Acculturation, nutrition, and health disparities in Latinos\textsuperscript{1–4}

Rafael Pérez-Escamilla

ABSTRACT

Background: Latinos have become the largest minority group in the United States and will represent 25% of the US population by 2050. Latinos experience a disproportionate burden of poverty and poor health outcomes.

Objectives: We critically examined the evidence for a link between acculturation and health disparities in Latinos with a focus on type 2 diabetes (T2D) and nutrition-related risk factors and illustrated how acculturation principles can help design a culturally appropriate T2D self-management intervention in Latinos.

Design: Evidence presented in this article was drawn from 1) systematic reviews identified through PubMed searches, 2) backward searches that were based on articles cited, 3) experts in the field, and 4) the author’s personal files.

Results: The preponderance of the evidence supported an association of acculturation with poor dietary quality and obesity. These associations appeared to be modified by several socioeconomic and demographic factors and were not always linear. The association between acculturation and T2D is unclear.

Conclusions: Longitudinal studies and more sophisticated analytic approaches are needed to better understand if and how acculturation affects health-disparity outcomes in Latinos. Tailoring interventions to the acculturation level of individuals is likely to help reduce health disparities in Latinos. \textit{Am J Clin Nutr} 2011;93(suppl):1163S–7S.

INTRODUCTION

Health disparities or inequities are defined by the World Health Organization as “differences in health which are not only unnecessary and avoidable, but are considered unfair and unjust” (1). Health disparities in the United States are evident by the major gap in life expectancy between counties with the highest and lowest life expectancies (18.4 y for men and 14.3 y for women) (2). A high proportion of the variance in these disparities is explained by the differential exposure to the following 4 modifiable risk factors: smoking, high blood pressure, excessive body fat, and high blood sugar concentrations (2).

Latinos are individuals living in the United States who come from 20 different Spanish-speaking countries in Latin America and the Caribbean. They are the largest minority group and experience a disproportionate burden of poverty and poor health outcomes including type 2 diabetes (T2D) (3). Understanding their exposure to modifiable risk factors and health outcomes is methodologically challenging because these vary as a function of acculturation (ie, the process by which immigrants adopt the attitudes, values, customs, beliefs, and behaviors of a new culture) (4). Acculturation is a complex dynamic process that is shaped by the cumulative experience of the interaction of individuals with their environments across the life cycle (5, 6). In most acculturation research, the construct was measured through simple proxies including birth place (a contextual and fixed indicator that seeks to capture entry into the acculturation process), language use (a process indicator that seeks to capture the acculturation process dynamic), and others such as the length of time residing in the United States (7, 8). Studies have also used acculturation unidirectional (as individuals become more acculturated, they give up their mother culture to the same extent) and, to a lesser extent, bidirectional (individuals can take different acculturation paths on the basis of different combinations of retaining or not their mother culture and adopting or not the host culture) scales (9–11). Language use is central to acculturation scales, but these can also include other acculturation dimensions such as food and social preferences (eg, the racial-ethnic identity of friends) (12, 13).

Recent reviews strongly suggested that Latino immigrants arrive in the United States practicing healthier behaviors than their European American counterparts. Acculturation has also been associated with lifestyle choices, including poorer nutrition, more tobacco use, and substance abuse (7, 9, 10). Studies have also shown that risk factors for poor physical and mental health were inversely associated with acculturation (7). Thus, it can be argued that the process of acculturation may increase health disparities in Latinos. In contrast, the acculturation in Latinos has been positively associated with a higher socioeconomic position (SEP), more access to health care, and even some desirable lifestyle behaviors such as leisure-time physical activity (3, 8, 9, 14). Thus, the overall influence of acculturation on health disparity outcomes in Latinos remains unknown.

The objectives of this article were J) to critically examine the evidence for a link between acculturation and health disparities in Latinos with a focus on T2D and nutrition-related risk factors and 2) to illustrate how acculturation principles can help design...
culturally appropriate T2D self-management interventions in Latinos.

Evidence integrated and presented in this article was drawn from 1) the most recent systematic reviews identified through PubMed (http://www.ncbi.nlm.nih.gov/sites/entrez) searches, 2) backward searches on the basis of articles cited, 3) experts in the field, and 4) the author’s personal files.

**DIET**

Findings from nationally representative surveys have consistently shown that higher acculturation is associated with lower dietary quality. In Mexican American adults in the Third National Health and Nutrition Examination Survey (NHANES III), adults born in Mexico were more likely than adults born in the United States to adhere to dietary guidelines with regards to total fat, saturated fat, fiber, and potassium (15). Adults born in Mexico were also more likely to consume the recommended daily allowances of vitamin C, vitamin B-6, folate, calcium, and magnesium. Consistent with these nutrient intake patterns, adults born in Mexico had a higher consumption of fruit, vegetables, fruit juice, grains, and legumes and a lower consumption of salty snacks, desserts, and added fats. Likewise, another national study showed that Mexican American women born in Mexico had a lower consumption of energy from fat, and women who spoke predominantly English had lower intakes of fruit and vegetables compared with women who spoke mostly Spanish. A marginally significant interaction between the place of birth and language suggested that US-born women who spoke predominantly English tended to have the lowest fruit and vegetable intakes (16).

Two independent NHANES III multivariate analyses reported an inverse association between the time living in the United States and serum carotenoid concentrations in foreign-born adults in general (17) and, specifically, in foreign-born Mexican American men (18). The latter study also documented a significant inverse relation of English-language use in US-born individuals with folate and vitamin C serum concentrations. These findings supported the biological plausibility for an association between acculturation and fruit and vegetable intakes in Latinos born in the United States (Figure 1).

Conclusions from 2 independent reviews that included findings from nationally representative (n = 6 studies, 5 studies of which were based on Hispanic Health and Nutrition Examination Survey and NHANES data) and regional and local samples (n = 28 studies) agreed with the NHANES and National Health Interview Survey findings (8, 19). Specifically, both reviews showed that a higher acculturation was associated with lower fruit and vegetable intakes and a higher consumption of sugar and sugar-sweetened beverages and added fats. Likewise, a higher acculturation was associated with food-consumption behaviors that led to higher solid fat, added-sugar, and sodium intakes such as the frequency of eating out, consumption of meals at fast-food outlets, and salty snack consumption (19).

Recent NHANES III findings suggested that the less-healthy dietary intake patterns associated with higher acculturation also applied to individuals with diabetes (20).

In a study conducted in the San Diego–Tijuana border (21), Mexican American women with a higher Anglo orientation, as measured by the acculturation rating scale for Mexican Americans (12), had higher fruit and vegetable and fiber intakes. The external validity of this unexpected finding was unclear because the vast majority of women were born in Mexico and preferred to be administered the survey in Spanish. Women may have come from the same geographical area in Mexico. It is possible that the association between acculturation and diet may be mediated by the characteristics of the sending communities. Likewise the host region, in this instance the US-Mexico border, may be a potent modifier of the relation between acculturation and dietary choices. Overall, the preponderance of the evidence suggested that acculturation may increase nutrition health disparities in Latinos because it has been consistently associated with less-healthy dietary intake patterns and food-consumption behaviors. Although the association with dietary quality was fairly consistent, there was no evidence to support a relation between acculturation and energy intake, which was not surprising because of the major methodologic challenges to assess energy intake reliably in free-living populations (22).

Findings suggested that it is important to protect the positive dietary behaviors of the Hispanic culture and to improve those of the more-acculturated Latinos. However, the external validity of findings was still unclear because studies have heavily concentrated on Mexican Americans living in the southwest region of the United States (19). Regarding the internal validity of studies, a concern was that both reviews identified contradictory findings within studies as a function of the acculturation indicator used (9, 19). Also, the preponderance of the evidence available to date has been derived from cross-sectional samples.

**OBESITY**

The vast majority of studies have shown a positive association between acculturation indicators and body-weight outcomes in Latinos (9, 23), although findings may have varied as a function of the acculturation indicators used (24). At first glance it would appear that this level of consistency in evidence may be suggestive of a causal link between acculturation and obesity risk in Latinos. However the vast majority of evidence was cross-sectional, and studies that focused on the influence of time living in the United States in obesity outcomes did not include an age-matched reference group of native-born Latinos. Thus, studies have not properly adjusted for time-dependent confounders.

![Figure 1](https://academic.oup.com/ajcn/article-abstract/93/5/1163S/4597887)
including the ages of immigrants upon arrival and amounts of time spent in the United States. This lack of adjustment represents a major methodologic flaw because obesity rates change as a function of age and have increased across time in immigrant and native-born minority populations. In an attempt to address this issue, Park et al (25) compared adult obesity trends in Latino immigrants and their US-born counterparts on the basis of 2 repeated cross-sectional samples drawn from the 1994–96 and 2004–06 National Health Interview Survey. A comparison of obesity trends broken down by age groups showed that obesity rates between 1995 and 2005 increased significantly more in native-born individuals than in immigrants (comparing individuals who had lived in the United States for 10–14 y compared with <5 y) and 2) diverged rather than converged in immigrants with respect to their age-matched US-born counterparts. These findings suggested that adult, immigrant, Latino populations may maintain a degree of resiliency in the development of obesity in relation to their native-born counterparts. This seminal study clearly showed the need for well-controlled cohort designs that include a parallel native-born group (and ideally a parallel group in the immigrant’s home country) and that fully take into account the time-dependent nature of the acculturation process (a function of time residing in the United States) and obesity trends (affected by an individual’s age and birth generation) to disentangle the relation between the two.

### TABLE 1

Diabetes and acculturation in Latinos

<table>
<thead>
<tr>
<th>First author (reference)</th>
<th>Study</th>
<th>Subjects</th>
<th>Acculturation measure</th>
<th>Association with T2D or RFs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>T2D</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perez-Stable (27)</td>
<td>HHANES 1982–1984</td>
<td>Mexican Americans</td>
<td>Language and ethnic orientation score</td>
<td>Men (+); women (−)</td>
</tr>
<tr>
<td>Sundquist (26)</td>
<td>NHANES III 1999–2004</td>
<td>Mexican Americans</td>
<td>Birth place and language</td>
<td>Birth place (+); language (US born) (−)</td>
</tr>
<tr>
<td>Mainous (8)</td>
<td>NHANES 1999–2002</td>
<td>Latinos</td>
<td>Birth place and language</td>
<td>Birth place (Ø); language score (−)</td>
</tr>
<tr>
<td>Kandula (28)</td>
<td>MESA study</td>
<td>Latinos and Asian Americans</td>
<td>Nativity, time in the United States, and language</td>
<td>Non-Mexican Latinos (+); Mexican Americans (Ø)</td>
</tr>
<tr>
<td>Borrell (31)</td>
<td>NHIS 2002–2003</td>
<td>BLs and WLs, AAs, and NLWs</td>
<td>NA (focused on race)</td>
<td>BL risk compared with WL, AA, and NLW risk (†)</td>
</tr>
<tr>
<td><strong>T2D risk factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emamrando (30)</td>
<td>MESA</td>
<td>Latinos and Asian Americans with hypertension, hypercholesterolemia, or diabetes</td>
<td>Language and time in the United States</td>
<td>Blood glucose, blood pressure, and hypercholesterolemia (−)</td>
</tr>
<tr>
<td>Espinosa de Los Monteros (21)</td>
<td>South San Diego Women’s Health Study</td>
<td>Mexican American women living on the California-Mexico border</td>
<td>ARSMA-II time in US living-area score</td>
<td>Metabolic syndrome on the basis of AOS from ARSMA-II (−)</td>
</tr>
<tr>
<td>Gestational diabetes</td>
<td>Kieffer (29)</td>
<td>National, birth certificates</td>
<td>Birth place</td>
<td>Birth place (−); depending on nativity (foreign-born compared with NLW women) (Ø, +)</td>
</tr>
</tbody>
</table>

1 T2D, type 2 diabetes; RF, risk factor; HHANES, Hispanic Health and Nutrition Examination Survey; NHANES, National Health and Nutrition Examination Survey; MESA, Multi-Ethnic Study of Atherosclerosis; NHIS, National Health Interview Survey; BL, Black Latino; WL, white Latino; AA, African American; NLW, non-Hispanic white; NA, not applicable; ARSMA-II, Acculturation Rating Scale for Mexican Americans; AOS, Anglo Orientation Scale; Ø, inverse U-shaped association; −, negative association; +, positive association; Ø, no association; †, increased risk. All studies were cross-sectional.

2 Nativity/language living area–based score, on the basis of census track aggregate data: percentage of foreign-born individuals who lived <10 y in the United States and percentage of Spanish-speaking households.

3 Metabolic syndrome was defined on the basis of central adiposity, hypertriglyceridemia, reduced HDL cholesterol, elevated blood pressure, and hyperglycemia.

### T2D

The evidence for an association between acculturation and T2D is mixed (9) and appears to be modified by the acculturation indicator used (26), sex (27), and Latino subethnicity (28). A major study showed that Latinas born in the United States were less likely to experience gestational diabetes. In foreign-born Latinos, risk of gestational diabetes was higher in Latinas (compared with non-Latina whites) but this was modified by nativity (29) (Table 1).

The lack of a consistent positive association between acculturation and T2D is puzzling because of the consistent association between acculturation, poor diet, and obesity. This may be explained by the positive association between acculturation and leisure-time physical activity and the inverse association between acculturation and metabolic-syndrome indicators in this ethnic group (Table 1). It is possible that the higher health care access associated with acculturation in Latinos facilitates access to preventive metabolic control screenings and a timely response when needed (3, 20, 30). It is also possible that, because acculturation is positively associated with the SEP, less-acculturated individuals may experience higher levels of chronic stress or allostatic load. However, a recent study from Texas did not support this hypothesis because the adjusted allostatic load (measured by 12 cardiovascular, metabolic, inflammatory, and stress hormone biomarkers) was significantly higher in US-born than in foreign-born Mexican Americans (13).
RACE AND T2D IN LATINOS

Very few studies have examined the association between race and health outcomes in Latinos. Borrell et al (31) documented that black Latinos had a higher risk of T2D compared with Latino whites, non-Latino whites, and African Americans. It is possible that black Latinos have a double burden of perceived racial discrimination associated with being black (13, 32) and Latino.

Overall, although acculturation has been consistently associated with poorer dietary quality and obesity disparities in Latinos, it is still unclear if and how acculturation is associated with disparities in risk of T2D. Future studies are needed to elucidate if and how skin color shapes the process of acculturation and related health-disparity outcomes in Latinos. Research in this area could benefit from the inclusion of allostatic load biomarkers, including stress hormones.

IMPLICATIONS OF ACCULTURATION PRINCIPLES FOR CLINICAL AND PUBLIC HEALTH PRACTICE

The SEP, and not culture per se, is the most powerful determinant of health disparities in Latinos (33). However, the cultural competence in health interventions is crucial for achieving successful outcomes (34). This section discusses how acculturation was taken into account in the design of the Diabetes Among Latinos Best Practices Trial (DIALBEST), which was a culturally competent and comprehensive best-practices intervention that sought to improve T2D self-management in Latinos.

DIALBEST

The primary outcome of the National Institutes of Health–funded DIALBEST randomized community trial was to improve glucose control (as proxied by glycated hemoglobin concentrations) via a 1-y community health worker (CHW)–led intervention. Latino participants (n = 211) with poorly controlled T2D were recruited from an inner-city community clinic in Connecticut. Participants were randomly assigned to the standard of care group or to the intervention group that, in addition, was programmed to receive 17 home visits from a CHW who was integrated as part of the health care management team. The topics covered in the CHW lessons exceeded the American Diabetes Association Medical Nutrition Therapy standards (35) and focused on diabetes and its complications, nutrition, glucose self-monitoring, medication adherence, physical activity, and mental health.

The DIALBEST intervention was patient centered and strongly grounded on behavioral change–theory principles including stages of change, motivation, and problem-solving theory. As recommended (5, 9, 34), the intervention was individually tailored and heavily took into account the acculturation and health-literacy levels of participants. The following dimensions of acculturation were strongly emphasized: 1) language preference, 2) family structure and support system, 3) food preferences, 4) experience navigating the health care system, and 5) cultural beliefs regarding T2D cause and medications. DIALBEST was implemented effectively, participants were highly satisfied with the intervention, and pre- and post-knowledge test scores showed significant improvements across T2D self-management dimensions (36). Although the final effect results of DIALBEST are not yet available, preliminary results suggested that the positive process-evaluation results translated into improved blood glucose control (37).

OVERARCHING RESEARCH RECOMMENDATIONS

Acculturation is strongly associated with positive changes in the SEP and health care access (33). Because of the strong associations of the SEP with lifestyle behaviors and health outcomes, it is important to understand whether acculturation is simply a marker of the SEP or if it determines or is determined by the SEP. If the former, then simple multivariate regression main-effect models can answer the question of whether the SEP is a confounder of the relation between acculturation and lifestyle behaviors or health outcomes. If the latter, then path analysis becomes the method of choice. Through these models, several hypotheses can be tested, including that 1) the process of acculturation may lead to a better SEP [ie, estimate direct and indirect (ie, mediated by the SEP) acculturation effects on lifestyle behavior and health outcomes of interest], and 2) the SEP modifies the relation between acculturation and behaviors or health outcomes (ie, a SEP × acculturation interaction). Advancing the knowledge in acculturation and health-disparity outcomes research requires longitudinal studies that test hypotheses grounded on solid behavioral change theory and well-operationalized constructs that can then be modeled with appropriate statistical techniques, including structural equation models. Also, studies need to consider the use of multidimensional and bidirectional acculturation scales that capture the life trajectories of individuals (38). Several studies have shown a nonlinear relation between acculturation and risk factors and health outcomes (9, 23, 28). Future studies need to be adequately powered to test this possibility. An important concern that still needs to be answered is whether changes in lifestyle behaviors and health outcomes attributed to acculturation in immigrants in the United States are confounded by movement from rural to urban areas (39). Longitudinal, binational study designs that include a well-matched reference group in the home country are needed to sort out the rural-urban movement confounding in nutrition acculturation research (40).

CONCLUSIONS

The preponderance of evidence supports an inverse association of acculturation with dietary quality and obesity [and a positive association with leisure-time physical activity (9)]. These associations appear to be modified by several socioeconomic and demographic factors and may not always be linear. The association between acculturation and T2D is unclear. Longitudinal studies and more sophisticated acculturation measures and analytic approaches are needed to better understand if and how acculturation affects health disparities in Latinos. Tailoring interventions to the acculturation level of individuals is likely to help reduce health disparities in Latinos.

The author had no conflicts of interest.

REFERENCES


