HHS Public Access

Author manuscript

Appetite. Author manuscript; available in PMC 2019 February 26.

Published in final edited form as:

Appetite. 2018 October 01; 129: 25–36. doi:10.1016/j.appet.2018.06.017.

Associations between acculturation, ethnic identity, and diet quality among U.S. Hispanic/Latino Youth: Findings from the HCHS/SOL Youth Study

Gabriela Arandia[a], **Daniela Sotres-Alvarez**[b], **Anna Maria Siega-Riz**[c], **Elva M. Arredondo**[d], **Mercedes R. Carnethon**[e], **Alan M. Delamater**[f], **Linda C. Gallo**[g], **Carmen R. Isasi**[h], **Ashley N. Marchante**[i], **David Pritchard**[b], **Linda Van Horn**[e], and **Krista M. Perreira**[j,*]

[a]Department of Health Behavior, University of North Carolina at Chapel Hill, 135 Dauer Drive, 302 Rosenau Hall, CB #7440, Chapel Hill, NC, 27599-7440, USA

[b]Collaborative Studies Coordinating Center, Department of Biostatistics, University of North Carolina at Chapel Hill, 123 W. Franklin Street, Suite 450, CB #8030, Chapel Hill, NC 27516, USA

[c]School of Nursing at University of Virginia, 225 Jeanette Lancaster Way, Charlottesville, VA 22903-3388, USA

[d]San Diego State University Graduate School of Global Public Health, 9245 Sky Park Court, Suite #221, San Diego, CA 92123-4311, USA

[e]Department of Preventive Medicine, Northwestern University, 680 N Lake Shore Drive, Suite 1400, Chicago, IL 60611, USA

[f]Department of Pediatrics, University of Miami, Mailman Center (MCCD), 1601 NW 12th Ave., Room 4048, Miami, FL 33136-1005, USA

[g]Department of Psychology, San Diego State University, 9245 Sky Park Court, Suite 110, San Diego, CA 92123-4311, USA

[h]Department of Epidemiology and Population Health, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Belfer Building, Room 1308, Bronx, NY 10461, USA

[i]Department of Psychology, University of Miami, 5665 Ponce De Leon Blvd, Coral Gables, FL 33124, USA

[j]Carolina Population Center, University of North Carolina at Chapel Hill, CB #8120, 123 W. Franklin St., Chapel Hill, NC 27516, USA

Abstract

[*]Corresponding author: perreira@email.unc.edu (K.M. Perreira). arandia.gabriela@gmail.com (G. Arandia), dsotres@unc.edu (D. Sotres-Alvarez), siegariz@virginia.edu (A.M. Siega-Riz), earrendon@mail.sdsu.edu (E.M. Arredondo), carnethon@northwestern.edu (M.R. Carnethon), adelamater@med.miami.edu (A.M. Delamater), lgallo@mail.sdsu.edu (L.C. Gallo), carmen.isasi@einstein.yu.edu (C.R. Isasi), ashley.marchante@gmail.com (A.N. Marchante), dpritch@live.unc.edu (D. Pritchard), lvanhorn@northwestern.edu (L. Van Horn).

Declarations of interest

None.

Background: Acculturation among Hispanic/Latinos has been linked to deteriorating dietary quality that may contribute to obesity risks. This study examined the relationship between acculturation, ethnic identity, and dietary quality in U.S. Hispanic/Latino youth.

Methods: This cross-sectional study included 1298 Hispanic/Latino youth ages 8–16 from the Hispanic Community Health Study/Study of Latino Youth (HCHS/SOL Youth), an ancillary study of offspring of participants in the adult HCHS/SOL cohort. Multivariable regression analyses assessed relationships between acculturation and ethnic identity with dietary quality as measured by Healthy Eating Index (HEI) scores, accounting for covariates, design effects, and sample weights. We also compared HEI scores by immigrant generation and language of interview.

Results: Youth were 12 ± 2.5 -years and 49.3% female. They were placed into five acculturation categories—including 48% integrated (bicultural orientation), 32.7% assimilated (high U.S. and low Latino orientation), 5.9% separated (high Latino and low U.S. orientation) or marginalized (neither U.S. nor Latino orientation), and 13.3% unclassified. Mean HEI was 53.8; there were no differences in HEI scores by acculturation category, but integrated youth had higher whole grains scores, lower sodium scores, and lower empty calories scores compared to assimilated youth. There were no differences in HEI scores by ethnic identity scores, and no consistent trend between dietary quality and ethnic identity. First- and second-generation youth had higher HEI scores, compared to third-generation youth, and, Spanish-speaking youth had higher HEI scores compared to English-speaking youth.

Conclusion: Results suggest that integrated youth in the U.S. may engage in healthier eating behaviors than those who are assimilated. Additional research on Hispanic/Latino youths' acculturation and diet can inform health promotion efforts to improve eating habits and health outcomes among this population.

Keywords

Acculturation; Ethnic identity; Healthy eating index; Youth; Hispanic/Latino; Immigrant

1. Introduction

The rising prevalence of obesity among Hispanic/Latino youth is an important public health problem today. Nearly 25 percent of Hispanic/ Latino children (ages 6 to 11) are obese, compared with 13.6 percent of non-Hispanic Whites and 21.4 percent of non-Hispanic Blacks of the same ages (Ogden et al., 2016). Among 12–19 year olds, 22.8 percent of Hispanic/Latino youth are obese, compared with 19.6 percent of non-Hispanic Whites and 22.6 percent of non-Hispanic Blacks (Ogden et al., 2016). Obesity during childhood raises risk for developing chronic health problems that extend and worsen into adulthood (Biro & Wien, 2010; Isasi et al., 2016).

Research suggests that acculturation to the U.S. mainstream, or the adoption of U.S cultural norms, values, and customs, exacerbates obesity risk among immigrants (Alidu & Grunfeld, 2017; Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005). Immigrants tend to have healthier diets than their non-immigrant counterparts upon arrival to the U.S., but, over time and successive generations in the U.S., may be susceptible to adopting mainstream U.S. dietary habits and unhealthy eating behaviors (Ayala, Baquero, & Klinger, 2008; Cuy

Castellanos, 2015; Satia-Abouta, Patterson, Neuhouser, & Elder, 2002). For example, researchers have found that higher immigrant generation relates to worse dietary patterns, including reduced intakes of fruit, vegetables, and grains and increased intakes of sugar-sweetened beverages, saturated fat, processed foods and sodium (Allen et al., 2007; Gordon-Larsen, Harris, Ward, & Popkin, 2003; Liu, Chu, Frongillo, & Probst, 2012; Liu, Probst, Harun, Bennett, & Torres, 2009; Martin, Van Hook, & Quiros, 2015; Popkin & Udry, 1998; Van Hook, Quiros, Frisco, & Fikru, 2016). However, this research does not account for the perspective that acculturation is a bi-dimensional process that can include maintenance of heritage (i.e., country-of-origin) cultural values, behaviors, and norms, along with and adoption of those of the U.S. culture. Fewer studies have employed acculturation scales to operationalize acculturation and those that have link greater acculturation with higher fast food intake and lower fruit and vegetable intake (Ayala et al., 2008; Unger et al., 2004).

Assessing the complex construct of acculturation via acculturation scales can provide a more complete picture of associated dietary changes, compared to one-item acculturation proxies, such as time in the U.S., that suggest that acculturation is a simple, linear process. To more fully capture youths' orientation towards heritage cultural maintenance, we also study associations between Hispanic/Latino youths' sense of ethnic identity and diet quality (Roberts et al., 1999; Sellers, Smith, Shelton, Rowley, & Chavous, 1998). Ethnic identity development represents a key developmental marker of childhood and adolescence, conceivably more critical for acculturating Hispanic/Latino youth (Rodriguez & Morrobel, 2004) who may experience acculturative stress as a result of life event stressors (Sam & Berry, 2010).

The current study addresses limitations of previous research by moving beyond commonly used proxies for acculturation (e.g., immigrant generation, time in the U.S.) by exploring associations between Hispanic/Latino youths' degree of acculturation measured by validated acculturation and ethnic-identity scales, and diet, assessed by the Healthy Eating Index 2010 (HEI-2010) (Guenther et al., 2013). Acculturation, the exchange of cultural, attitudes, customs, and behaviors, is assessed using the Acculturation, Habits, and Interests Multicultural Scale for Adolescents (AHIMSA) which categorizes youth into four acculturation groups (Unger et al., 2002).

We examined associations between acculturation and diet among Hispanic/Latino youth enrolled in the Hispanic Community Health Study/Study of Latino Youth (HCHS/SOL Youth) (Isasi et al., 2014). Given that Hispanic/Latino youth are the fastest-growing racial/ethnic minority population in the U.S. with higher obesity and related health problems than their non-Hispanic/Latino counterparts, understanding the influence of acculturation (AHIMSA; ethnic identity) on dietary intake is important for identifying high-risk groups and informing tailored preventive approaches to reduce the prevalence of obesity among these populations.

Our first hypothesis was that acculturation and diet would be negatively associated, such that assimilated youth (oriented towards U.S. culture *without* heritage cultural maintenance) would have poorer quality diets than integrated (oriented towards U.S. culture *with* heritage cultural maintenance), separated (oriented towards heritage cultural maintenance *without*

U.S. cultural adoption), or marginalized youth (oriented towards neither U.S., nor heritage cultures) (Unger et al., 2002). Because assimilated youth are most strongly oriented towards mainstream U.S. culture, we expected them to consume diets most similar to the U.S. mainstream, which are less healthy (Ayala et al., 2008; Satia-Abouta et al., 2002). Moreover, other studies have reported better health outcomes (e.g., greater self-esteem) among integrated or bicultural youth than among assimilated youth (Gonzales, Jensen, Montano, & Wynne, 2014; Schwartz et al., 2015). To better understand acculturative experiences across AHIMSA groups, we examined ethnic identity and acculturative stress across AHIMSA groups. We expected that ethnic identity would be weakest among assimilated youth, and that marginalized/separated youth would be experiencing the most acculturative stress.

Our second hypothesis was that ethnic identity and diet would be positively associated, such that youth with greater ethnic identity (enculturation or retention of one's culture of origin) would have healthier diets than youth with lower ethnic identity. This hypothesis was based upon the idea that youth with a stronger sense of ethnic identity would be more likely to consume traditional foods which tend to be healthier than mainstream U.S. foods (Ayala et al., 2008; Satia-Abouta et al., 2002).

2. Methods

This study includes a sample of Hispanic/Latino youth enrolled in the Hispanic Community Health Study/Study of Latino Youth (HCHS/ SOL Youth) (Isasi et al., 2014), an ancillary study of offspring of participants enrolled in the parent Hispanic Community Health Study/ Study of Latinos (HCHS/SOL), which is a population-based cohort study of 16,415 Hispanic/Latino adults (aged 18–74 years) recruited from 4 U.S. communities (Chicago, IL; Miami, FL; Bronx, NY; San Diego, CA) (Sorlie et al., 2010). A total of 1466 children ages 8–16 years old enrolled in HCHS/SOL Youth and attended a clinic visit between 2011 and 2013. Of the 1466 children, a total of 171 were excluded from the current analyses due to missing dietary measures (n = 13), acculturation measures (n = 23), or covariates (n = 135), leaving a final analytical sample of 1295.

Details about the methodology and protocols of HCHS/SOL and HCHS/SOL Youth have been described and published elsewhere (Ayala et al., 2014; Isasi et al., 2014; LaVange et al., 2010; Sorlie et al., 2010). The study was conducted with approval from the institutional review boards of each of the institutions involved in the study. Written informed consent and assent were obtained from parent/caregivers and their children, respectively.

3. Measures and data collection

3.1. Dietary intake

Child dietary intake was obtained from the child, with assistance from his/her parent if needed, via two interview-administered 24-hour recalls using multi-pass method with the Nutrition Data System for Research (NDSR) software developed by the University of Minnesota. Total dietary intake was calculated as the average of two 24-hour dietary recalls. The Healthy Eating Index 2010 (HEI-2010), a measure of overall dietary quality that assesses adherence of reported food intake to the *2010 Dietary Guidelines for Americans*

(Guenther et al., 2013) was applied accordingly. The 2010 version was current when data were collected and analyzed. This index includes twelve dietary components that reflect key aspects of dietary quality: total fruit, whole fruit, total vegetables, greens and beans, whole grains, dairy, total protein foods (beans and peas are included here and not with vegetables when the total protein foods standard is otherwise not met), seafood and plant proteins (beans and peas are included here and not with vegetables when the total protein foods standard is otherwise not met; includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as total protein foods), fatty acids, refined grains, sodium, and empty calories (Guenther et al., 2013). We report on scores for each component of the index and the HEI-2010 overall score, which ranges from 0 to 100 with higher scores indicating greater adherence to the 2010 Dietary Guidelines for Americans (Guenther et al., 2013). Diet quality assessed with the HEI-2010 has been shown to be correlated with overall mortality as well as many diet related chronic diseases including obesity (Schwingshackl & Hoffmann, 2015).

3.2. Acculturation

AHIMSA Scale.—Acculturation was based on participants' responses to the Acculturation, Habits, and Interests Multicultural Scale for Adolescents (AHIMSA), which assesses cultural preference/orientation regarding people, friends, fitting in with others, food, music, TV shows, holidays, and actions and thought processes (Unger et al., 2002). Notably, the 8-item scale does not include language use, a measure of acculturation central to other commonly-used scales. Each question provides respondents with the same four following response options: 1) U.S.; 2) The country my family is from; 3) Both; or 4) Neither (see Appendix 1A). Respondents are typically classified into one of four acculturation categories based on the AHIMSA subscale score (ranging from 0 to 8) with the highest score: Assimilated (high U.S. and low Latino orientation), Separated (high Latino and low U.S. orientation), Integrated (bicultural orientation), and Marginalized (neither U.S. nor Latino orientation). Youth whose responses did not reveal a clear fit were categorized into an "unclassified" group. The majority (64%) of these had high or equal scores on both the assimilation and integration subscales. Lastly, due to a small number of youth in the marginalized category (n = 5), we combined them with the separated group. Kuder-Richardson 20 (KR-20) reliability scores for each of the orientations are: integrated (KR-20 = 0.68), assimilated (KR-20 = 0.65), separated (KR-20 = 0.57), or marginalized (KR-20 = 0.42) (Perreira et al., 2018).

3.3. Ethnic identity

A total ethnic-identity score was derived from averaging eight ethnic-identity items from two scale domains: ethnic affirmation and belonging (derived from five items in the Multigroup Ethnic Identity Measure (MEIM)) and ethnic centrality and regard (derived from three items in the Multidimensional Model of Racial Identity (MMRI)) (Roberts et al., 1999; Sellers et al., 1998) (see Appendix 1B). Factor analysis confirmed that all items identified a single factor with a high reliability ($\alpha = 0.72$). We averaged all eight items for an overall ethnic-identity score ranging from 1 to 5, with a higher score indicating a stronger sense of ethnic identity in the child. Ethnic-identity scores (continuous) were divided into quartiles to

categorize participants by degree of ethnic identity and to allow for comparisons in dietary outcomes across groups.

3.4. Acculturative stress

The Acculturative Stress Index (Gil & Vega, 1996) was used to help contextualize the acculturation-related experiences across AHIMSA groups. We averaged all nine items on language conflict (2 items), acculturation conflict (4 items), and perceived discrimination (3 items) for an overall acculturative stress score ranging from 1 to 5, with a higher score reflecting greater acculturative stress (see Appendix 1C). Among the children in SOL Youth, the reliability for the 9-item acculturative stress index is $\alpha = 0.73$ (Perreira et al., 2018).

3.5. Participant characteristics

Children reported on their Hispanic/Latino background, place of birth, date of birth, language preference (English/Spanish), and gender, while parents/caregivers reported on household income and place of birth. Covariates included: age (determined by participant's date of birth), gender, and immigrant generation (determined by parents' and children's nativity: first generation = foreign-born with foreign-born parents; second generation = U.S.-born with foreign-born parents; third generation = U.S.-born with U.S.-born parents). Children's measurements for height and weight were used to calculate body mass index (BMI) and construct a categorical weight status variable based on age- and sex-specific percentiles according to guidelines from the Centers for Prevention and Control (underweight = BMI < 5th percentile; normal weight = BMI 5–84th percentile; overweight = BMI 85–94th percentile; obese = BMI 95 + percentile, BMI < 35 and 125% of 95 percentile; and severely obese = BMI 95 + percentile, BMI ≥ 35 or 125% of 95 percentile) (Kuczmarski et al., 2002).

4. Statistical analysis

All analyses were conducted using SAS software 9.4 (SAS Institute Inc., Cary, NC) and incorporated sampling weights, stratification and clustering to account for the HCHS/SOL complex survey design. Descriptive statistics were assessed for youth overall and by AHIMSA categories (Integrated, Assimilated, Separated/Marginalized, and Unclassified). ANOVA was used to test differences in the 2010-HEI scores (overall and for each component) between AHIMSA categories, and ethnic-identity quartile categories. We conducted multiple linear regression analyses to test separately the associations between independent variables of interest (AHIMSA, ethnic identity) and the dependent variable 2010-HEI overall score and its components, adjusting for potential confounders (age, gender, field center, immigrant generation, and annual family income). In addition, we calculated and compared overall HEI score using alternative measures of acculturation (immigrant generation, language preference) commonly used in the literature.

5. Results

5.1. Participant characteristics for overall and by AHIMSA categories

Table 1 shows HCHS/SOL Youth characteristics for youth overall and by AHIMSA categories. Gender was evenly distributed. A slightly higher percentage of youth were aged 8–10 years old (29.5%) compared to other age groups. According to the AHIMSA, most youth were categorized as integrated (n = 622, 48.0%) or assimilated (n = 423, 32.7%), and fewer were classified as separated/marginalized (n = 77, 5.9%) and unclassified (n = 173, 13.3%). Mean acculturative stress scores were different by AHIMSA; separated/marginalized youth experienced higher levels of acculturative stress (1.8) and integrated youth the lowest (1.5). The integrated youth had on average the highest ethnic identity score (4.4 out of 5) and the assimilated group the lowest (4.2). There were differences in nativity, immigrant generation, and language of preference across AHIMSA groups. The percentage of assimilated youth born in the U.S./U.S. territory was eleven percentage points higher compared to integrated youth (77.1%), and sixteen percentage points higher compared to separated/marginalized youth (71.8%). A greater proportion of third generation or higher were assimilated youth; second generation were more likely integrated, and first generation were more likely separated/marginalized. Overall, 79.9% preferred English as their primary language, with assimilated youth having the highest percentage (85.7%) and separated/marginalized the lowest (60.7%). Youth of Dominican heritage tended to be integrated; Puerto Rican youth tended to be assimilated; and youth of Mexican heritage were more likely separated/marginalized. Most (83.6%) lived in households earning annual family incomes of $40,000 or less, with over half (51.7%) in households earning less than $20,000. No differences were observed in income by AHISMA.

The overall obesity prevalence was 26.9%, including 10.2% who were severly obese. The highest prevalence was among unclassified youth (29.3%), followed by integrated youth (28.1%), compared to assimilated (25.2%) and separated/marginalized youth (20.5%), although differences were not statistically significant.

5.2. Overall diet and by AHIMSA category

Table 2 presents HEI scores for the overall sample and by AHIMSA category. The mean HEI score was 53.8 (out of 100 possible), with no differences across AHIMSA categories. Statistically significant differences in HEI scores for the sodium and empty calories components were observed across AHIMSA groups, such that separated/marginalized youth had higher sodium scores (higher HEI score means less sodium consumption which is more healthy), and unclassified youth had higher empty calories scores (higher HEI score means fewer empty calories, which is more healthy) relative to other groups. Differences in other dietary components and overall HEI scores among the AHIMSA groups were not statistically significant.

5.3. Overall diet by ethnic-identity quartiles

Table 3 presents HEI scores by ethnic-identity quartiles. There were no statistically significant mean differences in dietary quality across ethnic-identity quartiles.

5.4. Associations between AHIMSA category and HEI components

Multiple regression analyses results for associations between AHIMSA category and components of the HEI, controlling for age, gender, immigrant generation, annual family income, and field center, are shown in Table 4. Statistically significant associations were observed between acculturation categories and HEI scores for whole grains, sodium, and empty calories. Being integrated was associated with having higher whole grain scores (β = 0.21) and lower sodium scores (β = −0.11) compared to being assimilated (referent category). Belonging to the unclassified group was also associated with higher whole grain scores (β = 0.11) and lower sodium scores (β = −0.80), while being separated/marginalized was associated with lower whole grain scores (β = −1.33) and higher sodium scores (β = 0.36), compared to being assimilated. Integrated status was also associated with higher scores for empty calories (β = 0.15) than assimilated status. Moreover, unclassified status was also associated with higher scores for empty calories (β = 1.67), whereas separated/marginalized status was associated with lower scores for empty calories (β = −0.62) compared to assimilated status. No other associations were observed between AHIMSA categories and HEI components.

5.5. Associations between ethnic-identity quartile categories and HEI components

Multiple regression analyses results for associations between ethnic-identity quartiles and components of the HEI, adjusted for covariates, are shown in Table 5. Compared to the lowest ethnic-identity quartile (referent category), we found lower total fruit scores among youth in the second quartile (β = −0.16), higher total fruit scores among those in the third quartile (β = 0.12), and lower total fruit scores among the highest ethnic-identity quartile (Quartile 4) (β = −0.37). No other associations were found between ethnic identity and diet quality scores.

5.6. Mean overall HEI scores by several acculturation measures

Fig. 1 presents unadjusted and adjusted mean overall HEI scores across AHIMSA categories, ethnic-identity quartiles, and by commonly used measures of acculturation – immigrant generation and language preference. As expected, first- and second-generation youth had higher HEI scores (5 and 6 points higher, respectively), compared to third-generation youth, and, Spanish-speaking youth had higher HEI scores (4 points higher) compared to English-speaking youth.

6. Discussion

Understanding acculturation determinants that impact dietary quality can help inform health promotion strategies aimed at improving diet and reducing risks for obesity and chronic diseases among Hispanic/Latino youth. Youth reported a mean HEI score of 53.8 (out of 100 possible), which is similar to 55.07, that of the overall U.S. youth population aged 2–19 years old (U.S. Department of Agriculture, 2017). While there was no difference in the overall HEI score by AHIMSA, we found that integrated acculturation status was associated with better whole grain scores and higher scores for empty calories (i.e., lower percentage of calories from solid fats, alcohol, and added sugars) compared to assimilated status. These findings are consistent with theoretical frameworks and perspectives regarding acculturation,

including the social identity theory, developmental change, and stress and coping (Sam & Berry, 2010) and empirical research associating integration with better health (Gonzales et al., 2014; Sam & Berry, 2010; Schwartz et al., 2015). Separated/marginalized youth, on the other hand, had lower whole grain scores and lower scores for empty calories than assimilated youth. These findings suggest that separated/ marginalized youth may be vulnerable to unhealthy eating habits. Youth who were “unclassified” seem to be those that selectively acculturate, that is, they pick and choose the components of U.S. cultures and country-of-origin cultures that they want to adopt (Van Hook et al., 2016; Yeh, Viladrich, Bruning, & Roye, 2009). This group, therefore, represents a mix of identities and experiences among youth who have yet to settle into one category or another.

Overall we found little variation in diet quality measured with the HEI across AHIMSA categories among our sample, which was largely U.S. born, English speaking, assimilated and integrated, and had a strong sense of ethnic identity. Interestingly, however, we observed differences in overall HEI scores by traditional acculturation measures (i.e., language preference, immigrant generation) that would support better diet quality with less acculturation, that were not detected using the AHIMSA. As expected, we found that first- and second-generation youth had higher HEI scores, compared to third-generation youth, and, Spanish-speaking youth had higher HEI scores compared to English-speaking youth. With respect to ethnic identity and diet, we did not find consistent evidence that would support greater ethnic identity and better dietary quality. A possible explanation for this might be due to the small variation in ethnic identity among our sample.

We found that acculturative stress is related to both ethnic identity and acculturation. Consistent with our hypotheses, assimilated youth reported lower ethnic identity, and marginalized/separated youth experienced the most acculturative stress compared to the other groups. Acculturative stress may be differentially associated with diet; therefore, future work should examine the relationship between acculturative stress and diet to further elucidate our results on AHIMSA, ethnic identity, and diet.

Previous research indicates that detecting differences in diet by acculturation may be more difficult when studying Hispanics/Latinos in dense Hispanic/Latino communities than in more diverse communities with different race/ethnic groups. For example, a recent study by Hasson, Hsu, Davis, Goran, and Spruihit-Metz (2017) did not find any association between acculturation measured using the AHIMSA and diet among Latino youth in Los Angeles (L.A.), California. Wen et al. (2016) also did not find an association between acculturation using AHIMSA and diet among Hispanic/Latino youth in L.A. The authors of the latter study suggest that neighborhood cultural contexts (ethnic composition) may be a stronger determinant of diet than self-identified acculturation. An assessment of community-level factors, such as neighborhood ethnic composition and access to healthy foods within the local food environment, could help to contextualize the acculturation-dietary experiences of Hispanic/Latino youth. We also know that parents, especially those living in Latino communities, can influence children’s diet. In fact, upward socioeconomic mobility through increases in parental education attainment and socioeconomic status has been associated with healthier diets among Mexican-origin children (Martin, Hook, & Quiros, 2015; Van Hook et al., 2016). Furthermore, maternal acculturation has been positively associated with

young children's consumption of fast and convenience foods (Kaiser et al., 2015). Future work should also explore the impact of peers, friends, and other family members' influences (Cruwys, Beverlander, & Hermans, 2015; Davis, Cole, Blake, McKenney-Shuberty, & Peterson, 2016; Salvy, De La Haye, Bowker, & Hermans, 2012) to help shed light on relationships between acculturation and ethnic identity with eating habits of Hispanic/Latino youth.

6.1. Strengths and limitations

This study has several strengths. Firstly, this study offers insights on acculturation and diet quality among a large sample of Hispanic/Latino youth in the U.S. Secondly, we used validated acculturation measures for assessing cultural orientation and ethnic identity, alongside commonly used single item measures (e.g., immigrant generation) that are proxies for exposure to the U.S. Thirdly, two 24-hr dietary recalls were used to calculate HEI scores for individual dietary components and overall diet quality, as opposed to relying on crude self-report dietary measures (e.g., food frequency questionnaire assessing food intake in the past month).

Several limitations are worth noting. The self-reported nature of the diet data, especially among younger children that necessitated parental clarification may have inherent biases and/or variability different from the independently reported diet intake collected from the older children. Further, this study employs a cross-sectional design, so causality between acculturation factors and dietary quality cannot be determined. Large-scale longitudinal studies are needed to track individuals' dietary changes and generational changes over time. In addition, the study sample reflects the urban communities in which study recruitment took place. Thus, results may not be generalizable to Hispanic/Latino youth living in rural/suburban areas or where Hispanics/Latinos are underrepresented. Hispanic/Latino youth living in "ethnic enclaves" (areas with dense Hispanic/Latino populations) may acculturate more slowly than youth living in diverse communities. Further research is needed to understand acculturation processes among a diverse sample of Hispanic/Latino youth as well as the extent to which household and community-level/environmental determinants impact these processes.

7. Conclusion

This study contributes new knowledge to help explain associations between acculturation and dietary quality among a large, multi-ethnic sample of Hispanic/Latino youth at high-risk for obesity and related conditions. The AHIMSA did not differentiate overall HEI scores across AHIMSA groups, whereas more traditional measures (i.e., language preference and immigrant generation) did. However, differences in HEI components were observed using the AHIMSA, but how these components relate to obesity status needs further exploration. Specifically, we report evidence that being integrated was associated with dietary benefits. A better understanding of Hispanic/Latino youths' acculturation and how it impacts dietary quality is important to informing effective health promotion efforts that aim to improve eating habits and health outcomes among this obesity-prone population.

Acknowledgements

The SOL Youth Study was supported by Grant number R01HL102130 from the National Heart, Lung, and Blood Institute. The children in SOL Youth are drawn from the study of adults: The Hispanic Children's Community Health Study/Study of Latinos, which was supported by contracts from the National Heart, Lung, and Blood Institute (NHLBI) to the University of North Carolina (N01-HC65233), University of Miami (N01-HC65234), Albert Einstein College of Medicine (N01-HC65235), Northwestern University (N01-HC65236), and San Diego State University (N01-HC65237). The following Institutes/Centers/Offices contribute to the HCHS/SOL through a transfer of funds to NHLBI: National Center on Minority Health and Health Disparities, the National Institute of Deafness and Other Communications Disorders, the National Institute of Dental and Craniofacial Research, the National Institute of Diabetes and Digestive and Kidney Diseases, the National Institute of Neurological Disorders and Stroke, and the Office of Dietary Supplements. Additional support was provided by the Life Course Methodology Core of the New York Regional Center for Diabetes Translation Research (DK111022–8786). The study sponsors did not have any role in study design; collection, analysis, and interpretation of data; writing the report; and the decision to submit the report for publication. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Heart, Lung, and Blood Institute or the National Institutes of Health.

Appendix 1.: Measures

A. Acculturation, Habits, and Interests Multicultural Scale for Adolescents (AHIMSA) (Unger et al., 2002)

1 = The United States/*Los Estados Unidos*

2 = The country my family is from/*El país de donde es mi familia*

3 = Both/*Ambos*

4 = Neither/*Ninguno*

1 I am most comfortable being with people from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Me siento más cómodo(a) estando con gente de …	
2 My best friends are from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Mis mejores amigos son de …	
3 The people I fit in with best are from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Las personas con quien me llevo mejor son de …	
4 My favorite music is from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Mi música favorita es de …	
5 My favorite TV shows are from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Mis programas favoritos de televisión son de …	
6 The holidays I celebrate are from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
Los días de fiesta que yo celebro son de …	
7 The food I eat at home is from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
La comida que yo como en casa es de …	
8 The way I do things and the way I think about things are from …	1 ☐ 2 ☐ 3 ☐ 4 ☐
La manera en que yo hago las cosas y la manera en que yo pienso sobre las cosas son de …	

B. Ethnic Identity: Combines 5 items from the Multigroup Ethnic Identity Measure (MEIM) and 3 items from the Multidimensional Model of Racial Identity (MMRI) (Roberts et al., 1999a; Sellers et al., 1998)

Here in the United States there are many groups of people from many different backgrounds or ethnic groups. Now, I am going to read you some statements about your feelings about the ethnic group that you belong to. Please let me know how much you disagree or agree with each statement.

Aquí en los Estados Unidos, hay muchos grupos de personas de muchos orígenes o grupos étnicos diferentes. Ahora, voy a leerle algunas declaraciones sobre sus sentimientos hacia el grupo étnico al que usted pertenece. Por favor dígame qué tan de acuerdo o en desacuerdo está concada una de ellas.

1 = Strongly Disagree/*Muy en desacuerdo*

2 = Somewhat Disagree/*Algo en desacuerdo*

3 = Niether Agree nor Disagree/*No estoy ni de acuerdo ni en desacuerdo*

4 = Somewhat Agree/*Algo de acuerdo*

5 = Strongly Agree/*Muy de acuerdo*

1. I have a strong sense of belonging to my own ethnic group. *Tengo un fuerte sentido de pertenencia a mi grupo étnico.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
2. I feel good about my cultural or ethnic background. *Me siento bien sobre mi origen cultural o étnico.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
3. I am happy that I am a member of the group I belong to. *Estoy feliz de ser parte del grupo al que pertenezco.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
4. I feel a strong attachment towards my own ethnic group. *Siento un fuerte apego a mi propio grupo étnico.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
5. In general, being a member of my ethnic group is an important part of my self-image. *Por lo general, ser miembro de mi grupo étnico es una parte importante de mi imagen personal.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6. Being a part of my ethnic group is an important reflection of who I am. *Ser parte de mi grupo étnico es un reflejo importante de la persona que soy.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
7. I feel that the people in my ethnic group have made major accomplishments and advancements. *Siento que las personas de mi grupo étnico han hecho grandes logros y avances.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
8. I have a lot of pride in my ethnic group. *Tengo mucho orgullo en mi grupo étnico.*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

C. Acculturative Stress Index (Gil & Vega, 1996)

For the next set of questions, please think about your experiences in the US over the past year.

Para la siguiente serie de preguntas, por favor piense acerca de sus experiencias en los Estados Unidos durante el último año.

1 = Not at all/*Nunca*

2 = Very little/*Muy poco*

3 = Moderately/*Moderadamente*

4 = Very often/*Muy a menudo*

5 = Almost always/*Casi siempre*

1. How often has it been hard for you to get along with others because you don't speak English well? *¿Con qué frecuencia ha sido difícil para usted llevarse bien con los demás porque no habla buen inglés?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
2. How often has it been hard to get good grades because of problems in understanding English? *¿Con qué frecuencia ha sido difícil para usted obtener buenas notas debido a problemas para comprender el inglés?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
3. How often have you had problems with your family because you prefer U.S. customs? *¿Con qué frecuencia ha tenido problemas con su familia porque prefiere costumbres de los Estados Unidos?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
4. How often do you feel that you would rather be more American if you had a choice? *¿Con qué frecuencia siente que preferiría ser más americano/a si pudiera elegir?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
5. How often do you get upset at your parents because they don't know U.S. ways? *¿Con qué frecuencia se enoja con sus padres porque no conocen el modo de vivir en los Estados Unidos?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
6. How often do you feel uncomfortable having to choose between non-Hispanic/Latino and Hispanic/Latino ways of doing things? *¿Con qué frecuencia se siente incómodo/a al tener que elegir entre el modo de hacer las cosas de los hispanos/latinos y los no-hispanos/latinos?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
7. How often do people dislike you because you are Hispanic/Latino? *¿Con qué frecuencia usted no le agrada a la gente por ser hispano/latino?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
8. How often are you treated unfairly at school because you are Hispanic/Latino? *¿Con qué frecuencia es tratado injustamente en la escuela por ser hispano/latino?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐
9. How often do you see friends treated badly because they are Hispanic/Latino? *¿Con qué frecuencia ve que sus amigos son tratados mal por ser hispanos/latinos?*	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

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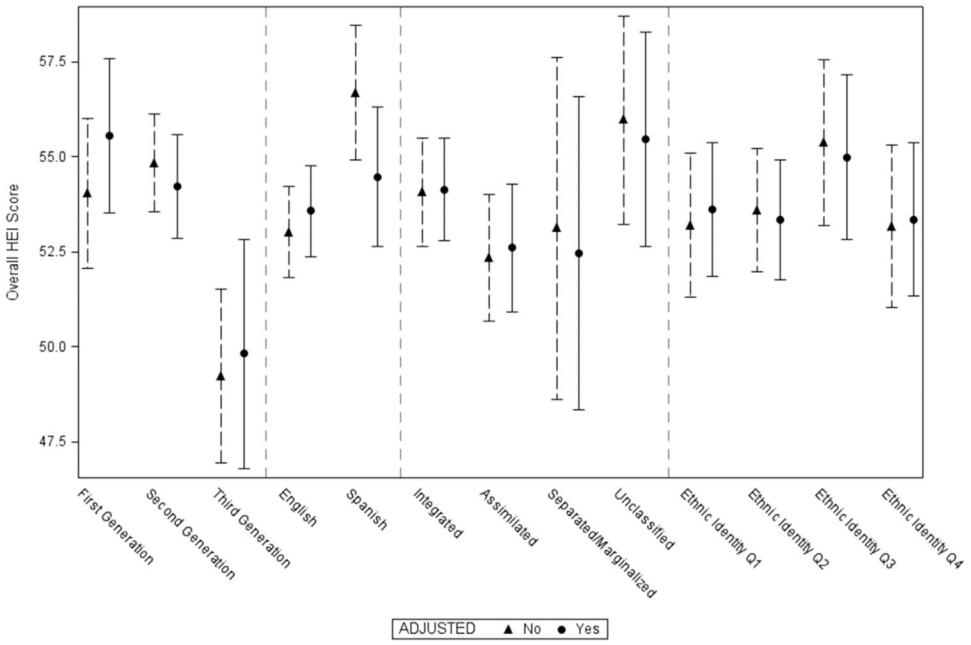

Fig. 1.

Mean overall HEI scores by acculturation measures, HCHS/SOL Youth Study (2011–2013). Adjusted means are adjusted for age, gender, Hispanic background, center, and parent income.

Table 1

Characteristics of U.S. Hispanic/Latino youth by AHIMSA (N = 1295), HCHS/SOL Youth Study(2011–2013).

	N	Overall N = 1295	Integrated (Bicultural Orientation) N = 622	Assimilated (U.S. Orientation) N = 423	Separated or Marginalized N = 77	Unclassified N = 173	P-value
		Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	
Ethnic Identity	1295	4.3 (4.3, 4.4)	4.4 (4.4, 4.5)	4.2 (4.1, 4.3)	4.3 (4.1, 4.4)	4.3 (4.2, 4.4)	< .001
Acculturative Stress	1287	1.6 (1.5, 1.6)	1.5 (1.4, 1.5)	1.7 (1.6, 1.8)	1.8 (1.6, 1.9)	1.6 (1.5, 1.7)	< .001
Gender							
Male	634	50.7 (47.3, 54.2)	49.7 (44.7, 54.7)	51.2 (44.6, 57.6)	58.4 (42.8, 72.5)	50.2 (39.8, 60.6)	0.751
Female	661	49.3 (45.8, 52.7)	50.3 (45.3, 55.3)	48.8 (42.4, 55.4)	41.6 (27.5, 57.2)	49.8 (39.4, 60.2)	
Age, yrs							
8–10	395	29.5 (26.6, 32.5)	17.9 (14.6, 21.8)	46.2 (39.5, 53.0)	26.9 (15.0, 43.3)	35.7 (26.9, 45.6)	< .001
11–12	313	22.0 (19.1, 25.3)	23.3 (18.8, 28.4)	18.8 (15.1, 23.2)	23.8 (13.6, 38.3)	24.0 (16.8, 33.2)	
13–14	343	23.3 (20.8, 26.0)	27.6 (23.8, 31.7)	15.1 (12.0, 18.8)	32.5 (18.8, 50.0)	22.0 (15.3, 30.6)	
15–16	244	25.2 (22.0, 28.7)	31.2 (26.3, 36.6)	19.9 (15.3, 25.6)	16.9 (8.1, 31.9)	18.3 (10.7, 29.4)	
Nativity							
Born in US or US territory	1029	80.6 (77.2, 83.6)	77.1 (72.0, 81.6)	88.2 (83.9, 91.5)	71.8 (56.2, 83.5)	79.8 (71.3, 86.3)	< .001
Born outside of US or US territory	266	19.4 (16.4, 22.8)	22.9 (18.4, 28.0)	11.8 (8.5, 16.1)	28.2 (16.5, 43.8)	20.2 (13.7, 28.7)	
Generational Status							
(Foreign-born) 1st Generation	266	19.4 (16.4, 22.8)	22.9 (18.4, 28.0)	11.8 (8.5, 16.1)	28.2 (16.5, 43.8)	20.2 (13.7, 28.7)	< .001
(U.S.-born) 2nd Generation	838	64.0 (59.9, 68.0)	64.4 (58.7, 69.6)	62.2 (55.3, 68.6)	62.9 (46.5, 76.9)	67.3 (57.7, 75.7)	
(U.S.-born) 3rd+ Generation	191	16.6 (13.4, 20.3)	12.8 (9.3, 17.3)	26.0 (20.0, 33.1)	8.8 (3.9, 18.7)	12.5 (7.5, 19.9)	
Background							
Dominican	152	13.4 (10.6, 16.8)	16.1 (12.3, 20.8)	10.8 (7.2, 15.8)	9.0 (2.7, 25.8)	11.1 (6.2, 19.0)	0.001
Puerto Rican	120	10.0 (7.7, 13.0)	9.0 (6.2, 12.8)	14.8 (10.8, 19.8)	4.5 (1.7, 11.5)	5.8 (2.8, 11.7)	
Cuban	99	5.6 (4.2, 7.6)	4.3 (2.8, 6.6)	6.8 (4.4, 10.3)	7.2 (3.2, 15.3)	7.4 (4.0, 13.2)	
Central American	106	6.4 (4.9, 8.2)	5.0 (3.5, 7.1)	7.7 (5.0, 11.7)	7.7 (2.7, 20.0)	7.9 (4.6, 13.2)	
Mexican	610	48.6 (43.7, 53.6)	53.4 (47.1, 59.6)	38.5 (32.1, 45.3)	54.3 (37.6, 70.1)	51.2 (40.5, 61.8)	
South American	61	4.0 (2.8, 5.8)	3.5 (2.1, 5.6)	4.7 (2.8, 7.8)	5.1 (1.6, 15.4)	4.1 (2.1, 8.0)	
Mixed	123	10.0 (7.7, 12.8)	7.2 (5.1, 10.1)	14.0 (10.2, 19.1)	9.9 (2.2, 35.2)	11.0 (5.8, 19.8)	

	N	Overall N = 1295	Integrated (Bicultural Orientation) N = 622	Assimilated (U.S. Orientation) N = 423	Separated or Marginalized N = 77	Unclassified N = 173	P-value
		Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	Weighted Mean or % (95% CI)	
Other	24	1.9 (1.2, 3.2)	1.5 (0.6, 3.4)	2.7 (1.3, 5.8)	2.3 (0.5, 8.9)	1.6 (0.3, 7.2)	
Language of preference							
English	1047	79.9 (75.6, 83.6)	79.1 (73.0, 84.1)	85.7 (80.2, 89.9)	60.7 (45.8, 73.8)	78.3 (66.8, 86.6)	0.011
Spanish	248	20.1 (16.4, 24.4)	20.9 (15.9, 27.0)	14.3 (10.1, 19.8)	39.3 (26.2, 54.2)	21.7 (13.4, 33.2)	
Annual family income							
< =$20,000	671	51.7 (46.7, 56.6)	51.7 (45.1, 58.3)	53.9 (47.3, 60.3)	49.8 (34.3, 65.3)	47.3 (36.8, 58.1)	0.635
$21,000-$40,000	424	31.9 (27.7, 36.4)	34.3 (28.5, 40.6)	30.1 (24.4, 36.6)	25.5 (13.4, 43.1)	29.8 (21.3, 39.9)	
> $40,000	200	16.4 (13.2, 20.2)	14.0 (10.6, 18.1)	16.0 (11.9, 21.2)	24.6 (11.6, 44.8)	23.0 (14.9, 33.6)	
Body mass index							
Underweight	33	3.0 (2.0, 4.5)	1.7 (0.9, 3.4)	6.1 (3.5, 10.6)	2.8 (0.6, 12.2)	0.5 (0.1, 3.4)	0.089
Normal weight	627	50.6 (46.8, 54.4)	49.9 (44.6, 55.2)	50.4 (44.8, 56.0)	65.5 (51.8, 77.1)	47.5 (38.2, 56.9)	
Overweight	267	19.5 (16.9, 22.4)	20.3 (16.6, 24.6)	18.2 (14.5, 22.7)	11.2 (5.4, 21.8)	22.7 (16.2, 31.0)	
Obese	232	16.7 (14.3, 19.4)	17.5 (14.2, 21.4)	15.6 (11.6, 20.6)	15.3 (7.6, 28.4)	17.0 (10.9, 25.5)	
Severely Obese	136	10.2 (8.2, 12.6)	10.6 (7.7, 14.3)	9.6 (6.7, 13.6)	5.2 (1.9, 13.4)	12.3 (7.1, 20.5)	

Table 2

Unadjusted Healthy Eating Index score means (95% CI) by AHIMSA level (N = 1295), HCHS/SOL Youth Study (2011–2013).

	Overall N = 1295	Integrated (Bicultural Orientation) N = 622	Assimilated (U.S. Orientation) N = 423	Separated or Marginalized N = 77	Unclassified N = 173	P-value*
HEI1 Total Fruit[a]	2.3 (2.1, 2.4)	2.2 (2.0, 2.4)	2.3 (2.1, 2.6)	2.5 (2.0, 3.0)	2.3 (1.9, 2.7)	0.668
HEI2 Whole Fruit[b]	2.1 (2.0, 2.3)	2.1 (1.9, 2.4)	2.0 (1.8, 2.3)	2.5 (1.8, 3.2)	2.2 (1.8, 2.6)	0.451
HEI3 Total Vegetables[c]	2.0 (1.9, 2.1)	2.0 (1.8, 2.1)	1.9 (1.7, 2.1)	2.0 (1.6, 2.4)	2.1 (1.9, 2.3)	0.581
HEI4 Greens and Beans[d]	1.2 (1.1, 1.4)	1.2 (1.0, 1.4)	1.2 (1.0, 1.4)	1.2 (0.5, 1.8)	1.6 (1.2, 2.0)	0.158
HEI5 Whole Grains[e]	4.5 (4.2, 4.8)	4.7 (4.3, 5.1)	4.2 (3.8, 4.7)	3.3 (2.3, 4.3)	4.7 (3.9, 5.4)	0.069
HEI6 Dairy[f]	7.4 (7.2, 7.7)	7.4 (7.1, 7.8)	7.2 (6.9, 7.6)	7.9 (6.9, 9.0)	7.8 (7.3, 8.3)	0.237
HEI7 Total Protein Foods[g]	4.3 (4.2, 4.4)	4.3 (4.1, 4.4)	4.3 (4.1, 4.4)	4.4 (4.1, 4.7)	4.3 (4.1, 4.5)	0.786
HEI8 Seafood and Plant Proteins[h]	1.8 (1.6, 2.0)	1.9 (1.6, 2.1)	1.6 (1.4, 1.9)	1.6 (1.0, 2.3)	2.1 (1.7, 2.5)	0.120
HEI9 Fatty Acids[i]	4.0 (3.7, 4.2)	4.1 (3.7, 4.4)	3.8 (3.4, 4.2)	3.7 (2.6, 4.8)	4.2 (3.6, 4.8)	0.631
HEI10 Refined Grains[j]	5.7 (5.4, 6.0)	5.9 (5.6, 6.3)	5.4 (5.0, 5.8)	5.8 (4.9, 6.7)	5.4 (4.6, 6.2)	0.261
HEI11 Sodium[k]	4.2 (3.9, 4.4)	4.2 (3.9, 4.6)	4.3 (3.8, 4.7)	4.5 (3.4, 5.6)	3.4 (2.9, 3.9)	0.047
HEI12 Empty Calories[l]	14.3 (13.9, 14.7)	14.0 (13.6, 14.5)	14.1 (13.5, 14.7)	13.7 (11.8, 15.6)	15.9 (15.2, 16.6)	< .001
HEI2010	53.8 (52.7, 54.8)	54.1 (52.7, 55.5)	52.3 (50.7, 54.0)	53.1 (48.6, 57.6)	56.0 (53.2, 58.7)	0.110

*P-value for overall test of equal means by AHIMSA.

[a]**Total Fruit:** Includes 100% fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.8 cup equiv/1,000 kcal. Standard for minimum score: No fruit.

[b]**Whole Fruit:** Includes all forms except fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.4 cup equiv /1,000 kcal. Standard for minimum score: No whole fruit.

[c]**Total Vegetables:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥1.1 cup equiv/1,000 kcal. Standard for minimum score: No vegetables.

[d]**Greens and Beans:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.2 cup equiv/1,000 kcal. Standard for minimum score: No dark green vegetables, beans or peas.

[e]**Whole Grains.** Optimum score = 10. Standard for maximum score: ≥1.5 oz equiv/1,000 kcal. Standard for minimum score: No whole grains.

[f]**Dairy:** Includes all milk products, such as fluid milk, yogurt, cheese, and fortified soy beverages. Optimum score = 10. Standard for maximum score: ≥1.3 cup equiv/1,000 kcal. Standard for minimum score: No dairy.

[g] **Total Protein Foods:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Optimum score = 5. Standard for maximum score: ≥2.5 oz equiv/1,000 kcal. Standard for minimum score: No protein foods.

[h] **Seafood and Plant Proteins:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.8 oz equiv/1,000 kcal. Standard for minimum score: No seafood or plant protein.

[i] **Fatty Acids:** Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 10. Standard for maximum score: (PUFAs +MUFAs)/SFAs > 2.5. Standard for minimum score: (PUFAs+MUFAs)/SFAs ≤1.2.

[j] **Refined Grains.** Optimum score = 10. Standard for maximum score: ≤1.8 oz equiv/1,000 kcal. Standard for minimum score: ≥4.3 oz equiv/1,000 kcal.

[k] **Sodium.** Optimum score = 10. Standard for maximum score: ≤1.1 gram/1,000 kcal. Standard for minimum score: ≥2.0 gram / 1,000 kcal.

[l] **Empty Calories:** Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is > 13 g/1000 kcal. Optimum score = 20. Standard for maximum score: ≤ 19% of energy. Standard for minimum score: ≥50% of energy.

Table 3

Unadjusted Healthy Eating Index score means (95% CI) by Ethnic Identity category (N = 1295), HCHS/SOL Youth Study (2011–2013).

	Overall N = 1295	Quartile 1 N = 360	Quartile 2 N = 362	Quartile 3 N = 258	Quartile 4 N = 315	P-value*
HEI1 Total Fruit[a]	2.3 (2.1, 2.4)	2.4 (2.1, 2.6)	2.2 (2.0, 2.5)	2.5 (2.2, 2.7)	2.1 (1.8, 2.3)	0.172
HEI2 Whole Fruit[b]	2.1 (2.0, 2.3)	2.0 (1.7, 2.3)	2.2 (1.9, 2.4)	2.4 (2.0, 2.7)	2.0 (1.8, 2.3)	0.405
HEI3 Total Vegetables[c]	2.0 (1.9, 2.1)	1.9 (1.7, 2.1)	1.9 (1.7, 2.1)	2.1 (1.9, 2.3)	2.0 (1.8, 2.2)	0.430
HEI4 Greens and Beans[d]	1.2 (1.1, 1.4)	1.3 (1.0, 1.5)	1.2 (1.0, 1.5)	1.2 (0.9, 1.5)	1.2 (1.0, 1.5)	0.985
HEI5 Whole Grains[e]	4.5 (4.2, 4.8)	4.3 (3.8, 4.9)	4.6 (4.1, 5.2)	4.8 (4.2, 5.4)	4.2 (3.6, 4.8)	0.492
HEI6 Dairy[f]	7.4 (7.2, 7.7)	7.4 (7.0, 7.8)	7.5 (7.0, 7.9)	7.6 (7.1, 8.0)	7.4 (6.9, 7.8)	0.951
HEI7 Total Protein Foods[g]	4.3 (4.2, 4.4)	4.2 (4.0, 4.4)	4.2 (4.1, 4.4)	4.3 (4.1, 4.5)	4.4 (4.2, 4.5)	0.449
HEI8 Seafood and Plant Proteins[h]	1.8 (1.6, 2.0)	2.0 (1.6, 2.3)	1.7 (1.4, 2.1)	1.7 (1.3, 2.0)	1.9 (1.6, 2.2)	0.616
HEI9 Fatty Acids[i]	4.0 (3.7, 4.2)	3.9 (3.4, 4.3)	3.9 (3.5, 4.4)	4.0 (3.5, 4.5)	4.2 (3.7, 4.7)	0.800
HEI10 Refined Grains[j]	5.7 (5.4, 6.0)	5.6 (5.2, 6.1)	5.6 (5.2, 6.1)	6.0 (5.4, 6.5)	5.6 (5.0, 6.2)	0.749
HEI11 Sodium[k]	4.2 (3.9, 4.4)	4.1 (3.6, 4.5)	4.1 (3.7, 4.6)	4.3 (3.8, 4.8)	4.2 (3.7, 4.7)	0.934
HEI12 Empty Calories[l]	14.3 (13.9, 14.7)	14.2 (13.5, 15.0)	14.3 (13.7, 14.9)	14.7 (14.1, 15.4)	14.0 (13.4, 14.5)	0.346
HEI2010	53.8 (52.7, 54.8)	53.2 (51.3, 55.1)	53.6 (52.0, 55.2)	55.4 (53.2, 57.6)	53.2 (51.0, 55.3)	0.430

*P-value for overall test of equal means by Ethnic Identity category.

[a]**Total Fruit:** Includes 100% fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.8 cup equiv/1,000 kcal. Standard for minimum score: No fruit.

[b]**Whole Fruit:** Includes all forms except fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.4 cup equiv /1,000 kcal. Standard for minimum score: No whole fruit.

[c]**Total Vegetables:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥1.1 cup equiv/1,000 kcal. Standard for minimum score: No vegetables.

[d]**Greens and Beans:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.2 cup equiv/1,000 kcal. Standard for minimum score: No dark green vegetables, beans or peas.

[e]**Whole Grains.** Optimum score = 10. Standard for maximum score: ≥1.5 oz equiv/1,000 kcal. Standard for minimum score: No whole grains.

[f]**Dairy:** Includes all milk products, such as fluid milk, yogurt, cheese, and fortified soy beverages. Optimum score = 10. Standard for maximum score: ≥1.3 cup equiv/1,000 kcal. Standard for minimum score: No dairy.

[g] **Total Protein Foods:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Optimum score = 5. Standard for maximum score: ≥2.5 oz equiv/1,000 kcal. Standard for minimum score: No protein foods.

[h] **Seafood and Plant Proteins:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.8 oz equiv/1,000 kcal. Standard for minimum score: No seafood or plant protein.

[i] **Fatty Acids:** Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 10. Standard for maximum score: (PUFAs +MUFAs)/SFAs > 2.5. Standard for minimum score: (PUFAs+MUFAs)/SFAs ≤1.2.

[j] **Refined Grains.** Optimum score = 10. Standard for maximum score: ≤1.8 oz equiv/1,000 kcal. Standard for minimum score: ≥4.3 oz equiv/1,000 kcal.

[k] **Sodium.** Optimum score = 10. Standard for maximum score: ≤1.1 gram/1,000 kcal. Standard for minimum score: ≥2.0 gram / 1,000 kcal.

[l] **Empty Calories:** Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is > 13 g/1000 kcal. Optimum score = 20. Standard for maximum score: ≤ 19% of energy. Standard for minimum score: ≥50% of energy.

Table 4

Regression coefficients for the association between AHIMSA level and Healthy Eating Index score, HCHS/SOL Youth Study (2011–2013).

Response variable	Integrated	Separated/marginalized	Unclassified	P-value*
	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)	
HEI1 Total Fruit[a]	−0.20 (−0.50, 0.11)	0.07 (−0.43, 0.57)	−0.15 (−0.59, 0.29)	0.557
HEI2 Whole Fruit[b]	0.03 (−0.29, 0.34)	0.37 (−0.30, 1.03)	0.05 (−0.42, 0.52)	0.750
HEI3 Total Vegetables[c]	0.01 (−0.20, 0.22)	−0.02 (−0.45, 0.40)	0.10 (−0.15, 0.35)	0.860
HEI4 Greens and Beans[d]	−0.05 (−0.36, 0.25)	−0.12 (−0.68, 0.44)	0.40 (−0.05, 0.84)	0.232
HEI5 Whole Grains[e]	0.21 (−0.40, 0.83)	−1.33 (−2.41, −0.25)	0.11 (−0.75, 0.97)	0.042
HEI6 Dairy[f]	0.44 (0.00, 0.88)	0.65 (−0.27, 1.58)	0.50 (−0.09, 1.09)	0.136
HEI7 Total Protein Foods[g]	−0.03 (−0.22, 0.17)	0.13 (−0.20, 0.46)	0.01 (−0.25, 0.28)	0.798
HEI8 Seafood and Plant Proteins[h]	0.11 (−0.23, 0.45)	−0.18 (−0.91, 0.55)	0.34 (−0.09, 0.77)	0.377
HEI9 Fatty Acids[i]	0.10 (−0.40, 0.61)	−0.21 (−1.36, 0.95)	0.39 (−0.32, 1.10)	0.658
HEI10 Refined Grains[j]	0.33 (−0.22, 0.88)	0.26 (−0.77, 1.28)	−0.14 (−0.95, 0.67)	0.620
HEI11 Sodium[k]	−0.11 (−0.65, 0.43)	0.36 (−0.82, 1.54)	−0.80 (−1.43, −0.16)	0.046
HEI12 Empty Calories[l]	0.15 (−0.60, 0.89)	−0.62 (−2.44, 1.20)	1.67 (0.81, 2.54)	< .001
HEI2010	1.00 (−1.03, 3.03)	−0.64 (−5.18, 3.89)	2.49 (−0.72, 5.70)	0.406

AHIMSA reference category: Assimilated.

*Controlling for: Age, gender, and generational status of child; field center, annual family income.

[a]**Total Fruit:** Includes 100% fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.8 cup equiv/1,000 kcal. Standard for minimum score: No fruit.

[b]**Whole Fruit:** Includes all forms except fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.4 cup equiv /1,000 kcal. Standard for minimum score: No whole fruit.

[c]**Total Vegetables:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥1.1 cup equiv/1,000 kcal. Standard for minimum score: No vegetables.

[d]**Greens and Beans:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.2 cup equiv/1,000 kcal. Standard for minimum score: No dark green vegetables, beans or peas.

[e]**Whole Grains.** Optimum score = 10. Standard for maximum score: ≥1.5 oz equiv/1,000 kcal. Standard for minimum score: No whole grains.

[f] **Dairy:** Includes all milk products, such as fluid milk, yogurt, cheese, and fortified soy beverages. Optimum score = 10. Standard for maximum score: ≥1.3 cup equiv/1,000 kcal. Standard for minimum score: No dairy.

[g] **Total Protein Foods:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Optimum score = 5. Standard for maximum score: ≥2.5 oz equiv/1,000 kcal. Standard for minimum score: No protein foods.

[h] **Seafood and Plant Proteins:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.8 oz equiv/1,000 kcal. Standard for minimum score: No seafood or plant protein.

[i] **Fatty Acids:** Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 10. Standard for maximum score: (PUFAs +MUFAs)/SFAs > 2.5. Standard for minimum score: (PUFAs+MUFAs)/SFAs ≤1.2.

[j] **Refined Grains.** Optimum score = 10. Standard for maximum score: ≤1.8 oz equiv/1,000 kcal. Standard for minimum score: ≥4.3 oz equiv/1,000 kcal.

[k] **Sodium.** Optimum score = 10. Standard for maximum score: ≤1.1 gram/1,000 kcal. Standard for minimum score: ≥2.0 gram / 1,000 kcal.

[l] **Empty Calories:** Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is > 13 g/1000 kcal. Optimum score = 20. Standard for maximum score: ≤ 19% of energy. Standard for minimum score: ≥50% of energy.

Table 5

Regression coefficients for the association between Ethnic Identity category and Healthy Eating Index score, HCHS/SOL Youth Study (2011–2013).

Response variable	Quartile 2	Quartile 3	Quartile 4	P-value*
	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)	
HEI1 Total Fruit[a]	−0.16 (−0.49, 0.16)	0.12 (−0.25, 0.49)	−0.37 (−0.69, −0.05)	0.029
HEI2 Whole Fruit[b]	0.08 (−0.29, 0.46)	0.33 (−0.09, 0.76)	−0.05 (−0.43, 0.33)	0.328
HEI3 Total Vegetables[c]	−0.02 (−0.27, 0.23)	0.11 (−0.14, 0.35)	0.03 (−0.21, 0.27)	0.757
HEI4 Greens and Beans[d]	−0.10 (−0.44, 0.24)	−0.15 (−0.58, 0.27)	−0.07 (−0.42, 0.29)	0.899
HEI5 Whole Grains[e]	0.13 (−0.57, 0.82)	0.29 (−0.51, 1.09)	−0.19 (−0.97, 0.60)	0.681
HEI6 Dairy[f]	0.01 (−0.55, 0.56)	0.17 (−0.41, 0.75)	0.06 (−0.52, 0.64)	0.930
HEI7 Total Protein Foods[g]	−0.01 (−0.25, 0.23)	0.05 (−0.19, 0.29)	0.15 (−0.08, 0.38)	0.468
HEI8 Seafood and Plant Proteins[h]	−0.29 (−0.72, 0.14)	−0.41 (−0.89, 0.06)	−0.12 (−0.56, 0.32)	0.300
HEI9 Fatty Acids[i]	0.06 (−0.55, 0.68)	0.02 (−0.59, 0.63)	0.30 (−0.38, 0.98)	0.814
HEI10 Refined Grains[j]	−0.08 (−0.64, 0.47)	0.26 (−0.40, 0.92)	−0.12 (−0.82, 0.57)	0.739
HEI11 Sodium[k]	0.09 (−0.54, 0.73)	0.27 (−0.40, 0.95)	0.11 (−0.55, 0.78)	0.887
HEI12 Empty Calories[l]	−0.09 (−0.97, 0.79)	0.43 (−0.58, 1.44)	−0.23 (−1.10, 0.63)	0.510
HEI2010	−0.39 (−2.49, 1.71)	1.49 (−1.35, 4.34)	−0.49 (−2.83, 1.86)	0.506

Ethnic Identity reference category: lower quartile.

*Controlling for: Age, gender, and generational status of child; field center, annual family income.

[a]**Total Fruit:** Includes 100% fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.8 cup equiv/1,000 kcal. Standard for minimum score: No fruit.

[b]**Whole Fruit:** Includes all forms except fruit juice. Optimum score = 5. Standard for maximum score: ≥ 0.4 cup equiv /1,000 kcal. Standard for minimum score: No whole fruit.

[c]**Total Vegetables:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥1.1 cup equiv/1,000 kcal. Standard for minimum score: No vegetables.

[d]**Greens and Beans:** Includes any beans and peas not counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.2 cup equiv/1,000 kcal. Standard for minimum score: No dark green vegetables, beans or peas.

[e]**Whole Grains.** Optimum score = 10. Standard for maximum score: ≥1.5 oz equiv/1,000 kcal. Standard for minimum score: No whole grains.

[f] **Dairy:** Includes all milk products, such as fluid milk, yogurt, cheese, and fortified soy beverages. Optimum score = 10. Standard for maximum score: ≥1.3 cup equiv/1,000 kcal. Standard for minimum score: No dairy.

[g] **Total Protein Foods:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Optimum score = 5. Standard for maximum score: ≥2.5 oz equiv/1,000 kcal. Standard for minimum score: No protein foods.

[h] **Seafood and Plant Proteins:** Beans and peas are included here (and not with vegetables) when the Total Protein Foods standard is otherwise not met. Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 5. Standard for maximum score: ≥0.8 oz equiv/1,000 kcal. Standard for minimum score: No seafood or plant protein.

[i] **Fatty Acids:** Includes seafood, nuts, seeds, soy products (other than beverages) as well as beans and peas counted as Total Protein Foods. Optimum score = 10. Standard for maximum score: (PUFAs +MUFAs)/SFAs > 2.5. Standard for minimum score: (PUFAs+MUFAs)/SFAs ≤1.2.

[j] **Refined Grains.** Optimum score = 10. Standard for maximum score: ≤1.8 oz equiv/1,000 kcal. Standard for minimum score: ≥4.3 oz equiv/1,000 kcal.

[k] **Sodium.** Optimum score = 10. Standard for maximum score: ≤1.1 gram/1,000 kcal. Standard for minimum score: ≥2.0 gram / 1,000 kcal.

[l] **Empty Calories:** Calories from solid fats, alcohol, and added sugars; threshold for counting alcohol is > 13 g/1000 kcal. Optimum score = 20. Standard for maximum score: ≤ 19% of energy. Standard for minimum score: ≥50% of energy.