Acculturation and healthy lifestyle habits among Hispanics in United States-Mexico border communities

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ABSTRACT

Objective.   *To explore the relationship between acculturation and healthy lifestyle habits in the largely Hispanic populations living in underserved communities in the United States of America along the U.S.-Mexico border.*

Methods.   *A cross-sectional study was conducted from April 2006 to June 2008 using survey data from the Alliance for a Healthy Border, a program designed to reduce health disparities in the U.S.-Mexico border region by funding nutrition and physical activity education programs at 12 federally qualified community health centers in Arizona, California, New Mexico, and Texas. The survey included questions on acculturation, diet, exercise, and demographic factors and was completed by 2 381 Alliance program participants, of whom 95.3% were Hispanic and 45.4% were under the U.S. poverty level for 2007. Chi-square (χ^2) and Student's t tests were used for bivariate comparisons between acculturation and dietary and physical activity measures. Linear regression and binary logistic regression were used to control for factors associated with nutrition and exercise.*

Results.   *Based on univariate tests and confirmed by regression analysis controlling for sociodemographic and health variables, less acculturated survey respondents reported a significantly higher frequency of fruit and vegetable consumption and healthier dietary habits than those who were more acculturated. Adjusted binary logistic regression confirmed that individuals with low language acculturation were less likely to engage in physical activity than those with moderate to high acculturation (odds ratio 0.75, 95% confidence interval 0.59–0.95).*

Conclusions.   *Findings confirmed an association between acculturation and healthy lifestyle habits and supported the hypothesis that acculturation in border community populations tends to decrease the practice of some healthy dietary habits while increasing exposure to and awareness of the importance of other healthy behaviors.*

Key words   Acculturation; health education; border health; Mexico; United States.

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Acculturation is a complex process through which "immigrants adopt the attitudes, values, customs, beliefs, and behavior of a new culture" (1). In the process, healthy lifestyle habits improve or deteriorate. Health outcomes, as a consequence, are influenced by this continuous process of adjustment to a new culture. Research on Hispanic health and its relationship with the acculturation process has produced mixed and at

some points perplexing evidence. Within the public health arena, researchers have been paying closer attention to the role that acculturation has on several dimensions of health, including health behaviors (dietary practices, physical activity patterns, smoking and alcohol consumption, breastfeeding, etc.); health care use and access; health perceptions and outcomes; chronic conditions (diabetes, hypertension, obesity, etc.); and mental health.

Many studies have investigated the relationship between acculturation and the healthy lifestyle components of nutrition and physical activity (2–4). While the evidence is not conclusive, due to the use of different measures of acculturation and healthy lifestyle habits, certain findings are consistent: fruit and vegetable consumption is higher among less acculturated individuals whereas physical activity is positively associated with acculturation.

Hispanics residing in U.S. border communities tend to be less acculturated and have higher poverty rates, lower rates of health insurance coverage, and less access to health care services than non-border Hispanics and most other U.S. ethnic groups. Acculturation is an important factor in border region populations' adoption or rejection of healthy

lifestyle habits and therefore must be considered and addressed in programs that seek to improve health behaviors and health outcomes in U.S.-Mexico border communities.

The objective of this study was to look at acculturation and its association with diet and exercise in the unique environment of the largely Hispanic U.S. communities along the border between the United States of America and Mexico using two different measures as acculturation proxies.

MATERIALS AND METHODS

Data source

This cross-sectional study, conducted from April 2006 to June 2008, utilizes data from the Alliance for a Healthy Border ("the Alliance"), a diabetes and cardiovascular disease prevention program sponsored by Pfizer Inc (New York, N.Y., USA). The overall objective of the Alliance is to reduce health disparities among the largely Hispanic population residing in underserved U.S. communities along the U.S.-Mexico border by funding nutrition and physical activity education programs at 12 federally qualified community health centers (CHCs) in Arizona, California, New Mexico, and

Texas. CHCs are generally located in areas where people face substantial economic and cultural barriers to health care access and disproportionately serve low-income and ethnic/racial minority populations across the United States (e.g., about one-fourth of CHC patients are African American and one-third are Hispanic) (5, 6).

Table 1 presents selected sociodemographic characteristics of the counties where Alliance programs are located and compares them to the characteristics of the Alliance sample. With the exception of Pima County, Arizona, and San Diego County, California, counties with Alliance CHCs are predominantly Hispanic (59.6% to 95.0%) and have a much higher percentage (17.6% to 32.9%) of families living below the 2007 U.S. poverty level (< US$ 10 200) compared with the general U.S. population (9.8%). The proportion of the counties' overall populations without health insurance coverage ranges from a low of 19.4% in Pima County to 39.9% in Webb County, Texas, compared to 15.9% for the general U.S. population (7). As a subsample of these counties, the Alliance sample has similar demographics, with even higher percentages for those three measures (95.3% Hispanic, 45.4% of families below the poverty level, and close to 60% with-

TABLE 1. Selected sociodemographic characteristics of the U.S. general population, counties with the Alliance for a Healthy Border program,[a] and Alliance program participants, U.S.-Mexico border region, April 2006–June 2008

Sample population	Hispanic[b] (%)	Families below poverty level[b,c] (%)	Uninsured[d] (%)	Foreign-born[b] (%)	Speaks language other than English at home[b] (%)
Counties with Alliance programs					
Pima, Arizona	32.3	10.3	19.4	13.4	28.2
Santa Cruz, Arizona	80.8[e]	17.6	24.0	32.4	80.5[e]
Imperial, California	75.5	18.5	21.7	31.8	68.9
San Diego, California	29.9	7.9	21.6	23.0	35.3
Doña Ana, New Mexico	64.6	20.5	29.8	19.3	53.8
Luna, New Mexico	59.6	28.7	27.6	18.5	49.5[e]
El Paso, Texas	81.3	24.9	29.5	27.0	75.7
Hidalgo, Texas	89.3	32.9	30.4	28.5	82.5
Maverick, Texas	95.0[e]	29.6	30.6	34.0	94.5
Webb, Texas	94.7	27.1	39.9	28.5	93.1
United States	14.7	9.8	15.9	12.5	19.5
Alliance program participants					
(n = 2 806)	95.3	45.4	58.8	79.6	91.9

[a] Pfizer Inc–sponsored diabetes and cardiovascular disease prevention program designed to reduce health disparities through nutrition and physical activity education at 12 federally qualified community health centers in Arizona, California, New Mexico, and Texas.
[b] As per U.S. Census Bureau 2005–2007 American Community Survey estimates (unless specified otherwise).
[c] Less than US$ 10 200 for a family of one (2007).
[d] U.S. Census Bureau, Small Area Health Insurance Estimates (7).
[e] As per U.S. Census Bureau Census 2000.

out health insurance). The share of the foreign-born in the Alliance program border counties averaged around 23%, whereas close to 80% of Alliance participants were born in Mexico. As expected, the percentage of those speaking a language other than English at home was higher for the counties with higher Hispanic representation, and was more than 90% for the Alliance sample.

The data for the current study are part of the Alliance program's baseline assessment of its 2 806 participants. Participants were recruited into the 12 different CHC programs through promotions at health fairs, flyers at clinics, provider referrals, and word of mouth. Each CHC designed its own prevention program based on center experiences and community characteristics. Therefore, each CHC program was unique in terms of curriculum, program length, and delivery method. The curriculums were either adapted from well-established national programs or fully developed in-house. Program durations ranged from four weeks to six months and the interventions took place at either the individual level or within a group setting. All programs focused on being culturally appropriate and most utilized community health workers (known as *promotoras de salud*, in Spanish) who were familiar with the health care needs and sociocultural environment within each community.

The baseline assessment surveys were administered upon enrollment in the Alliance programs. The questionnaires were based on the U.S. Centers for Disease Control and Prevention (CDC) Behavioral Risk Factor Surveillance System (BRFSS) 2005 survey and the 2003 Community Tracking Study (CTS) Household Survey (8). The questions covered acculturation, diet, exercise, health status, and demographic variables, among other topics. Alliance program participants could opt to complete a written questionnaire or answer the questions orally, in English or Spanish. Clinical health outcomes and anthropometric measures (weight, height, waist-to-hip ratio, heart rate, blood pressure, fasting blood glucose, glycosylated hemoglobin A1c, cholesterol, etc.) were also collected. Participants who were not Hispanic and/or had missing data on the acculturation measures were excluded from the analysis, resulting in a sample size of 2 381 participants. All participants provided written informed consent to participate

in the study, which was approved by the Institutional Review Board of the University of Texas–Pan American (Edinburg, Texas).

Dependent variables: healthy lifestyle habits

Physical activity was measured using questions from the BRFSS exercise and physical activity module and the criteria for sufficient physical activity defined by a U.S. federal initiative known as Healthy People 2010. Participants were asked to indicate their level of engagement in two types of physical activity: vigorous, and moderate. Based on their answers, participants were classified into one of three categories: 1) "meets Healthy People 2010 recommendations" (being moderately active for at least 30 minutes 5–7 days a week, or being vigorously active for at least 20 minutes 3–7 days a week); 2) "insufficiently active" (i.e., failing to meet the Healthy People 2010 criteria); and 3) "inactive" (no physical activity). Categories were then collapsed into two groups to form two dichotomous physical activity measures: 1) meeting Healthy People 2010 physical activity recommendations versus not meeting them, and 2) engaging in any physical activity versus being inactive.

Dietary habits were assessed using two measures: 1) weekly frequency of fruit and vegetable consumption, which was calculated based on responses to questions on the consumption frequency of juice, fruits, green salad, potatoes, carrots, and vegetables; and 2) the Healthy Habits Scale,[5] a 12-item scale that measures the level of engagement in healthy dietary habits related to fat/cholesterol intake, salt/sodium intake, and other general habits, such as reading nutrition labels, using smaller food portions, and avoiding snacks and soft drinks. Responses were scored on a scale from 1 ("never engaging in a healthy habit") to 4 ("always engaging in a healthy habit"), and were summed to obtain a total score. Higher scores indicated a higher level of engagement in healthy dietary habits.

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[5] Based on a subset of the "My family habits" survey questions of the *Salud para su Corazón* ("For the Health of Your Heart") Initiative (http://www.nhlbi.nih.gov/health/prof/heart/latino/salud.htm).

Independent variables

Acculturation. Acculturation is the process through which minority individuals adapt to and assimilate into the mainstream culture. Several measures have been developed to attempt to capture this complex process. In the current study, two measures were utilized: 1) the Short Acculturation Scale for Hispanics (SASH) (9), a five-item scale that focuses on language use; and 2) country of birth (United States versus Mexico/other countries). SASH has shown high levels of reliability and validity (9) and is frequently used in the acculturation literature (10–12). It includes the following five questions: 1) "In general, what language do you read and speak?" 2) "What was the language you used as a child?" 3) "What language do you usually speak in your home?" 4) "In what language do you usually think?" and 5) "What language do you usually speak with your friends?" For each question, respondents indicate the use of "only Spanish," "Spanish more than English," "both equally," "English more than Spanish," or "only English." Each answer is scored from 1 to 5 and scores are summed to obtain an overall acculturation score that ranges from 5 to 25, with higher scores reflecting higher levels of acculturation. Based on their score, individuals are categorized as having either a low level or a moderate to high level of acculturation.

Sociodemographic and health characteristics. Several sociodemographic and health-related characteristics were examined in the current study. Age was classified into three categories: 18–44 years, 45–64 years, and 65 years and older. For regression models, a continuous age variable was used. The sex variable was coded "1" for "male." Income was classified into five categories for univariate analysis and as a dichotomous variable (coded "1" for those with incomes < US$ 10 000 and "0" for those with incomes ≥ US$10 000). Education was also a dichotomous variable (coded "1" for those who did not complete high school and "0" for all others). Those who answered "yes" to questions on whether they had been diagnosed with diabetes by a health care professional or were limited in their activities by physical, emotional, or mental problems were assigned a value of "1." Body mass index (BMI) values were calculated based on

weight (kg) and height (m^2). Based on these values, participants were classified into one of three groups: normal weight (< 25), overweight (from 25 to 29.9), or obese (≥ 30).

Statistical analysis

SPSS version 16.0 (SPSS Inc., Chicago, Ill., USA) (13) was used to conduct the study's statistical analysis, which included 1) chi-square (χ^2) and Student's t tests to examine differences between program participants' acculturation levels by sociodemographic and healthy lifestyle variables; and 2) multivariate analysis (binary logistic regression and linear regression) to model the relationship between acculturation and healthy lifestyle habits while controlling for a set of variables associated with nutrition and exercise (sex, age, income, education, health status, etc.).

RESULTS

Sample characteristics

Table 2 presents Alliance sample characteristics by acculturation measure. Program participants were primarily < 65 years of age (84.1%) and female (78.8%) with less than a high school education (69.4%) and an annual household income of less than US$ 30 000 (92.8%). Almost 41% reported having health care coverage. A quarter of the respondents indicated that they were limited in their activities due to physical, mental, or emotional problems. Slightly more than one-third of all respondents reported being diagnosed with diabetes by a health care professional. Only 9.5% had a BMI value indicating normal weight, with 31.5% classified as overweight and close to 60% obese, according to baseline weight and height measurements. Almost half of the

respondents reported that they did not participate in any physical activities or exercise outside of their regular job, and only 20% met the Healthy People 2010 physical activity recommendations. The average program participant consumed 26 servings of fruits and vegetables per week and had a score of 30 on the Healthy Habits Scale. Overall acculturation levels were low, with more than half of the respondents reporting the sole use of Spanish for reading, thinking, language used as a child, and speaking at home and with friends. Less than 2% reported the exclusive use of English. A total of 82% of the sample was foreign-born.

Univariate results

Several demographic variables were significantly associated with acculturation. Lower levels of acculturation were associated with being older and female,

TABLE 2. Characteristics of participants in the Alliance for a Healthy Border program,[a] by level of language acculturation and country of birth, U.S.-Mexico border region, April 2006–June 2008

Characteristic	Proportion of Alliance sample	Language acculturation score						Country of birth		
		Low (%)		Moderate (%)		High (%)		United States (%)	Other[c] (%)	
		5	6–10	11–15	16–20	21–25	P[b]			P[b]
Acculturation		52.6	27.6	12.6	5.7	1.6		18.2	81.8	
Age (years)							< 0.001			0.344
18–44	35.8	28.9	44.5	40.8	41.2	55.3		38.0	35.4	
45–64	48.3	51.2	46.0	42.5	49.3	36.8		45.1	49.0	
≥ 65	15.9	19.9	9.5	16.7	9.6	7.9		16.9	15.6	
Female	78.8	82.7	76.7	71.3	72.8	68.4	< 0.001	71.7	80.4	< 0.001
Income (in US$)							< 0.001			0.071
< 10 000	46.0	53.9	37.1	34.4	43.7	42.1		42.8	46.8	
≥ 10 000 to < 20 000	32.6	30.8	37.2	32.3	27.8	31.6		31.9	32.8	
≥ 20 000 to < 30 000	14.2	11.3	15.8	20.5	19.0	13.2		15.5	13.8	
≥ 30 000	7.2	4.0	9.9	12.8	9.5	13.2		9.9	6.6	
No high school degree	69.4	86.6	60.7	42.8	30.6	13.2	< 0.001	43.5	75.3	< 0.001
Has health insurance	40.9	38.8	38.1	51.2	52.1	42.4	< 0.001	47.4	39.5	0.004
Limited by physical, mental, or emotional problems	25.4	24.3	24.1	25.5	35.8	42.1	0.006	31.2	24.1	0.002
Diagnosed with diabetes	37.1	39.0	30.0	39.7	45.8	42.1	< 0.001	40.9	36.2	0.073
Body mass index							< 0.001			< 0.001
< 25 (normal weight)	9.5	8.2	12.0	10.3	9.8	5.7		8.7	9.7	
25–29.9 (overweight)	31.5	32.9	33.6	29.5	15.8	22.9		23.8	33.2	
≥ 30 (obese)	59.0	58.9	54.4	60.1	74.4	71.4		67.5	57.0	
Physical activity							0.019			0.526
Inactive	48.5	51.6	46.7	44.4	37.9	41.2		47.4	48.7	
Insufficiently active	31.6	28.5	34.1	36.7	35.3	41.2		33.9	31.1	
Meets Healthy People 2010[d]	19.9	19.9	19.2	18.9	26.7	17.6		18.7	20.2	
Dietary habits	Mean	Mean	Mean	Mean	Mean		P[b]	Mean		P[b]
Weekly frequency of fruit and vegetable consumption	25.5	25.6	26.6	24.9	21.0	23.2	0.043	23.6	25.9	0.031
Healthy Habits Score[e]	30.3	30.2	31.0	30.7	29.0	26.8	< 0.001	29.3	30.6	< 0.001

[a] Pfizer Inc–sponsored diabetes and cardiovascular disease prevention program designed to reduce health disparities through nutrition and physical activity education at 12 federally qualified community health centers in Arizona, California, New Mexico, and Texas; n = 2 381.
[b] Based on chi-square test (P < 0.05).
[c] Of foreign-born Alliance program participants 99% were from Mexico.
[d] U.S. federal health initiative that recommends being moderately active for at least 30 minutes 5–7 days per week or vigorously active for at least 20 minutes 3–7 days per week.
[e] A subset of the "My family habits" survey questions of the *Salud para su Corazón* ("For the Health of Your Heart") Initiative (http://www.nhlbi.nih.gov/health/prof/heart/latino/salud.htm).

having a lower income level, and lacking a high school degree. Overall, the highly acculturated were more likely to have negative health indicators (limited in their activities by physical, mental, or emotional problems, diagnosed with diabetes, and obese) versus the less acculturated. The only measure for which there was a larger share of low-acculturation individuals versus highly acculturated individuals was language acculturation. The country-of-birth measure (U.S.-born versus foreign-born) did not yield significant differences in physical activity. Those ranked "highly acculturated" based on the language acculturation score and the country of birth measures consumed fewer servings of fruits and vegetables and had significantly lower scores on the Healthy Habits Scale compared with those classified as having low acculturation.

Regression results

Table 3, Panel A presents the results (odds ratios [ORs] and 95% confidence intervals [CIs]) of the binary logistic regression models that tested the association between Alliance participants' level of physical activity and level of acculturation. Model 1 defines physical activity as "meeting the Healthy People 2010 physical activity recommendations" whereas model 2 considers an individual physically active if he/she is involved in any level of moderate or vigorous exercise. All models controlled for age, sex, education level, income level, and being limited in any activities due to physical, mental, or emotional problems. Within each model, two acculturation measures were used. Models 1a and 2a measured acculturation by the language acculturation score. Models 1b and 2b used country of birth as a proxy for acculturation.[6]

There was no evidence of a significant relationship between physical activity and acculturation in the first model (with overall model fit defined as significant at the 10% level only). For the second model, physical activity was only associated with language acculturation. Individuals with low levels of acculturation were less likely to be active (OR 0.75, 95% CI 0.59–0.95) versus those with moderate to high levels of acculturation. Country of birth did not yield significant

differences in physical activity. A significant relationship was only detected for the language acculturation measure, for a less stringent specification of physical activity involvement. This finding is consistent with others in the literature in which less acculturated Hispanics had a lower prevalence of leisure-time physical activity compared to those who were more acculturated (10, 14, 15).

Table 3, Panel B presents the results of the linear regression analysis, which used weekly servings of fruit and vegetables and the Healthy Habits Score as the dependent variables. The fruit and vegetable servings variable was log-transformed to achieve normality. The models controlled for age, sex, education level, income level, and diabetes diagnosis by a health care professional. The rationale for controlling for the latter variable was the fact that those diagnosed with diabetes often engage in special, healthy diets to control their disease.

Overall, there was a strong association between acculturation and dietary habits, with low-acculturation individuals exhibiting higher fruit and vegetable intake and healthier dietary habits relative to those with higher acculturation levels. Those characterized as possessing low acculturation based on the language acculturation measure had a 14% higher fruit and vegetable weekly consumption relative to the moderate to high acculturation group. Similarly, those born in Mexico had a 17% higher fruit and vegetable intake compared to those born in the United States. In terms of healthy dietary habits, there was a significant positive relationship between low acculturation levels and higher scores on the Healthy Habits Scale. Those who reported relying primarily on the Spanish language scored an average of 0.82 more points on the Healthy Habits Scale than those who did not. Those born in Mexico had an average score difference of 1.52 points over those born in the United States. These findings are similar to those of other studies that examined fruit and vegetable consumption and other aspects of dietary intake (16–18).

DISCUSSION

The findings of the current study confirm the association between acculturation and healthy lifestyle habits and are consistent with the idea that when residents of border communities acculturate

they tend to experience a reduction in some of their healthy dietary habits but at the same time gain awareness of the importance of other healthy behaviors, such as physical activity. The study results also indicate that those who are less acculturated have a healthier dietary intake, either through higher frequency of fruit and vegetable consumption or healthier habits related to fat/cholesterol/sodium intake, versus the highly acculturated. Fruit and vegetable intake among participants born in Mexico was 17% higher than those born in the United States and 14% higher for those with low scores in language acculturation. Findings for the Healthy Habits Scale were similar. The results for physical activity were not conclusive yet were similar to other findings in the literature where higher levels of acculturation seemed to improve the likelihood of participation in exercise. This study also showed that those with low levels of acculturation are less likely to have negative health indicators than those with higher levels of acculturation.

In the study's univariate analyses, a positive relationship was found between diabetes diagnosis by a health care professional and higher levels of acculturation. This result is in contrast to the findings of other studies examining acculturation and diabetes prevalence among Hispanics. For example, results from the 1999–2002 National Health and Nutrition Examination Survey (12) indicate that individuals with the lowest level of language acculturation were more likely to have a diabetes diagnosis compared to those with the highest level of acculturation. The San Antonio Heart Study (19) also found increased acculturation to be associated with a linear decline in both obesity and diabetes. The discrepancy in these study results may be due to the fact that the rate of diabetes prevalence in the U.S.-Mexico border region is among the highest in the United States (20). The Alliance participants shared this trait, with 37.1% reporting a diabetes diagnosis. This high prevalence most likely contributed to the association between high acculturation and diabetes found by the study.

This study has several limitations. First, like most studies examining acculturation, the use of single-dimension proxies precluded capturing the multidirectional and multidimensional nature of the process. However, more than one measure was considered, and the results

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[6] Using the continuous acculturation score in model estimation yielded similar results.

TABLE 3. Multivariate analysis of baseline assessment of participants in the Alliance for a Healthy Border program,[a] U.S.-Mexico border region, April 2006–June 2008

	Panel A. Results from binary logistic regression models of physical activity on acculturation measures				Panel B. Regression models of dietary habits on acculturation measures[b]			
	Meets Healthy People 2010[c]		Engages in moderate or vigorous activity		Frequency of fruit and vegetable intake		Healthy Habits Scale[d] score	
	Model 1a Language scale	Model 1b Country of birth	Model 2a Language scale	Model 2b Country of birth	Model 1a Language scale	Model 1b Country of birth	Model 2a Language scale	Model 2b Country of birth
Acculturation scale	OR[e] (95% CI)[f]	OR (95% CI)	OR (95% CI)	OR (95% CI)	Effect[g] (95% CI)	Effect[g] (95% CI)	Coefficient (95% CI)	Coefficient (95% CI)
Age	1.01 (0.99, 1.01)	1.01 (0.99, 1.01)	1.00 (0.99, 1.01)	1.01 (0.99, 1.01)	0.30 (0.10, 0.60)[h]	0.42 (0.10, 0.60)[i]	0.06 (0.04, 0.08)[i]	0.06 (0.04, 0.08)[i]
Male	1.33 (1.01, 1.73)[h]	1.35 (1.04, 1.75)[h]	1.13 (0.90, 1.41)	1.14 (0.92, 1.43)	−18.94 (−26.00, −11.40)[i]	−18.94 (−25.77, −11.04)[i]	−0.77 (−1.43, −0.11)[h]	−0.73 (−1.39, −0.07)[h]
Completed high school or more	1.02 (0.79, 1.33)	1.09 (0.84, 1.41)	1.30 (1.05, 1.61)[h]	1.41 (1.14, 1.74)[i]	2.02 (−48.83, 11.07)	1.01 (−6.67, 10.30)	0.95 (0.30, 1.59)[h]	1.06 (0.44, 1.69)[h]
Income < US$ 10 000	1.00 (0.80, 1.26)	1.00 (0.79, 1.26)	1.12 (0.96, 1.39)	1.14 (0.95, 1.38)	−4.88 (−11.4, 2.84)	−3.92 (−11.04, 3.25)	−0.72 (−1.28, −0.16)[i]	−0.68 (−1.23, −0.12)[h]
Limited in activities by physical, mental, or emotional problems	0.75 (0.58, 0.98)[h]	0.77 (0.59, 0.99)[h]	0.71 (0.57, 0.87)[i]	0.72 (0.59, 0.89)[i]	NA[j]	NA[j]	NA[j]	NA[j]
Diagnosed with diabetes	NA[j]	NA[j]	NA[j]	NA[j]	−4.88 (−12.19, 2.74)	−4.88 (−12.45, 2.43)	1.73 (1.14, 2.32)[i]	1.74 (1.16, 2.32)[i]
Low acculturation	0.89 (0.67, 1.19)	NA[j]	0.75 (0.59, 0.95)[h]	NA[j]	13.88 (3.67, 25.61)[i]	NA[j]	0.82 (0.10, 1.54)[h]	NA[j]
Foreign-born	NA[j]	1.12 (0.82, 1.51)	NA[j]	0.99 (0.78, 1.26)	NA[j]	17.0 (6.29, 28.79)[i]	NA[j]	1.52 (0.81, 2.24)[i]
Model significance (P)	0.098[k]	0.100[k]	<0.001[k]	0.001[k]	<0.001[l]	<0.001[l]	<0.001[l]	<0.001[l]

[a] Pfizer Inc.–sponsored diabetes and cardiovascular disease prevention program to reduce health disparities through nutrition and physical activity education at 12 federally qualified community health centers in Arizona, California, New Mexico, and Texas.
[b] Unstandardized coefficients and standard errors.
[c] U.S. federal health initiative that recommends being moderately active for at least 30 minutes 5–7 days per week or vigorously active for at least 20 minutes 3–7 days per week.
[d] A subset of the "My family habits" survey questions of the *Salud para su Corazón* ("For the Health of Your Heart") Initiative (http://www.nhlbi.nih.gov/health/prof/heart/latino/salud.htm).
[e] OR: odds ratio.
[f] CI: 95% confidence interval.
[g] Percentage increase/decrease in fruit and vegetable intake.
[h] $P < 0.05$.
[i] $P < 0.01$.
[j] NA: not applicable (variable is not included in specified model).
[k] Based on chi-square test ($P < 0.05$).
[l] Based on F test ($P < 0.05$).

were consistent for dietary habits irrespective of the measure used. Second, the majority of the study sample had low levels of acculturation. A wider spectrum of variation in acculturation levels may have produced different results. Finally, the cross-sectional design of the study did not allow for inferring causality.

Despite the above limitations, the study overcomes some of the objections of those who advocate suspending the use of acculturation as a variable in health studies (21). For example, the study sample comprises a more uniform set of individuals than is used in most studies of acculturation, which helps make the acculturation experience more homogeneous. The homogeneity of the sample's acculturation experience stems from several factors: 1) ancestry (almost all are Mexican Americans); 2) geographic location (all are residents of border communities); and 3) similar sociodemographic characteristics (93% have incomes less than US$ 30 000, and

almost 70% have no high school degree). These factors should have resulted in less influence from some of the contextual elements considered to be important factors in the acculturation process.

Findings of the current study indicate that culture and the acculturation process play an important role in the adoption of dietary and physical activity habits among the largely Hispanic communities along the U.S.-Mexico border. These findings underscore the importance of taking cultural factors into account when designing prevention programs aimed at behavior modification. The Alliance program is an example of such an effort. For example, it funded 12 CHCs but did not introduce a "one size fits all" prevention program. Instead, it encouraged and supported the independence and uniqueness of each center, stipulating only that the educational programs be designed to improve nutrition and the level of physical activity. The different CHC approaches to this task were

based on the health needs of the local population, the available expertise and human capital, and the demographic and socioeconomic characteristics of the local community. As a result, each educational program was unique in terms of curriculum, program length, and delivery method. All programs were designed to be culturally appropriate and utilized *promotoras*—community educators familiar with the local culture and context. Taking cultural factors into account thus becomes a critical ingredient for the success of prevention programs aimed at improving health behaviors and outcomes in minority populations.

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RESUMEN

Aculturación y hábitos de vida saludables en los hispanos de las comunidades de la zona fronteriza entre México y los Estados Unidos

Objetivo. Explorar la relación entre la aculturación y los hábitos de vida saludables en las poblaciones en gran parte hispanas que residen en comunidades subatendidas de los Estados Unidos en la zona fronteriza con México.

Métodos. De abril del 2006 a junio del 2008, se llevó a cabo un estudio transversal a partir de los datos de la encuesta de la Alianza para una Frontera Saludable, un programa que se concibió para reducir las disparidades de salud en la zona fronteriza entre México y los Estados Unidos mediante el financiamiento de programas educativos en materia de nutrición y actividad física en 12 centros de salud comunitarios con calificación federal, en Arizona, California, Nuevo México y Texas. La encuesta incluyó preguntas sobre aculturación, régimen alimentario, ejercicio y factores demográficos, y fue respondida por 2 381 participantes del programa, de los que 95,3% eran hispanos y 45,4% estaban por debajo del nivel de pobreza del año 2007 en los Estados Unidos. Se utilizaron las pruebas de ji cuadrado (χ^2) y t de Student para la comparación bifactorial entre la aculturación y las mediciones nutricionales y de actividad física. El control de los factores asociados con la nutrición y el ejercicio se llevó a cabo mediante métodos de regresión lineal y regresión logística binaria.

Resultados. Con base en pruebas unifactoriales, confirmadas mediante análisis de regresión con control de las variables sociodemográficas y de salud, los entrevistados menos aculturados notificaron una frecuencia significativamente mayor de consumo de frutas y verduras y hábitos alimentarios más saludables que los más aculturados. Mediante regresión logística binaria ajustada se confirmó que la probabilidad de que las personas con bajo nivel de aculturación idiomática realizaran algún tipo de actividad física era menor que la de los que tenían un grado de aculturación entre moderado y alto (razón de posibilidades 0,75; intervalo de confianza de 95% 0,59–0,95).

Conclusiones. Los resultados confirmaron una asociación entre la aculturación y los hábitos de vida saludables y apoyaron la hipótesis de que la aculturación en las comunidades de las poblaciones fronterizas tiende a reducir la práctica de algunos hábitos alimentarios saludables mientras que aumenta la exposición a otros comportamientos saludables, como la actividad física, y por tanto, la toma de conciencia de su importancia.

Palabras clave Aculturación; educación en salud; salud fronteriza; México; Estados Unidos.