ACCULTURATION, WEIGHT, AND WEIGHT-RELATED BEHAVIORS AMONG MEXICAN AMERICANS IN THE UNITED STATES

Indu B. Ahluwalia, PhD; Earl S. Ford, MD; Michael Link, PhD; Julie C. Bolen, PhD

Objective: This analysis explores the association between acculturation and body weight, self-perceptions of weight, and attempt to lose weight among Mexican Americans.

Methods: Data were analyzed from the National Health and Nutrition Examination Survey (NHANES) for 2001–2002. Indicator of acculturation used was language assimilation. Factor analysis was used to construct the acculturation measure, and descriptive and multivariable analyses were conducted using SUDAAN.

Results: The acculturation measure differentiated body weight, weight-related behavior, and self-perceptions about weight. Those lower on the acculturation scale were less likely to have a high BMI (≥30) (24% vs 32%), and their perceptions of their own weight, desired weight, and recent history of trying to lose weight differed significantly from those persons high on the acculturation scale and these varied by sex. Among Mexican Americans with a BMI ≥25, those lower on the acculturation measure were significantly less likely to perceive themselves as overweight (60% vs 73%). They were also less likely to have attempted to lose weight in the past year than those who were high on the acculturation measure (OR = 0.49; 95% CI: 0.31–0.79).

Conclusions: Less acculturated Mexican Americans with BMI ≥25 were less likely to perceive themselves as overweight and to have tried to lose weight. The acculturation measure provides insights into Mexican Americans' perceptions of their own weight and their recent attempt of trying to lose weight. (*Ethn Dis*. 2007;17:643–649)

Key Words: Mexican American, Acculturation, Weight, Behavior

From the Division of Adult and Community Health, Centers for Disease Control and Prevention, Atlanta, Georgia (IBA, ESF, ML, JCB).

Address correspondence and reprint requests to Indu, Ahluwalia, MPH, PhD; Division of Adult and Community Health; National Centers for Chronic Disease Prevention and Health Promotion; Centers for Disease Control and Prevention; 4770 Buford Highway, NE; Mailstop K-66; Atlanta, GA 30341-3717; 770-488-5764; 770-488-8150 (fax); iahluwalia@cdc.gov.

INTRODUCTION

Increasing weight is a precursor to the development of many important chronic diseases such as diabetes mellitus, cardiovascular disorders, chronic obstructive pulmonary disease, arthritis/osteoarthritis, various cancers, and hypertension.[1–5] As Hispanics represent the fastest-growing population in the United States and have a high prevalence of type 2 diabetes, obesity, and metabolic syndrome, we need to examine specific factors (including lifestyle behaviors) that may be contributing to their health and disease profiles.[3,6–9]

The population of US Hispanics increased 3.3% from July 2004 to July 1, 2005; a recent estimate for the total population was 42.7 million (http://www.census.gov). Hispanics hail from 25 countries and represent diverse cultures that are united by the Spanish language. Mexican Americans represent the majority of US Hispanics, followed by people from Central America, Puerto Rico, Cuba, and other countries.

Many Hispanics have lived in the United States for generations, while others are recent arrivals. Personal experience with migration and the place of birth and cultural norms have important influences on self-identification, health behaviors or risk factors that lead to disease or wellness, and interactions with the healthcare system.[7–14] The process of learning about a new culture and incorporating some of its aspects (language, food, etc.) into the background culture, which is often described as acculturation, is thought to have substantial influences on health. Various articles in the literature about Hispanic Americans, especially Mexican Americans, have discussed the process of acculturation or ways of measuring the acculturation process relative to health-related behaviors or outcomes.[15–18] Existing literature shows that health-related behaviors, perceptions and outcomes, such as nutrition and smoking, as well as body weight and self-image, may be affected by the acculturation process.[18–24] For example, a study examining the attitudes of Hispanic and non-Hispanic women toward smoking and obesity found that less-acculturated women had more positive attitudes toward those who were overweight than toward smokers and more acculturated women had more positive attitudes toward smokers than those who were overweight.[22] Given the presumed importance of background culture and the steady integration of new immigrants into the host culture of the United States, it is important to understand how cultural factors influence behaviors and attitudes relative to health, in part because such an understanding may give us insights into strategies for health promotion and disease prevention.

. . .this analysis was conducted to explore the relationship between acculturation and issues related to weight, perceptions of weight, desire for weight change, and attempt at weight loss by Mexican Americans.

Given the rapid increase in the Hispanic population and the need to ensure that the public health system can provide preventive services to this

important population group, this analysis was conducted to explore the relationship between acculturation and issues related to weight, perceptions of weight, desire for weight change, and attempt at weight loss by Mexican Americans. We also explored these issues by sex. Specific measure of acculturation from the National Health and Nutrition Examination Survey (NHANES) for 2001–2002 was identified and its relationship with selected weight-related variables such as body mass index (BMI), waist circumference, perceptions of weight, desired weight, and weight-related behavior was examined.

METHODS

The Centers for Disease Control and Prevention (CDC), through its National Center for Health Statistics, uses the NHANES to develop estimates for the prevalence of major diseases and disorders and risk factors among the US population. We used NHANES data to conduct this analysis. This dataset is a nationally representative sample of the non-institutionalized civilian population. The household interviews were conducted by trained bilingual interviewers either in English or Spanish. More information about data collection, sampling, and data collection modules and methods can be found at the National Center for Health Statistics website: http://www.cdc.gov/NCHS/nhanes.htm.

A total of 1301 adults identified as Mexican American were included in the analysis. Of the 664 women in the sample, 510 had pregnancy status available and, of these, 90 were identified to be pregnant at the time of interview. We excluded pregnant women from analyses on weight and weight-related topics.

The NHANES dataset contains a variety of modules on specific topics; in this analysis, modules on demographic characteristics, acculturation, and nutrition-related behaviors and measurements were used. The acculturation module obtains information on language and parents' place of birth by persons identifying themselves as Mexican Americans or members of another Hispanic group. Use of language is the most common indicator of the degree of acculturation into the host culture.[14–16]

Body weight and weight-related variables

Body mass index (BMI), which was calculated as weight in kilograms divided by height in meters squared, was obtained with standardized equipment and procedures (reference manual can be accessed from http://www.cdc.gov/nchs/data/nhanes/bm.pdf). Those with a BMI of <18.5 were classified as underweight; 18.5–24.9, having a healthy weight; 25–29.9, overweight; and ≥ 30, obese. Central obesity was measured using the criteria set forth by the International Diabetes Federation (IDF).[25] Central obesity, or abdominal obesity, was assessed using waist circumference and it is one of the factors used to define metabolic syndrome, which is characterized by a clustering of risks associated with insulin resistance. Using the IDF definition for respondents from Latin American countries, people at risk were defined as men having a waist circumference of ≥ 90 centimeters and women whose waists measured ≥ 80 cm. Individuals with unusually high or low values of waist circumference for their BMI were excluded.

We also explored the association between perceptions of current weight, desired weight, and attempting to lose weight, the latter two indicators could be aspects of body image, which is a cultural phenomenon, and may be affected by the process of acculturation. The questions asked were: "Do you consider yourself now to be… (overweight, underweight, or about the right weight)?"; "Would you like to weigh… (more, less or stay about the same)?"; "During the past 12 months have you tried to lose weight?"

Acculturation Measure

For this analysis we used five questions on the use of language to develop the acculturation measure: "In general, what languages do you read and speak?"; "What was the language(s) used as a child?"; "What language(s) do you usually speak at home?"; "In which language(s) do you usually think?"; "What language(s) do you usually speak with your friends?".

Each item measured by the questions above represents an individual language use domain and was scored 1–5 by the participant: 1, only Spanish; 2, more Spanish than English; 3, both equally; 4, more English than Spanish; 5, only English. We used exploratory factor analysis to examine the underlying concept of language assimilation across the five items. The empirical analysis showed that one factor with an Eigen value of 4.3 would be retained, and all items loaded on this one factor with a standardized Cronbach's coefficient alpha=0.95. The properties of the items were thought to represent a central concept of language assimilation. The five items representing use of language were combined into a summary scale (range: 5 to 25), with lower scores reflecting more Spanish and higher scores more English use.

We used the country of parents' birth to examine another possible influence on household culture. Answers to two questions were analyzed: "In what country was your father born?" and "In what country was your mother born?". Possible responses were: United States (except Puerto Rico), Puerto Rico, Cuba, Mexico, Dominican Republic, Colombia, El Salvador, Nicaragua, Other (specify). Respondents were placed in one of three categories: 1) both parents born in the United States; 2) both parents born in Mexico; 3) one parent born in Mexico and one parent born in the United States or elsewhere.

The relationship of the language score to the birthplace of parents was examined. Mean language score varied by this factor as follows: both born in the United States=19.9, SD=4.96; both born in Mexico =9.7, SD=5.7; one born in Mexico and one born in the United States or elsewhere=17.1, SD=6.7. Thus, when both parents were born in the United State and when only one was from Mexico, there was a preference for English; when both parents were born in Mexico, there was a preference for Spanish. Because use of language is the main factor differentiating groups of Mexican Americans, a decision was made to use it as the main indicator of acculturation and to control for the parents' place of birth in the multivariable analyses. Using the modal value for the language use or assimilation score of 10, an acculturation measure was developed that categorized people as highly acculturated if their language score was 10 or above and less acculturated if their score was below 10.

Other variables considered in the analysis included the respondent's sex, education, marital status, and age. Education was assessed as less than high school, high school, and more than high school, and four categories were used for marital status: married, widowed or divorced or separated, single, and living with a partner. Only adults aged ≥18 years were included in the analysis.

The percent missing varied from <1% for demographic variables to 10% for BMI. Exploratory factor analysis was conducted using SAS and SUDAAN version 9.0 (Research Triangle Institute, Research Triangle Park, NC 2005) was used to account for the complex sampling design. Both descriptive and multivariable logistic regression analyses were conducted using SUDAAN. Chi-square analyses were conducted to examine bivariate relationships between the two levels of acculturation measure and demographic and outcome variables. Multivariable logistic regression models were computed to examine the association between weight-related variables and acculturation measure while adjusting for martial status, age, education, and parents' country of birth.

Table 1. Descriptive statistics of the acculturation variable among Mexican Americans in NHANES data for adults (≥18 years of age), 2001–2002

	Acculturation			
	Low (*n*=624)		High (*n*=677)	
	n	% (SE)	*n*	% (SE)
Sex				
Male	323	55.7 (1.00)	314	48.9 (1.86)*
Female	301	44.3 (1.00)	363	51.1 (1.86)
Education				
<High school	495	75.8 (3.24)	270	32.5 (2.01*
High school	73	14.9 (2.92)	155	25.2 (2.63)
>High school	54	9.25 (1.73)	251	42.2 (2.85)
Marital status				
Married	394	65.7 (3.37)	334	50.8 (3.62)
Widowed/divorced /separated	74	7.4 (1.87)	93	11.9 (1.10)
Single	120	19.6 (1.95)	204	28.6 (2.71)
Living with partner	35	7.2 (1.84)	46	08.6 (2.22)
Age (mean years)	624	34.7 (0.95)	677	36.7 (0.91)
Parents' place of birth				
Both US	14	1.1 (1.05)	282	44.7 (6.20)*
Both Mexico	593	97.6 (1.16)	283	39.1 (5.94)
One Mexico and one US or elsewhere	12	1.3 (0.31)	109	16.2 (1.80)

Unweighted sample size. Percentages were weighted to be nationally representative.
NHANES, National Health and Nutrition Examination Survey; SE, standard error.
* Significant at $P<.05$.

RESULTS

Of the Mexican American adults, just a little more than half were men (52%), and the majority were married (58%), <35 years of age (55%), and had relatively little education, ie, they had not completed high school (55%). For more than two-thirds (69%), both parents had been born in Mexico, 23% had both parents born in the United States, 8% had just one parent born in Mexico and, using the acculturation measure, 51% were categorized as being in the low acculturation group. Those with low acculturation were more likely to be male, they were more poorly educated, married, and 98% of the less acculturated had both parents born in Mexico (Table 1).

In all, an estimated 28% (SE = 2.0%) of the non-pregnant population had a BMI of ≥30, classifying them as obese, and 64% (SE = 1.8%) had a higher than recommended waist circumference, indicating the presence of central obesity. Almost half, 49%, (SE = 1.9%) of the population believed they were overweight, 6% (SE = 1.1%) thought they were underweight, and 45% (SE = 1.9%) believed they were the right weight. A fairly small percentage (8%, SE = 1.2%) wanted to gain weight, 55% (SE = 1.8%) wanted to weigh less, and 37% (SE = 1.5%) wanted to stay the same. Overall, almost one third 31% (SE = 1.4%) had tried to lose weight in the past 12 months. As shown in Table 2, those who were less acculturated were more likely to have a BMI <30, consider themselves to be the right weight, want to remain at their weight, and have not attempted to lose weight in the past 12 months ($P<.05$ for all comparisons). Data by sex show that males in the low acculturation group were less likely to be obese, have lower waist circumference, perceive themselves

Table 2. Distribution of Mexican American population aged ≥18 years by weight variables, by level of acculturation, NHANES, 2001–2002.

		Acculturation					
		Overall		Males		Females	
	N	Low % (SE)	High % (SE)	Low % (SE)	High % (SE)	Low % (SE)	High % (SE)
Weight classification (by BMI)							
Underweight (<18.5)	15	–	–	–	–	–	–
Healthy weight (18.5–24.9)	311	30.4 (2.82)	34.2 (2.91)*	33.4 (2.90)	32.1(4.06)	25.8 (5.34)	36.5 (3.95)*
Overweight (25–29.9)	378	45.1 (2.09)	33.0 (2.30)	50.6 (3.36)	37.7 (3.68)	36.6 (4.14)	27.7 (3.05)
Obese (≥30)	260	24.2 (2.51)	31.7 (2.60)	16.0 (2.42)	29.0 (4.30)	36.9 (6.62)	33.8 (4.2)
Waist circumference †							
Higher than recommended	677	63.9 (2.97)	63.6 (2.77)	55.2 (3.23)	58.3 (4.04)	78.3 (5.40)	69.6 (4.22)*
Lower than recommended	370	36.1 (2.97)	36.4 (2.77)	44.8 (3.23)	41.7 (4.04)	21.7 (5.40)	30.4 (4.22)
Perception of weight							
Overweight	511	45.1 (2.70)	52.8 (2.33) *	33.6 (2.02)	40.8 (3.48)	64.7 (5.75)	66.6 (3.06)*
Underweight	65	4.2 (1.28)	6.9 (1.72)	–	10.3 (2.95)	–	–
Right weight	476	50.2 (2.45)	40.2 (2.65)	61.8 (1.91)	48.9 (3.62)	31.8 (4.20)	30.3 (3.00)*
Desire for weight change							
Want to gain	87	5.9 (1.25)	9.4 (1.88) *	6.9 (0.84)	13.6 (3.33)	–	–
Stay the same	399	42.4 (2.09)	32.3 (2.41)	54.0 (2.11)	40.9 (3.98)	23.8 (2.42)	22.5 (2.47)*
Want to lose	569	51.7 (2.86)	58.3 (2.41)	38.9 (2.51)	45.5 (3.79)	71.8 (4.75)	72.9 (2.46)
Attempted to lose weight in the past 12 months							
Yes	294	24.0 (1.87)	38.4 (2.83) *	14.9 (2.10)	28.3 (3.11)	38.9 (4.09)	49.7 (4.67)*
No	677	75.9 (1.87)	61.6 (2.83)	85.1 (2.10)	71.7 (3.11)	61.1 (4.09)	50.3 (4.67)

Pregnant women were excluded. Unweighted sample size. Percentages were weighted to be nationally representative. Estimates are not presented if the sample sizes were too small to produce a stable estimate. NHANES, National Health and Nutrition Examination Survey; SE, standard error; BMI, body mass index.

* Significant at $P<.05$.

† Based on International Diabetes Foundation recommendations; men ≥90 cm and women ≥80 cm.

to be overweight, want to lose weight or had attempted to lose weight than those in higher acculturation group. For females, a higher proportion of those in the low acculturation group were classified as obese and had higher than recommended waist circumference; however, their perception of their weight and desire for weight change was similar across the two acculturation categories and quite different than those of their male counterparts.

As revealed in Table 3, among those Mexican Americans with a higher BMI (≥25), the less acculturated were more likely to believe they were the right weight, fewer wanted to lose weight, and had not tried to lose weight recently ($P<.05$). Similarly, multivariate models confined to those with BMI ≥25 showed that the less acculturated were less likely to have tried to lose weight in the past 12 months (odds ratio [OR] = 0.49; 95% confidence interval [CI] = 0.31–0.79) than were the more acculturated. Patterns among men and women were similar, but the 95% CI overlapped 1.00 for females (Table 3).

DISCUSSION

This study shows that a measure of acculturation using language assimilation was able to differentiate quantitative results for body weight as well as weight-related perceptions and behavior within the Mexican American population. Results show that Mexican Americans who were lower on this acculturation scale were less likely to have a BMI ≥30 and that their perceptions of their own weight, their desired weight, and attempting to lose weight in the past 12 months differed significantly from the results for persons who were high on the acculturation measure. These patterns differed across sex and acculturation in their magnitude, especially as it related to perception of weight, desire for weight change, and attempt to lose weight. These findings may reflect the circumstances of the participants as many of the males in the lower acculturation category may be involved in occupations requiring manual labor, which may require higher levels of physical activities and hence its impact on weight and waist circumference. Furthermore, in analyses limited to the overweight or obese, those low in acculturation were less likely to perceive themselves as overweight, to want to

Results show that Mexican Americans who were lower on this acculturation scale were less likely to have a BMI ≥30

Table 3. Relation of acculturation to weight variables among Mexican American adults classified as overweight or obese (BMI ≥25), NHANES, 2001–2002

	Acculturation					
	Overall		Males		Females	
	Low % (SE)	High % (SE)	Low % (SE)	High % (SE)	Low % (SE)	High % (SE)
Perception of weight						
Overweight	60.4 (3.24)	73.2 (2.96)*	46.9 (3.03)	59.9 (4.42)	79.1 (4.60)	89.4 (2.22)*
Under and right weight†	39.6 (3.24)	26.8 (2.96)	53.1 (3.03)	40.1 (4.42)	20.9 (4.60)	10.6 (2.22)
Desire for weight change						
Want to gain or stay the same‡	34.3 (3.40)	22.5 (3.16)*	47.2 (3.25)	34.7 (4.30)	16.4 (4.11)	–
Want to lose	65.7 (3.40)	77.5 (3.16)	52.8 (3.25)	65.3 (4.30)	83.6 (4.11)	92.2 (2.04)*
Attempted to lose weight in the past 12 months						
Yes	29.3 (1.98)	51.4 (4.25)*	19.1 (2.00)	42.5 (3.41)	44.1 (4.40)	62.0 (6.34)*
No	70.7 (1.98)	48.6 (4.25)	80.9 (2.00)	57.5 (3.41)	55.9 (4.40)	38.0 (6.34)
Multivariable analysis	§OR (95% CI)		OR (95% CI)		OR (95% CI)	
Attempted to lose weight in past 12 months	0.49 (0.31–0.79)	1.00	0.45 (0.27–0.74)	1.00	0.40 (0.15–1.08)	1.00

Pregnant women excluded. Unstable estimates are not presented. BMI, body mass index; NHANES, National Health and Nutrition Examination Survey; OR. Odds ratio;SE, standard error.

* Significant at $P<.05$.

† Underweight and right weight was combined because of small sample in the underweight category.

‡ Gain weight combined with stay the same because of small cell sizes in the want-to- gain category.

§ Adjusted for marital status (dichotomized into single (includes widowed, separated, and divorced) and married (includes living with a partner), age, education, and parents' country of birth.

lose weight, or to have tried to lose weight in the past year. The patterns for low and high acculturation groups among males and females were similar but magnitude was different. Again, these findings may be a reflection of how cultural norms may influence perceptions of weight and behaviors that may be related to it, as discussed in the existing literature.[18–24] The findings of waist circumference or central obesity show that it was high for individuals in both low and high acculturation categories, indicating increased risk for metabolic syndrome.[9]

These results show that incorporating measures of acculturation in research is important when examining the health-related behaviors of populations that are linguistically and culturally distinct from the host culture. This analysis points toward designing interventions that are culturally appropriate for discussing issues of weight, including illnesses and conditions that are associated with overweight and obesity, and individual perceptions of body image as expressed by their perceptions, desires and behaviors, which may affect health-seeking behaviors, as well as adherence to recommended therapies and professional advice.

The finding that, even among those Mexican Americans who were overweight or obese, there was a lower likelihood among the less acculturated to have tried to lose weight in the past 12 months is similar to results from previous work on acculturation and weight and body image, where Hispanics who were less acculturated were seen to possibly view extra weight as a sign of prosperity.[10–11,22–24] This, however, may change as the individuals become more acculturated into the host culture where a very different set of perceptions and attitudes about body image exist. These findings have implications toward prevention interventions with a multicultural and multi-lingual population, as it will be necessary for the providers to fully explore individual understanding, beliefs, nutrition-related practices and behaviors and then advise them accordingly. These findings notwithstanding, being overweight or obese and having a higher than recommended waist circumference could be indicators of current chronic disease, such as type 2 diabetes, or a precursor to such a disorder. These findings show that perceptions of one's weight may be dictated by cultural norms, an idea with profound implications for the provision of preventive health services that are sensitive and appropriate to ensure long-term changes that are acceptable among immigrant populations.

This study, along with others, shows that as Mexican Americans adopt aspects of the dominant US culture, they may increase their risk for major chronic diseases. Being overweight or obese can heighten risk for elevated blood pressure, type 2 diabetes, heart disease, various cancers, chronic obstructive pulmonary disease among others, and such conditions can lead to increased morbidity and mortality in a large population with unmet needs for health care. To potentially stem these

developments, researchers and the public health community should understand the influence of culture and the process of acculturation on health-related behaviors (eg, weight gain, loss, or maintenance), especially among the growing population of Hispanics. [10,11] Understanding the dynamics of the Hispanic population groups, their literacy levels, their health-related behaviors and body images, which are no doubt influenced by cultural norms and values, is necessary for developing responsive healthcare systems and programs to reduce disparities between various ethnic groups. The findings from this study add to understanding how acculturation may contribute to perceptions about weight and weight-related issues, which are increasingly becoming important aspects of health in this population. Given the projected growth in the Hispanic population of the United States, it is important to recognize that differences in health-related behaviors exist within this group and that these differences may contribute toward health disparities that should be addressed.

The findings of this study should be evaluated within the context of the following limitations. First, the cross-sectional nature of the data does not allow us to make any inferences about causal relationships between acculturation and weight or weight-related behavior. Second, samples in some cells were small, which necessitated combining them, thereby reducing our ability to examine differences between some groups. Third, acculturation is a multidimensional concept, and our analysis was able to examine only certain aspects of that phenomenon. These limitations notwithstanding, our analysis has important strengths, in that the NHANES dataset allowed us to examine the issue of weight and weight-related perceptions and behaviors that are no doubt in part culturally determined. Being able to examine one ethnic group allowed us to develop insight into how acculturation may function in differentiating perceptions related to personal weight and provide ideas about influence of acculturation on important issues, which can be used to develop targeted interventions.

In sum, this study shows that acculturation, as measured by language assimilation, provides insights into the Mexican American population's perceptions of important issues related to personal weight, weight-related perceptions and behaviors that are often shaped by background and culture. Understanding these differences and incorporating these understandings into the delivery of health services and initiatives in health promotion are ways to reduce risk for important chronic diseases in this rapidly growing population group.

ACKNOWLEDGMENTS

Disclaimer: The findings and conclusions in this report are those of the authors, and do not necessarily represent the views of the Centers for Disease Control and Prevention.

REFERENCES

1. Must A, Spandan J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. *JAMA*. 1999;282:1523–529.
2. Mokdad AH, Ford ES, Bowman BA, et al. Diabetes trends in the U.S.: 1990–1998. *Diabetes Care*. 2000;23:1278–1283.
3. Mokdad AH, Ford ES, Bowman BA, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*. 2001;289:76–79.
4. Centers for Disease Control and Prevention. Prevalence of self-reported arthritis or chronic joint symptoms among adults—United States, 2001. *Morb Mortal Wkly Rep*. 2002;51:948–950.
5. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight and obesity and mortality from cancer in a prospectively studied cohort of US adults. *N Engl J Med*. 2003;348:1625–1638.
6. Torres M, Azen S, Varma R. Prevalence of obesity and associated co-morbid conditions in a population-based sample of primary urban Mexican Americans. *Ethn Dis*. 2006;16:362–369.
7. Dey AN, Lucas JW. Physical and mental health characteristics of US- and foreign-born adults: United States. *Adv Data*, 2006;(369): 1–19.
8. Mainous AG 3rd, Majeed A, Koopman, et al. Acculturation and diabetes among Hispanics: evidence from the 1999–2002 National Health and Nutrition Examination Survey. *Public Health Rep*. 2006;121:60–66.
9. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the Third National Health and Nutrition Examination Survey. *JAMA*. 2002;287:365–359.
10. Borrell LN. Racial identity among Hispanics: implications for health and well-being. *Am J Public Health*. 2005;95:379–381.
11. Zsembik B, Fennell D. Ethnic variation in health and the determinants of health among Latinos. *Soc Sci Med*. 2005;61:53–63.
12. Gordon-Larsen P, Harris KM, Ward DS, Popkin BM. Acculturation and overweight-related behaviors among Hispanic immigrants to the US: the National Longitudinal Study of Adolescent Health. *Soc Sci Med*. 2003;57: 2023–2034.
13. Evenson KR, Sarmiento OL, Ayala GX. Acculturation and physical activity among North Carolina Latina immigrants. *Soc Sci Med*. 2004;59:2509–2522.
14. Marin G, Perez-Stable EJ, Marin BV. Cigarette smoking among San Francisco Hispanics: the role of acculturation and gender. *Am J Public Health*. 1989;79:196–198.
15. Marin G, Sabogal F, Marin BV, Otero-Sabogal R, Perez-Stable E. Development of a short acculturation scale for Hispanics. *Hisp J Behav Sci*. 1987;9:183–205.
16. Marin G, Gamba R. A new measurement of acculturation for Hispanics: the bidimensional acculturation scale for Hispanics (BAS). *Hisp J Behav Sci*. 1996;18:297–316.
17. Dana R. Assessment of acculturation in Hispanic populations. *Hisp J Behav Sci*. 1996; 18:317–328.
18. Hunt LM, Schneider S, Comer B. Should ''acculturation'' be a variable in health research? A critical review of research on US Hispanics. *Soc Sci Med*. 2004;59:973–986.
19. Lara M, Gamboa C, Kahramanian MI, Morales LS, Bautista DE. Acculturation and Latino health in the United States: a review of the literature and its sociopolitical context. *Annu Rev Public Health*. 2005;26:367–397.
20. Dixon LB, Sundquist J, Winkleby M. Differences in energy, nutrient, and food intakes in a US sample of Mexican-American women and men: findings from the Third National Health and Nutrition Examination Survey, 1994–1998. *Am J Epidemiol*. 2000;152:548–557.

21. Pawson IG, Martorell R, Mendoza FE. Prevalence of overweight and obesity in US Hispanic populations. *Am J Clin Nutr*. 1991;53(6 Suppl):1522S–1528S.
22. Johnsen L, MacKirnan D, Spring B, Pingitore R. Sommerfeld BK Smoking as subculture? Influences on Hispanic and non-Hispanic White women's attitudes toward smoking and obesity. *Health Psychol*. 2002;21:279–87.
23. Nieri T, Kulis S, Keith VM, Hurdle D. Body image, acculturation, and substance abuse among boys and girls in the Southwest. *Am J Drug Alcohol Abuse*. 2005;31:617–639.
24. Cachelin FM, Monreal TK, Juarez LC. Body image and size perceptions of Mexican American women. *Body Image*. 2006;3:67–75.
25. International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome. Part 1: Worldwide definition for use in clinical practice. Available at: www.idf.org. Last accessed on 05/02/2006.

AUTHOR CONTRIBUTIONS

Design concept of study: Ahluwalia, Ford, Link, Bolen
Acquisition of data: Ahluwalia
Data analysis and interpretation: Ahluwalia, Ford, Link, Bolen
Manuscript draft: Ahluwalia, Ford, Link
Statistical expertise: Ahluwalia, Ford, Link, Bolen
Supervision: Ahluwalia