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Generational Status, Neighborhood Context, and Mother-Child Resemblance in Dietary Quality in Mexican-origin Families

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Abstract

Children of immigrants in the United States often grow up in very different nutrition environments than their parents. As a result, parent-child concordance in diet may be particularly weak in immigrant families. Yet, little is known about parent-child dietary resemblance in immigrant families and how local contexts shape it. This study uses data from the 1999/2000–2009/2010 Continuous National Health and Nutrition Examination Survey to examine mother-child resemblance in dietary quality in Mexican-origin families in the United States. We investigate how immigrant generational status and neighborhood context shape the association between mothers' and children's dietary quality. We find that mother-child resemblance in dietary quality is weaker for first-generation children relative to third-generation children. However, residence in an immigrant enclave strengthens the mother-child association in dietary quality for first-generation children. Findings offer a unique within-family perspective of immigrant health. Results suggest that the healthy eating advantage of Mexican immigrant mothers may not be sustained across family generations and that Mexican immigrant mothers may face unique challenges in promoting healthy eating among their children.

Keywords

USA; Diet; Dietary quality; Dietary resemblance; Mexican; Children of immigrants; Family; Neighborhoods

1. Introduction

Mexican immigrant women in the United States (U.S.) have lower obesity prevalence than Mexican American women (Barcenas et al. 2007; Guendelman et al. 2013; Hamilton, Teitler and Reichman 2011). Yet, children of Mexican immigrants have similar or higher risks of overweight and obesity and gain weight faster than children born to Mexican American mothers (Baker, Balistreri and Van Hook 2009; Buttenheim et al. 2013). In fact, among

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young children, Mexican boys in immigrant families have the highest obesity prevalence of all U.S. racial/ethnic groups (Van Hook, Baker and Altman 2009). This concerning pattern suggests that this immigrant health advantage may not be sustained across generations within families.

Diet, a critical proximate determinant of obesity and various chronic diseases, represents a key behavioral mechanism through which this and other health advantages may be lost or maintained across family generations. Children of immigrants in the U.S. often grow up in different social and nutrition environments than their parents. Foreign-born parents may be unfamiliar with U.S. nutrition environments or retain preferences for food from their country of origin, whereas their children may develop distinct food preferences or consume American foods as a way to fit in with their peers of U.S. parentage (Greder, de Slowing and Doudna 2012; Guendelman, Cheryan and Monin 2011; McArthur, Anguiano and Nocetti 2001). Thus, parent-child resemblance in diet may be particularly weak in immigrant families, potentially leaving children of immigrants more susceptible to external influences on diet. Yet, local social contexts such as neighborhoods—which influence dietary habits (Lee and Cubbin 2002), parenting behaviors (Pinderhughes et al. 2001), and immigrant adaptation (Portes and Zhou 1993)—likely condition parent-child dietary resemblance in immigrant families. However, to our knowledge, previous work has not directly addressed these questions. Thus, we know little about the intergenerational association in diet in immigrant families and how contextual forces shape it.

The purpose of this study is to examine the intergenerational association in dietary quality among Mexican-origin mothers and children in the U.S. We use dietary recall data from a national sample of Mexican-origin mothers and children in the 1999/2000–2009/2010 Continuous National Health and Nutrition Examination Survey to investigate two research questions: 1) Does mother-child resemblance in dietary quality vary by immigrant generational status? 2) Does neighborhood context—specifically, residence in an immigrant enclave—condition the association between generational status and mother-child dietary resemblance?

Understanding whether, how, and in what contexts the dietary quality of children of Mexican immigrants resembles that of their mothers represents an important research endeavor for several reasons. First, it advances knowledge of within-family associations in health behaviors in immigrant families, which can improve understanding of factors that likely contribute to the intergenerational loss of the immigrant health advantage in obesity for Mexican children of immigrants. Second, it elucidates whether Mexican immigrant parents face unique challenges in promoting healthy eating and managing obesity risk among their children. Third, it sheds light on the role that local social contexts play in shaping family associations in dietary behavior in Mexican immigrant families. These new insights have important implications for public health initiatives aimed at improving the diets of and reducing obesity among Mexican-origin children.

2. Background

2.1. Parent-child dietary resemblance

Childhood eating behavior tracks into adulthood such that childhood diet is a significant predictor of adult diet and thus has both short- and long-term consequences for health (Kelder et al. 1994; Mikkila et al. 2004; Nicklaus et al. 2004). Although multiple factors—genetic, psychological, social, and environmental—determine children’s dietary behavior (Birch and Fisher 1998), interventions designed to improve children’s diets often target parents as the primary shapers of children’s diets (Brown and Ogden 2004; Golan and Crow 2004; Wang et al. 2010). Parents can serve both as dietary role models by modeling their eating behavior to their children and as dietary gatekeepers by controlling household food availability and regulating their children’s food intake (Brown and Ogden 2004; Golan and Crow 2004).

However, there are mixed findings about the strength of the association between parents’ and children’s diets. Some studies have documented a moderate parent-child dietary resemblance (Mitchell et al. 2003; Oliveria et al. 1992), whereas other studies have found only a weak resemblance (Cullen, Lara and de Moor 2002). (For a review, see Wang et al. 2010). Differences across studies in the strength of the association between parents’ and children’s dietary intakes can be partially attributed to the use of small, non-representative samples. There have only been two nationally representative U.S.-based studies (Beydoun and Wang 2009; Zuercher, Wagstaff and Kranz 2011). Although both studies found modest correlations in parent-child dietary intakes, they also found parents’ healthy eating to be an important predictor of children’s healthy eating. Even after controlling for sociodemographic factors, children’s odds of consuming a high quality diet more than doubled if their parents (Beydoun and Wang 2009) or householder (Zuercher, Wagstaff and Kranz 2011) ate a high quality diet.

Recent work has also called attention to sociodemographic variation (by age, gender, race/ethnicity, and socioeconomic status) in parent-child dietary resemblance (Beydoun and Wang 2009). However, this literature has not yet addressed parent-child dietary resemblance in immigrant families, a group that warrants increased research attention in this area. Children in immigrant families make up 25 percent of all U.S. children, and children of Mexican immigrants constitute the largest share within this group (Child Trends 2014). Obesity prevalence among children of immigrants, especially those of Mexican origin, is high (Baker, Balistreri and Van Hook 2009; Buttenheim et al. 2013), making it critical to examine the constellation of distal and proximate determinants of obesity for this group. Moreover, for reasons discussed below, immigrant parents may face unique struggles in promoting healthy eating among their children.

2.2. Parent-child dietary resemblance in immigrant families

Immigration scholars have long been interested in intergenerational processes in immigrant families (Kwak 2003; Portes and Rumbaut 2001). Yet, a lack of datasets with information about the health of children of immigrants and their parents has made it difficult to examine intergenerational associations in health in immigrant families. Although no large-scale

studies have examined the intergenerational association in dietary behavior in immigrant families, related studies on dietary behavior and weight-related health provide reasons to suspect such associations to be weaker in immigrant families.

2.2.1. Dissonant dietary acculturation—Qualitative literature on dietary behavior in immigrant families points to a divergence in eating behavior among immigrant parents and their children. These studies suggest that different paces of dietary acculturation—the process by which immigrants adopt the average dietary patterns of the U.S.-born population—between immigrant parents and their children contribute to diet dissimilarity. Immigrant parents may experience a relatively slow pace of dietary acculturation and maintain preferences for a traditional diet from their country of origin, which, in the case of Mexican immigrants, tends to be healthier than the average U.S. diet (Batis et al. 2011; Duffey et al. 2008; Gordon-Larsen et al. 2003) (though this pattern may be changing due to the nutrition transition in Mexico (Rivera et al. 2004)). Their children may more quickly develop preferences for American food, especially unhealthy processed food, and eschew foods from their parents' country of origin (Greder, de Slowing and Doudna 2012; McArthur, Anguiano and Nocetti 2001; Sussner et al. 2008), often out of embarrassment or a desire to assert an “American identity” by fitting in with dominant U.S. dietary culture (Guendelman, Cheryan and Monin 2011). As one Mexican immigrant mother notes, “Only my husband and I eat Mexican foods, and my kids eat American foods” (McArthur, Anguiano and Nocetti 2001). Other mothers add that their children dislike Mexican food and prefer American foods such as French fries, hamburgers, and Coke (McArthur, Anguiano and Nocetti 2001).

The general pattern in which children of immigrants adopt U.S. ways faster than their parents is known as dissonant acculturation and is characterized by intergenerational conflict, loss of parental authority, and unfavorable well-being outcomes for children (Portes and Rumbaut 2001). Applied to dietary behavior, we expect that dissonant dietary acculturation will be associated with weaker mother-child concordance in dietary quality and poorer dietary quality for children of immigrants given that of their mothers.

Although the aforementioned studies reveal clear generational dietary differences in immigrant families and highlight the struggles immigrant parents face in encouraging their children to eat a healthy diet, the samples lack non-immigrant comparison groups. Therefore, it is not clear whether such challenges are unique to immigrant families or are typical of most families in the U.S., where “picky eating” is relatively common among children (Mascola, Bryson and Agras 2010) and obesogenic environments are pervasive and frequently targeted toward children (Harris and Graff 2011). A key contribution of our study is the incorporation of a non-immigrant Mexican-origin comparison group.

2.2.2. Maternal perceptions of health and U.S. nutrition environments—

Mexican immigrant mothers' perceptions of childhood health and familiarity with obesity risk might also contribute to greater intergenerational dissimilarity in dietary quality in immigrant families. Previous research suggests that immigrant mothers' material conditions in childhood influence their child feeding practices and perceptions of healthy childhood weight (Cheah and Van Hook 2012). Chinese and Korean immigrant mothers who experienced material deprivation in childhood were more likely to believe that their children

should weigh more and to have more relaxed child feeding practices, and their children consumed more soda and sweets (Cheah and Van Hook 2012). Although the nutrition transition in Mexico over the last two decades has made obesity prevalence among Mexican women roughly equal to that of U.S. women, Mexican immigrant women have lower obesity prevalence than both non-migrant women in Mexico (Ro and Fleischer 2014) and Mexican American women in the U.S. (Guendelman et al. 2013). Other research shows that foreign-born Latina mothers are less likely to accurately classify their children as overweight (Ariza et al. 2004) and that they do not associate their child's obesity with poor health (Baker and Altman 2014). Therefore, Mexican immigrant mothers may be more permissive of less healthy diets for their children if they prefer heavier children or are unaccustomed to managing obesity risk (Cheah and Van Hook 2012).

2.3. Neighborhood influences on parent-child dietary resemblance in immigrant families

We further argue that the mother-child association in dietary quality in immigrant families will be conditioned by local social contexts, particularly neighborhoods. Neighborhoods play an important role in shaping diet (Dubowitz et al. 2008; Lee and Cubbin 2002; Park et al. 2011), parenting behaviors (Pinderhughes et al. 2001), and immigrant adaptation (Portes and Zhou 1993). Because of neighborhood influences in these three realms, we hypothesize that neighborhoods will condition mother-child resemblance in dietary quality for immigrant families. Indeed, a common theme in the qualitative literature is immigrant mothers' perception that external social forces such as neighborhoods and schools affected their ability to shape their children's diet (Greder, Romero de Slowing, and Doudna 2012).

Although neighborhood context is likely important for mother-child resemblance in dietary quality in all families, we argue that one neighborhood attribute in particular—foreign-born concentration—may be especially salient to mother-child resemblance in dietary quality in immigrant families. Immigrant enclaves—neighborhoods with a high concentration of foreign-born residents—typically offer greater access to foods from immigrants' countries of origin. Children of immigrants in these neighborhoods might have more exposure to such foods or feel less pressure to consume American foods. Consequently, their pace of dietary acculturation may be slower and more aligned with that of their parents. In contrast to dissonant acculturation, this pattern of acculturation, known as selective acculturation, tends to be associated with less intergenerational conflict, stronger parental authority, and more favorable well-being outcomes for children of immigrants (Portes and Rumbaut 2001). Additionally, immigrant enclaves typically provide stronger social networks, or higher levels of social capital, for immigrants (Zhou and Bankston 1994), which may reinforce parental dietary norms and strengthen concordance in dietary quality. Thus, we expect a stronger mother-child association in dietary quality for children of immigrants in immigrant enclaves.

3. Methods

3.1 Data

We used restricted-use data from the 1999/2000–2009/2010 Continuous National Health and Nutrition Examination Survey (NHANES), a repeated cross-sectional survey that collects

health, nutrition, and sociodemographic information from a nationally representative sample of the U.S. population. As a leading source of U.S. dietary data, the NHANES is well-suited for this study. The restricted-use NHANES contains household identifiers, which can be used to link children and mothers, and geographic identifiers, which can be linked to the U.S. Census and American Community Survey to obtain information about respondents' neighborhoods. These attributes create a unique opportunity to study the joint influences of maternal dietary quality, immigrant generation, and neighborhoods on children's diet.

3.2. Analytic sample

We derived our analytic sample from a subsample of children and mothers. The NHANES randomly samples individuals within households. Forty percent of sampled children under age 15 had a mother who also was randomly selected to participate in the survey. Our decision to use mothers as the focal parent in this study was both theoretical and practical. From a theoretical standpoint, mothers typically spend more time than fathers providing routine childcare such as meals (Kotila, Schoppe-Sullivan and Kamp Dush 2013), and thus often are children's primary dietary providers. Additionally, parent-child dietary resemblance tends to be stronger among mothers versus fathers (Oliveria et al. 1992). From a practical standpoint, mothers are the only family members who can be reliably identified in the NHANES. The NHANES provides a number to identify respondents in the same household, but does not provide information about the nature of family relationships between household members. However, for children ages 15 and younger, the NHANES records the mother's age at the child's birth, which we used to match children to their mothers. (It does not record paternal age at the child's birth). If the age difference between the child and an adult woman in the household matched the maternal age at the child's birth, we identified those two respondents as a mother-child match. We allowed for a 2-year difference to account for possible age reporting errors.

This age-based matching approach, which has been employed in studies using NHANES (Zhang et al. 2014), can be expected to yield a high percentage of accurate matches. Only 2 percent of Mexican-origin children age 15 and younger in the U.S. live with more than one woman who is within 2 years of their mother's age (authors' tabulations of the 2005 American Community Survey). Thus, the likelihood of false positive matches between a child and a woman in the household who is not his/her mother is small.

Because not all children had mothers who were sampled, we assessed the representativeness of the subsample by comparing summary statistics of the subsample to those of the total sample of children. We found that the two samples were substantively identical aside from two minor exceptions: the subsample contains a slightly higher percentage of second-generation children and a slightly larger average household size.

After identifying all children with mothers in the survey (N=9,308), we restricted our sample to Mexican-origin children, ages 2–15, whose mother was also in the survey (N=2,333). We excluded children younger than age 2 because the dietary quality outcome does not apply to them. We eliminated 243 respondents who did not have a valid measure of dietary quality from the day 1 dietary recall interview (described below), which brought our final analytic sample to 2,090 Mexican-origin children.

3.3. Dependent variable

3.3.1. Child's dietary quality—Our dependent variable was the child's Healthy Eating Index (HEI) 2010, a measure of overall dietary quality that is associated with various health outcomes including obesity (Guo et al. 2004), metabolic syndrome (Pan and Pratt 2008), and type 2 diabetes and cardiovascular disease (Schwingshackl and Hoffmann 2015). NHANES assesses dietary intake through two 24-hour dietary recall interviews conducted by trained interviewers. We used only the day 1 dietary recall because response rates for day 1 were higher than day 2 and because we lacked access to the day 2 dietary recall data in our restricted-use dataset. Proxy respondents reported for children ages 5 and younger and assisted with interviews for children ages 6–11.

From the dietary recall data, we computed the child's total HEI score, which evaluates dietary quality in terms of conformance to the Dietary Guidelines for America (DGA) set by the U.S. Department of Health and Human Services and the U.S. Department of Agriculture (USDA) (Guenther et al. 2013). The total HEI score reflects the sum of scores of 12 components that measure adequacy and moderation in the intake of different nutrients and food groups. The nine adequacy components include total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein foods, seafood and plant protein, and fatty acids, with higher scores indicating higher intake. The three moderation components include refined grains, sodium, and empty calories, with higher scores indicating lower intake. The total HEI score ranges from 0–100, with higher scores indicating a healthier diet, or stronger conformance to the DGA. The HEI-2010 is assumed to be valid for different subpopulations because it disaggregates food into separate ingredients, which are then assigned to food groups that are culturally neutral (Guenther et al. 2013).

3.4. Independent variables

3.4.1. Mother's dietary quality—Our first focal independent variable was mother's total HEI score, which follows the same coding as child's HEI and was centered at its mean.

3.4.2. Child's generational status—Our second key independent variable was the child's generational status. We classified children as first-generation if they and their mother were born in Mexico, as second-generation if they were born in the U.S. and their mother was born in Mexico, and as third-plus generation if they and their mother were born in the U.S.

3.4.3. Neighborhood context—Our final independent variable of interest was a dichotomous measure of residence in an immigrant enclave. Operationalizing neighborhoods as census tracts (Sampson, Morenoff and Gannon-Rowley 2002), we linked the NHANES to tract-level data from the 2000 Census Summary Files (for the 1999–2004 NHANES) and the 2005–2009 American Community Survey Summary Files (for the 2005–2010 NHANES). We classified respondents as living in an immigrant enclave if the share of foreign-born residents in their tract fell in the top quartile.

3.4.4. Control variables—We adjusted for four sets of controls. The first set—child's characteristics—consisted of sex, age, the proportion of total grams of food consumed away

from home, and the typical number (0–10) of school meals (free, reduced-price, or full-priced breakfasts and lunches) eaten per week during the school year. It is important to note that because this measure of school meals includes all school meals, not only free or reduced-priced meals, it is not the same as the free or reduced-priced school meals measure that is often used as a proxy for poverty status. It is also important to note that approximately 32 percent of the children in our sample typically eat no school meals per week and that about half of this number is made up of children younger than 4 to whom the question about school meals does not apply. The second set of control variables—mother’s characteristics—included mother’s education (less than high school, high school, or more than high school) and employment status (full-time (more than 35 hours per week), part-time (35 hours or less per week), or not in labor force). The third set—household characteristics—accounted for household size, whether any English is spoken in the household, and whether the household experienced any food insecurity in the last 12 months, which we defined as households with low or very low food security (Bickel et al. 2000). In supplementary models, we controlled for an alternate measure of language use—whether the interview was conducted in Spanish or English—and for the ratio of family income to poverty, but eliminated them because they were not significant. The final set of control variables—dietary recall characteristics—captured whether the recall fell on a weekend and whether it took place during summer.

3.5. Analytic strategy

We used ordinary least squares (OLS) regression with a series of interaction terms to address our research questions. To examine whether the association between mother’s HEI and child’s HEI varies by the child’s generational status, we included an interaction between mother’s HEI and child’s generational status. To assess whether the moderating effect of generational status on mother-child dietary resemblance varies by neighborhood context, we included three-way interactions between mother’s HEI, child’s generational status, and neighborhood foreign-born concentration.

We adjusted for non-response and the probability of selection into the survey by weighting all analyses with the day 1 dietary recall weight, scaled to represent the population at the midpoint of the combined survey period. We used the “svy” command in Stata 13 to estimate robust standard errors that account for the clustering of observations due to the survey’s complex multi-stage sampling design. In supplementary analyses, we used multilevel models to account for the dependence of observations and obtained results consistent with those from the OLS models. However, because the intraclass correlation, or the ratio of between-tract variance to total variance in child’s HEI, was near zero (ICC=.005), indicating that multilevel models were not necessary (Garson 2012), we proceeded with single-level OLS models.

We used multiple imputation by chained equations to impute missing values for the three variables with missing cases: mothers’ HEI (2 percent missing), mother’s education (3 percent missing), and food insecurity (2.4 percent missing). This multiple imputation procedure performs well with variables that have missingness levels in those ranges (Johnson and Young 2011). We present pooled coefficients from five imputed datasets.

Results from models using multiply imputed data and models using listwise deleted data are nearly identical.

4. Results

4.1. Descriptive statistics

Table 1 presents the sample statistics by child's generational status. Across generations, Mexican-origin children eat a similarly healthy diet, though second-generation children have a slightly higher mean HEI score than third-generation children. The differences in healthy eating are more pronounced among mothers, with Mexican immigrant mothers eating significantly healthier diets on average than Mexican American mothers; the mean HEI score for Mexican immigrant mothers is about 6 points higher than that of Mexican American mothers.

Of direct relevance to our research questions is the pattern of difference between mother's HEI and child's HEI by generational status. Whereas third-generation children and their mothers exhibit a negligible difference in HEI scores, second-generation children score nearly 3.5 points lower and first-generation children nearly 5 points lower than their mothers. Such differences are meaningful in terms of dietary health. For example, a 5-point difference in HEI scores reflects the difference between meeting or exceeding the recommended daily consumption amount for fruit, vegetables, or protein, and not consuming any of these food groups at all (Guenther et al. 2013). The correlations between mother's HEI and child's HEI further illustrate this linear pattern of difference by generation: children of Mexican immigrant mothers exhibit much weaker correlations than children of Mexican American mothers: $r=.16$ and $r=.28$ for first and second-generation children respectively, compared to $r=.34$ for third-generation children. Also of note is that children of immigrants are significantly more concentrated in immigrant enclaves.

4.2. Does mother-child resemblance in dietary quality vary by child's generational status?

Model 1 in Table 2 shows the main effects of the key independent variables in our analysis. Mother's HEI is a significant positive predictor of child's HEI; with each increase in mother's HEI, child's HEI increases by .28. Generational status does not have a significant association with child's HEI net of all other predictors. Residence in an immigrant enclave is also not significantly associated with child's HEI net of controls.

Model 2 in Table 2 assesses the first research question about variation by generational status in the association between mother's HEI and child's HEI. The interaction term between mother's HEI and first-generation is negative and significant, indicating that the association between mother's HEI and child's HEI is weaker for first-generation children than it is for third-generation children. The interaction term for second-generation children is also negative, but is smaller in magnitude and not statistically significant. For ease of interpretation, we used the coefficients from Model 2 to calculate the predicted slopes and values of child's HEI by mother's HEI and child's generational status with all predictors held at their means. Figure 1 shows that the slope of mother's HEI on child's HEI is much flatter for first-generation children ($\beta_{1st}=.14$) relative to both second ($\beta_{2nd}=.27$) and third-generation children ($\beta_{3rd}=.33$), though the difference in slopes is significant only between

the first and third-generations. Across the displayed range of mother's HEI (from about 25 to 75, into which 95 percent of the sample falls), child's HEI increases only by 7 points for first-generation children, whereas it increases by 14 and 16 points for second- and third-generation children respectively. This suggests that first-generation children do not reap the same dietary benefits from their mother's healthy eating that their third-generation counterparts do.

4.3. Does residence in an immigrant enclave condition the association between generational status, maternal dietary quality, and child's dietary quality?

Model 4 in Table 2 introduces three-way interaction terms for mother's HEI, child's generational status, and residence in an immigrant enclave to address our second research question. (For reference purposes, Model 3 shows the corresponding lower-order two-way interactions without the three-way interactions in the model). We observe a significant positive interaction between mother's HEI, generational status, and residence in an immigrant enclave for first-generation children, but not for second-generation children. Figure 2 depicts this association graphically for each generation. Among first-generation children, the slope of mother's HEI is significantly steeper for those who reside in immigrant enclaves compared to those who do not ($\beta_{IE}=.31$ and $\beta_{OTH}=.05$ respectively). This indicates that mother-child resemblance in dietary quality is stronger among first-generation children in immigrant enclaves. Across the displayed range of maternal HEI, child's HEI increases by 15 points for first-generation children living in immigrant enclaves, but only by 2 points for their counterparts who reside outside immigrant enclaves. Whereas a 2-point difference in HEI signifies only a modest improvement in dietary health, a 15-point difference represents a dramatic improvement. For example, it denotes the difference between consuming the recommended daily amount of whole grains plus the recommended daily amount of vegetables versus consuming neither any whole grains nor any vegetables at all. In contrast, the slopes for second and third-generation children do not vary significantly by residence in an immigrant enclave.

4.4. Sensitivity analyses

We conducted sensitivity analyses (not shown) to assess the robustness of our findings. First, we modeled three-way interactions between sociodemographic characteristics (sex, age, mother's education level, and mother's work status), generational status, and mother's HEI and between food away from home (number of school meals and the proportion of grams consumed outside the home), generational status, mother's HEI. None of these interactions were significant.

Second, we tested alternate specifications of generational status and neighborhood foreign-born concentration. We assessed whether there were differences in mother-child dietary concordance between first-generation children who arrived at a younger ages and foreign-born children who arrived at older ages. We did not find significant differences in the mother-child association in dietary quality for either of these two groups relative to third-generation children. The lack of significance does not necessarily indicate that age at migration does not moderate mother-child concordance in dietary quality; rather, it likely results from the reduction in sample size that arises when the first-generation group is

disaggregated. Regarding neighborhood foreign-born concentration, we found that the continuous version of this variable was also a significant moderator.

Third, we tested a dichotomous specification of the outcome. Defining a “high quality” diet as diets in the top quartile of HEI (1=top quartile) (Pan and Pratt 2008), we used logistic regression to model children’s odds of having a high quality diet as a function of mother’s high quality diet and all controls. In these models, we used continuous neighborhood variables to maintain sufficient sample sizes for the interactions. Consistent with previous research (Beydoun and Wang 2009), we found that children’s odds of having a healthy diet more than doubled if their mother ate a healthy diet (odds ratio=2.15). Generational status again moderates this association; in this case, the association between mother’s and child’s high quality diet is significantly weaker for both first *and* second-generation children relative to third-generation children. However, neighborhood foreign-born concentration did not significantly moderate this association.

5. Discussion

High obesity prevalence among the large and growing population of Mexican children of immigrants in the U.S. represents a pressing public health concern. This health pattern is especially troubling because Mexican immigrant mothers have relatively low obesity prevalence compared with Mexican American mothers. The ways in which Mexican immigrant parents and children negotiate their familial, social, and nutrition environments might contribute to the intergenerational loss of this health advantage. Therefore, understanding whether, how, and in what contexts immigrant parents’ diet and weight-related behaviors predict that of their children deserves increased research attention.

This study investigated how the interplay of maternal dietary quality, immigrant generation, and neighborhood context shapes the dietary quality of a national sample of Mexican-origin children in the U.S. We examined whether the association between mother’s and child’s HEI varies by child’s generational status and by residence in an immigrant enclave. We found that the mother-child association in dietary quality is weaker for first-generation children compared to third-generation children but that among first-generation children, mother-child resemblance in dietary quality is stronger among those who live in immigrant enclaves.

These findings raise three important points for discussion. First, results suggest that the healthy eating advantage of Mexican immigrant mothers might not be sustained across family generations. Whereas children of Mexican American mothers eat diets that are as (un)healthy as that of their mothers, first-generation children whose mothers eat a relatively healthy diet eat significantly less healthy diets than their mothers. We also found that this was the case for second-generation children when we evaluated the odds of consuming a high quality diet. On the other hand, this finding has potentially promising implications for first-generation children whose mothers eat a relatively poor quality diet because it suggests that their diets are not as determined by their mothers as are those of third-generation Mexican-origin children. We are cautious in our interpretation of these results because they rely on one 24-hour dietary recall, but they nevertheless suggest that children of immigrants would eat healthier diets if mother-child resemblance in dietary quality was as strong as it is

for children of U.S.-born mothers. They further suggest that promoting healthy eating among children may be especially difficult for Mexican immigrant mothers because of the weaker association between their dietary quality and that of their children.

Previous studies (Baker and Altman 2014; Cheah and Van Hook 2012; Greder, de Slowing and Doudna 2012; McArthur, Anguiano and Nocetti 2001) lead us to speculate that dissonant dietary acculturation, coupled with maternal familiarity with obesity risk and U.S. food environments, may explain greater dissimilarity in dietary quality in immigrant families. Other family dynamics, such as parenting practices and mother-child relationships, may also differ in immigrant and non-immigrant families and underlie differences in mother-child concordance in dietary quality. Differences in mother-child English language use and proficiency might tap into some of these relational dynamics. The NHANES does not provide such variables to allow us to assess these potential mechanisms, but future research should consider them. Another important task for future research is to incorporate fathers, siblings, and other family members to gain a more detailed understanding of family dietary influences in immigrant families. Future studies would also benefit from the use of multiple dietary recalls and other types of dietary assessments.

Second, our findings prompt concern that a weaker mother-child association in dietary quality may leave Mexican children of immigrants particularly vulnerable to negative external influences on diet. Due to lack of data, our study could not address whether children of immigrants are more vulnerable to the dietary influences of other key social contexts such as schools or peers. This question represents a critical area for future research.

Third, our results highlight the role of neighborhoods in shaping family associations in dietary behavior within Mexican immigrant families. Residence in an immigrant enclave is associated with stronger mother-child resemblance in dietary quality for first-generation children. Immigrant enclaves likely facilitate access to traditional Mexican food and lessen pressure for children to eat American foods, which may foster mother-child similarity in dietary quality. First-generation children, having been born outside the U.S., may be particularly vulnerable to pressure to consume unhealthy American foods as a way to fit in with peers, which is why immigrant enclaves may be especially protective for them in terms of maintaining dietary quality similar to that of their mother. It is unclear why immigrant enclaves were less protective for second-generation children. One possibility is that their peer networks extend beyond the neighborhood, or that their mothers have been in the U.S. longer and are less socially connected to the immigrant community.

As the first national-level study of parent-child dietary resemblance in immigrant families, this study offers several policy implications. It suggests that parent-focused childhood obesity interventions and healthy eating initiatives may have little impact in improving the dietary quality of children in Mexican immigrant families. Such initiatives should be tailored to address the unique challenges that immigrant parents face in promoting healthy eating among their children. It also underscores the need for context-based interventions; parent-focused obesity and diet interventions may be more effective for immigrant families in immigrant enclaves. More broadly, our study emphasizes the need for researchers and policymakers to consider how intergenerational associations in health behaviors may work

differently for immigrant families and the important role that local contexts play in shaping those associations.

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References

- Ariza, Adolfo J.; Chen, Edwin H.; Binns, Helen J.; Christoffel, Katherine Kaufer. Risk factors for overweight in five- to six-year-old Hispanic-American children: A pilot study. *Journal of Urban Health*. 2004; 81(1):150–61. [PubMed: 15047793]
- Baker, Elizabeth H.; Altman, Claire E. Maternal Ratings of Child Health and Child Obesity, Variations by Mother's Race/Ethnicity and Nativity. *Maternal and Child Health Journal*. 2014:1–10. [PubMed: 23483413]
- Baker, Elizabeth H.; Balistreri, Kelly Stamper; Van Hook, Jennifer. Maternal Employment and Overweight Among Hispanic Children of Immigrants and Children of Natives. *Journal of Immigrant and Minority Health*. 2009; 11(3):158–67. [PubMed: 17963041]
- Barcenas, Carlos H.; Wilkinson, Anna V.; Strom, Sara S.; Cao, Yumei; Saunders, Katherine C.; Mahabir, Somdat; Hernández-Valero, María A.; Forman, Michele R.; Spitz, Margaret R.; Bondy, Melissa L. Birthplace, Years of Residence in the United States, and Obesity Among Mexican-American Adults. *Obesity*. 2007; 15(4):1043–52. [PubMed: 17426341]
- Batis, Carolina; Hernandez-Barrera, Lucia; Barquera, Simon; Rivera, Juan A.; Popkin, Barry M. Food Acculturation Drives Dietary Differences among Mexicans, Mexican Americans, and Non-Hispanic Whites. *The Journal of Nutrition*. 2011; 141(10):1898–906. [PubMed: 21880951]
- Beydoun, May A.; Wang, Youfa. Parent-child dietary intake resemblance in the United States: Evidence from a large representative survey. *Social Science & Medicine*. 2009; 68(12):2137–44. [PubMed: 19375837]
- Bickel, Gary; Nord, Mark; Price, Christofer; Hamilton, William; Cook, John. *Guide to Measuring Household Food Security*, Revised 2000. Alexandria, VA: U.S. Department of Agriculture, Food and Nutrition Service; 2000.
- Birch, Leann L.; Fisher, Jennifer O. Development of Eating Behaviors Among Children and Adolescents. *Pediatrics*. 1998; 101(Supplement 2):539–49. [PubMed: 12224660]
- Brown, Rachael; Ogden, Jane. Children's eating attitudes and behaviour: a study of the modelling and control theories of parental influence. *Health Education Research*. 2004; 19(3):261–71. [PubMed: 15140846]
- Buttenheim, Alison M.; Pebley, Anne R.; Hsieh, Katie; Chung, Chang Y.; Goldman, Noreen. The shape of things to come? Obesity prevalence among foreign-born vs. US-born Mexican youth in California. *Social Science & Medicine*. 2013; 78(0):1–8. [PubMed: 23273875]
- Cheah, Charissa SL.; Van Hook, Jennifer. Chinese and Korean immigrants' early life deprivation: An important factor for child feeding practices and children's body weight in the United States. *Social Science & Medicine*. 2012; 74(5):744–52. [PubMed: 22265872]
- Child Trends. *Child Trends Data Bank. Indicators on Children and Youth*. Washington D.C: Child Trends; 2014. Immigrant Children.
- Cullen, Karen Weber; Lara, Katina M.; de Moor, Carl. Familial concordance of dietary fat practices and intake. *Family & community health*. 2002; 25(2):65–75. [PubMed: 12010116]
- Dubowitz, Tamara; Subramanian, SV.; Acevedo-Garcia, Dolores; Osypuk, Theresa L.; Peterson, Karen E. Individual and Neighborhood Differences in Diet Among Low-Income Foreign and U.S.-Born Women. *Women's Health Issues*. 2008; 18(3):181–90. [PubMed: 18222706]

- Duffey, Kiyah J.; Gordon-Larsen, Penny; Ayala, Guadalupe X.; Popkin, Barry M. Birthplace Is Associated with More Adverse Dietary Profiles for US-Born Than for Foreign-Born Latino Adults. *The Journal of Nutrition*. 2008; 138(12):2428–35. [PubMed: 19022968]
- Garson, G David. Hierarchical linear modeling: Guide and applications. Thousand Oaks, CA: Sage; 2012.
- Golan, Moria; Crow, Scott. Targeting Parents Exclusively in the Treatment of Childhood Obesity: Long-Term Results. *Obesity Research*. 2004; 12(2):357–61. [PubMed: 14981230]
- Gordon-Larsen, Penny; Harris, Kathleen Mullan; Ward, Dianne S.; Popkin, Barry M. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Social Science & Medicine*. 2003; 57(11):2023–34. [PubMed: 14512234]
- Greder, Kimberly; de Slowing, Flor Romero; Doudna, Kimberly. Latina Immigrant Mothers: Negotiating New Food Environments to Preserve Cultural Food Practices and Healthy Child Eating. *Family and Consumer Sciences Research Journal*. 2012; 41(2):145–60.
- Guendelman, Maya D.; Cheryan, Sapna; Monin, Benoît. Fitting In but Getting Fat: Identity Threat and Dietary Choices Among U.S. Immigrant Groups. *Psychological Science*. 2011; 22(7):959–67. [PubMed: 21653909]
- Guendelman, Sylvia D.; Ritterman-Weintraub, Miranda L.; Fernald, Lia CH.; Kaufer-Horwitz, Martha. Weight Status of Mexican Immigrant Women: A Comparison With Women in Mexico and With US-Born Mexican American Women. *American Journal of Public Health*. 2013; 103(9):1634–40. [PubMed: 23865649]
- Guenther, Patricia M.; Casavale, Kellie O.; Reedy, Jill; Kirkpatrick, Sharon I.; Hiza, Hazel AB.; Kuczyński, Kevin J.; Kahle, Lisa L.; Krebs-Smith, Susan M. Update of the Healthy Eating Index: HEI-2010. *Journal of the Academy of Nutrition and Dietetics*. 2013; 113(4):569–80. [PubMed: 23415502]
- Guo X, Warden BA, Paeratakul S, Bray GA. Healthy Eating Index and Obesity. *Eur J Clin Nutr*. 2004; 58(12):1580–86. [PubMed: 15162130]
- Hamilton, Erin R.; Teitler, Julien O.; Reichman, Nancy E. Mexican American Birthweight and Child Overweight: Unraveling a Possible Early Life Course Health Transition. *Journal of Health and Social Behavior*. 2011; 52(3):333–48. [PubMed: 21788453]
- Harris, Jennifer L.; Graff, Samantha K. Protecting Children From Harmful Food Marketing: Options for Local Government to Make a Difference. *Preventing Chronic Disease*. 2011; 8(5):A92. [PubMed: 21843422]
- Johnson, David R.; Young, Rebekah. Toward Best Practices in Analyzing Datasets with Missing Data: Comparisons and Recommendations. *Journal of Marriage and Family*. 2011; 73(5):926–45.
- Kelder SH, Perry CL, Klepp KI, Lytle LL. Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *American Journal of Public Health*. 1994; 84(7):1121–26. [PubMed: 8017536]
- Kotila, Letitia E.; Schoppe-Sullivan, Sarah J.; Kamp Dush, Claire M. Time in Parenting Activities in Dual-Earner Families at the Transition to Parenthood. *Family Relations*. 2013; 62(5):795–807. [PubMed: 26405367]
- Kwak, Kyunghwa. Adolescents and their parents: A review of intergenerational family relations for immigrant and non-immigrant families. *Human Development*. 2003; 46(2–3):115–36.
- Lee, Rebecca E.; Cubbin, Catherine. Neighborhood Context and Youth Cardiovascular Health Behaviors. *American Journal of Public Health*. 2002; 92(3):428–36. [PubMed: 11867325]
- Mascola, Anthony J.; Bryson, Susan W.; Stewart Agras, W. Picky eating during childhood: A longitudinal study to age 11 years. *Eating Behaviors*. 2010; 11(4):253–57. [PubMed: 20850060]
- McArthur, Laura H.; Viramontez Anguiano, Ruben P.; Nocetti, Deigo. Maintenance and Change in the Diet of Hispanic Immigrants in Eastern North Carolina. *Family and Consumer Sciences Research Journal*. 2001; 29(4):309–35.
- Mikkila V, Rasanen L, Raitakari OT, Pietinen P, Viikari J. Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases: The Cardiovascular Risk in Young Finns Study. *European Journal of Clinical Nutrition*. 2004; 58(7):1038–45. [PubMed: 15220946]

- Mitchell, Braxton D.; Rainwater, David L.; Hsueh, Wen-Chi; Kennedy, Amy J.; Stern, Michael P.; Maccluer, Jean W. Familial Aggregation of Nutrient Intake and Physical Activity: Results from the San Antonio Family Heart Study. *Annals of Epidemiology*. 2003; 13(2):128–35. [PubMed: 12559672]
- Nicklaus, Sophie; Boggio, Vincent; Chabanet, Claire; Issanchou, Sylvie. A prospective study of food preferences in childhood. *Food Quality and Preference*. 2004; 15(7–8):805–18.
- Oliveria, Susan A.; Curtis Ellison, R.; Moore, Lynn L.; Gillman, Matthew W.; Garrahie, Ellen J.; Singer, Martha R. Parent-child relationships in nutrient intake: the Framingham Children's Study. *The American Journal of Clinical Nutrition*. 1992; 56(3):593–8. [PubMed: 1503074]
- Pan, Yang; Pratt, Charlotte A. Metabolic Syndrome and Its Association with Diet and Physical Activity in US Adolescents. *Journal of the American Dietetic Association*. 2008; 108(2):276–86. [PubMed: 18237576]
- Park, Yoosun; Neckerman, Kathryn; Quinn, James; Weiss, Christopher; Jacobson, Judith; Rundle, Andrew. Neighbourhood immigrant acculturation and diet among Hispanic female residents of New York City. *Public Health Nutrition*. 2011; 14(09):1593–600. [PubMed: 21414245]
- Pinderhughes, Ellen E.; Nix, Robert; Michael Foster, E.; Jones, Damon. The Conduct Problems Prevention Research Group. Parenting in Context: Impact of Neighborhood Poverty, Residential Stability, Public Services, Social Networks, and Danger on Parental Behaviors. *Journal of Marriage and Family*. 2001; 63(4):941–53. [PubMed: 19829752]
- Portes, Alejandro; Rumbaut, Ruben G. *Legacies: The story of the immigrant second generation*. University of California Press; 2001.
- Portes, Alejandro; Zhou, Min. The New Second Generation: Segmented Assimilation and Its Variants. *Annals of the American Academy of Political and Social Science*. 1993; 530:74–96.
- Rivera, Juan A.; Barquera, Simon; González-Cossío, Teresa; Olaiz, Gustavo; Sepúlveda, Jaime. Nutrition Transition in Mexico and in Other Latin American Countries. *Nutrition Reviews*. 2004; 62:S149–S57. [PubMed: 15387482]
- Ro, Annie; Fleischer, Nancy. Changes in health selection of obesity among Mexican immigrants: A binational examination. *Social Science & Medicine*. 2014; 123:114–24. [PubMed: 25462612]
- Sampson, Robert J.; Morenoff, Jeffrey D.; Gannon-Rowley, Thomas. Assessing “Neighborhood Effects”: Social Processes and New Directions in Research. *Annual Review of Sociology*. 2002; 28:443–78.
- Schwingshackl, Lukas; Hoffmann, Georg. Diet Quality as Assessed by the Healthy Eating Index, the Alternate Healthy Eating Index, the Dietary Approaches to Stop Hypertension Score, and Health Outcomes: A Systematic Review and Meta-Analysis of Cohort Studies. *Journal of the Academy of Nutrition and Dietetics*. 2015; 115(5):780–800.e5. [PubMed: 25680825]
- Sussner, Katarina M.; Lindsay, Ana C.; Greaney, Mary L.; Peterson, Karen E. The Influence of Immigrant Status and Acculturation on the Development of Overweight in Latino Families: A Qualitative Study. *Journal of Immigrant and Minority Health*. 2008; 10(6):497–505. [PubMed: 18373200]
- Van Hook, Jennifer; Baker, Elizabeth; Altman, Claire E. Does it begin at school or home? The institutional origins of overweight among young children of immigrants. In: Grigorenko, Elena L.; Takanishi, Ruby, editors. *Immigration, diversity, and education*. Routledge/Taylor and Francis Group; 2009. p. 205–24.
- Wang Y, Beydoun MA, Li J, Liu Y, Moreno LA. Do children and their parents eat a similar diet? Resemblance in child and parental dietary intake: systematic review and meta-analysis. *Journal of Epidemiology and Community Health*. 2010
- Zhang, Qi; Lamichhane, Rajan; Chen, Hsin-Jen; Xue, Hong; Wang, Youfa. Does child-parent resemblance in body weight status vary by sociodemographic factors in the USA? *Journal of Epidemiology and Community Health*. 2014; 68(11):1034–42. [PubMed: 25059731]
- Zhou, Min; Bankston, Carl L. Social Capital and the Adaptation of the Second Generation: The Case of Vietnamese Youth in New Orleans. *International Migration Review*. 1994; 28(4):821–45.
- Zuercher, Jennifer L.; Wagstaff, David A.; Kranz, Sibylle. Associations of food group and nutrient intake, diet quality, and meal sizes between adults and children in the same household: a cross-sectional analysis of U.S. households. *Nutrition Journal*. 2011; 10(1):1–12. [PubMed: 21208446]

HIGHLIGHTS

- We model mother-child resemblance in dietary quality in Mexican-origin families.
- Generational status and neighborhoods condition resemblance in dietary quality.
- Resemblance in dietary quality is weakest for first-generation children.
- Immigrant enclaves strengthen dietary resemblance for the first-generation.

Figure 1.

Predicted Child's HEI by Mother's HEI and Child's Generational Status

Note: Dotted line indicates slope significantly different from 3rd generation at $p < .05$ level.

Figure 2.
Child's HEI by Mother's HEI, Child's Generational Status, and Neighborhood Foreign-born Concentration

Note: Dotted line indicates slopes significantly different at $p < .05$ level.

Table 1
Weighted Sample Means and Proportions by Child's Generational Status, Mexican-origin Children Ages 2–15

	All	1 st generation	2 nd generation	3 rd generation
Child's HEI	45.60 (18.08)	44.45 (17.83)	47.03 (18.69) *	44.12 (16.75)
Mother's HEI	47.82 (19.24)	49.18 (20.09) *	50.51 (19.39) *	43.86 (17.11)
Resides in immigrant enclave	0.29	0.35 *	0.35 *	0.21
Child's characteristics				
Generational status				
1 st generation	0.12			
2 nd generation	0.50			
3 rd generation	0.38			
Male	0.51	0.60 *	0.50	0.50
Age	8.18 (5.71)	10.08 (5.58) *	7.94 (5.65)	7.89 (5.47)
Typical number of school meals per week	4.72 (5.59)	6.19 (5.66) *	4.76 (5.76)	4.17 (5.06)
Proportion of food (grams) consumed away from home	0.29 (0.41)	0.24 (0.42) *	0.26 (0.38) *	0.34 (0.42)
Mother's characteristics				
Mother's education				
High school	0.56	0.79 *	0.69 *	0.32
Some college	0.17	0.10 *	0.15 *	0.23
College or more	0.27	0.11 *	0.17 *	0.45
Mother's work status				
Not in labor force	0.53	0.63	0.54	0.48
Part-time	0.16	0.14	0.16	0.16
Full-time	0.31	0.24 *	0.29	0.36
Household characteristics				
Number of people living in household	5.19 (1.92)	5.43 (1.80)	5.40 (1.92)	4.83 (1.80)
Food insecure	0.35	0.50 *	0.39 *	0.27
No English spoken in household	0.37	0.62 *	0.55 *	0.05
Dietary recall characteristics				

	All	1 st generation	2 nd generation	3 rd generation
Summer	0.12	0.14 *	0.12 *	0.10
Weekend	0.30	0.41 *	0.31	0.26
Pearson correlation between child's HEI and mother's HEI				
	0.30	0.16	0.28	0.34
N	2090	304	1078	708

Source: Continuous NHANES 1999/2000 – 2009/2010

Note: Standard deviations in parentheses for continuous variables.

* significantly different from 3rd generation at p <.05 level

Table 2

Unstandardized Regression Coefficients from OLS Models Predicting Healthy Eating Index-2010, Mexican-origin Children Ages 2–15

	Model 1	Model 2	Model 3	Model 4
Mother's HEI	0.28 (0.04) ***	0.33 (0.05) ***	0.33 (0.05) ***	0.37 (0.06) ***
Child's generational status				
1st generation	−0.65 (1.11)	−0.70 (1.09)	−0.85 (1.32)	−0.98 (1.35)
2nd generation	−0.01 (1.05)	−0.23 (1.04)	0.28 (1.23)	0.23 (1.21)
Immigrant enclave	0.67 (0.71)	0.78 (0.70)	2.09 (1.74)	1.21 (1.60)
Interaction terms				
Generational status * Mother's HEI ^a				
1st generation * Mother's HEI		−0.19 (0.07) *	−0.20 (0.07) **	−0.33 (0.09) ***
2nd generation * Mother's HEI		−0.05 (0.06)	−0.05 (0.06)	−0.11 (0.07)
Generational status * Neighborhood context				
1st generation * Immigrant enclave			−0.40 (2.54)	−0.14 (2.66)
2nd generation * Immigrant enclave			−2.27 (2.59)	−1.48 (2.45)
Mother's HEI * Immigrant enclave			0.02 (0.06)	−0.16 (0.08)
Generational status * Mother's HEI * Neighborhood context ^a				
1st generation * Mother's HEI * Immigrant enclave				0.43 (0.15) **
2nd generation * Mother's HEI * Immigrant enclave				0.22 (0.11)
Child's characteristics				
Male	−1.26 (0.65)	−1.26 (0.65)	−1.22 (0.64)	−1.22 (0.63)
Age	−0.55 (0.11) ***	−0.55 (0.11) ***	−0.55 (0.11) ***	−0.56 (0.11) ***
Typical number of school meals per week	−0.12 (0.09)	−0.11 (0.09)	−0.10 (0.09)	−0.11 (0.09)
Proportion of food (grams) consumed away from home	−5.58 (1.23) ***	−5.52 (1.21) ***	−5.46 (1.24) ***	−5.53 (1.23) ***
Mother's education level				
Some college	0.25 (1.07)	0.17 (1.09)	0.15 (1.08)	0.08 (1.07)
College or more	1.47 (0.95)	1.44 (0.94)	1.43 (0.96)	1.35 (0.95)
Mother's work status				
Part-time	0.82 (1.07)	0.89 (1.07)	0.86 (1.08)	0.89 (1.09)

	Model 1	Model 2	Model 3	Model 4
Full-time	1.58 (0.97)	1.62 (0.98)	1.64 (0.98)	1.51 (0.98)
Household characteristics				
Number of people living in household	0.20 (0.31)	0.19 (0.30)	0.18 (0.31)	0.15 (0.31)
Food insecure	0.37 (0.79)	0.41 (0.81)	0.43 (0.81)	0.47 (0.81)
No English spoken in household	2.18 (0.95) *	2.18 (0.95) *	2.17 (0.94) *	2.10 (0.92) *
Dietary recall characteristics				
Summer	-1.49 (0.89)	-1.63 (0.91)	-1.62 (0.90)	-1.58 (0.90)
Weekend	-2.18 (1.18)	-2.20 (1.18)	-2.17 (1.18)	-2.03 (1.18)
Constant	50.56 (1.99) ***	50.73 (2.00) ***	50.50 (2.04) ***	50.91 (2.01) ***
N=2090				

Source: Continuous NHANES 1999/2000 – 2009/2010

Note: Standard errors in parentheses.

^a results of F-test of joint significance of categorical variables significant at p<.05.

*** p<.001,
** p<.01,
* p<.05