sugar-Sweetened Beverages (5)	Sugar (6)
Food setting (ref=Home meals)						
School meals (from cafeteria)	19.34 (0.99) ***	-28.03 (2.48) ***	-1.56 (1.09) ***	16.64 (2.64) ***	-57.39 (4.18) ***	3.97 (0.60) ***
School meals (non-cafeteria)	1.59 (1.27)	-15.15 (3.17) ***	-3.45 (1.39) *	-11.15 (3.37) **	29.94 (5.34) ***	0.17 (0.76)
Fast food restaurant meals	17.12 (1.86) ***	-38.31 (4.67) ***	-2.22 (2.05) ***	-5.15 (4.96)	89.82 (7.87) ***	10.21 (1.12) ***
Table service restaurant meals	1.41 (2.71)	27.86 (6.80) ***	2.85 (2.99) ***	-11.95 (7.23)	104.71 (11.45) ***	14.41 (1.63) ***
Other meals	0.46 (0.99)	-5.89 (2.49) *	-0.90 (1.09)	-13.02 (2.64) ***	33.14 (4.19) ***	2.40 (0.60) ***
Meal type (ref=Lunch)						
Breakfast	7.20 (0.82) ***	-25.55 (2.05) ***	-14.35 (0.90) ***	9.49 (2.18) ***	-72.79 (3.45) ***	3.38 (0.49) ***
Dinner	-1.65 (0.89)	2.78 (2.23)	-3.00 (0.98) **	-10.57 (2.37) ***	-6.27 (3.75)	-0.11 (0.53)
Snack	6.95 (0.79) ***	-42.83 (1.97) ***	-16.27 (0.87) ***	7.37 (2.09) ***	-70.41 (3.32) ***	-5.95 (0.47) ***
Dietary recall characteristics						
Day 1	-1.25 (0.52) *	2.37 (1.31)	-1.31 (0.58) *	0.04 (1.39)	7.89 (2.21) ***	0.58 (0.45)
Weekend	0.13 (0.78)	1.88 (1.94)	-2.04 (0.85) *	-2.81 (2.06)	17.40 (3.27) ***	1.97 (0.71) *
Constant	45.91 (0.78) ***	49.63 (1.94) ***	20.22 (0.86) ***	35.41 (2.07) ***	106.71 (3.28) ***	25.74 (0.69) ***
N=20,786 person-meals						

Source: National Health and Nutrition Examination Survey 2003/2004–2013/2014

Note: Data are weighted. Standard errors in parentheses.

* p<.05;

** p<.01;

*** p<.001