

# Dietary acculturation: Applications to nutrition research and dietetics

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## ABSTRACT

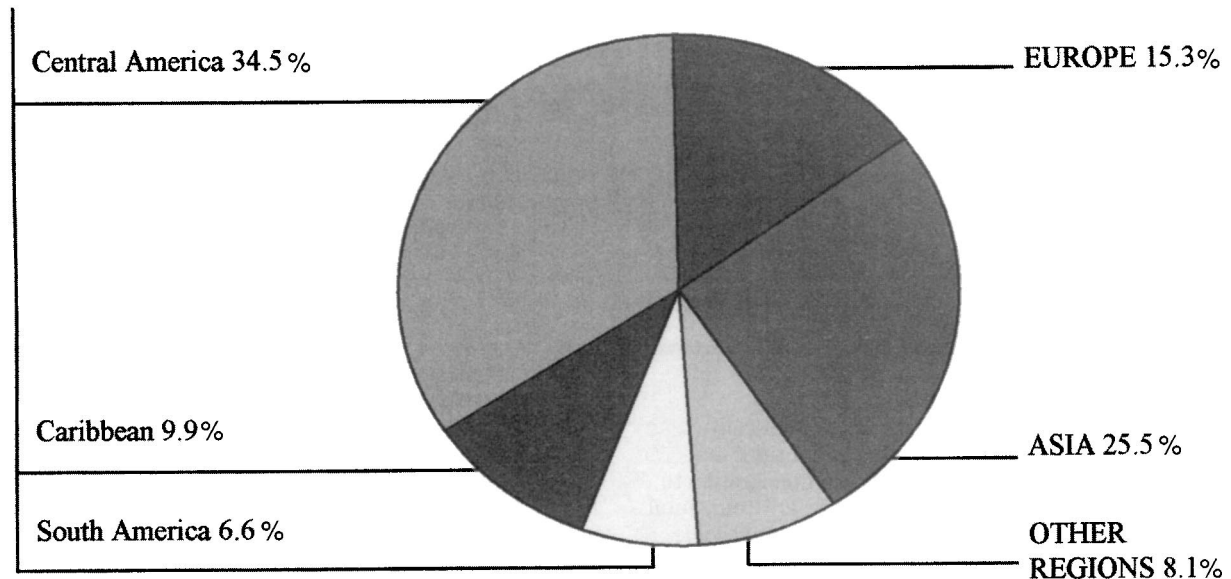
The US immigrant population is growing dramatically, making the health status of racial/ethnic minorities an increasingly important public health issue. Immigration to the United States is usually accompanied by environmental and lifestyle changes that can markedly increase chronic disease risk. In particular, adoption of US dietary patterns that tend to be high in fat and low in fruits and vegetables is of concern. The process by which immigrants adopt the dietary practices of the host country—called “dietary acculturation”—is multidimensional, dynamic, and complex; in addition, it varies considerably, depending on a variety of personal, cultural, and environmental attributes. Therefore, to intervene successfully on the negative aspects of dietary acculturation, it is important to understand the process and identify factors that predispose and enable it to occur. In this report, we give an overview of acculturation, define dietary acculturation and present a model for how it occurs, discuss measurement issues related to dietary acculturation, review the literature relating acculturation to eating patterns, and provide a case study illustrating how information on acculturation can be used to design dietary interventions in 2 markedly different immigrant groups. Finally, we give applications for nutrition researchers and dietetic practitioners. Studies investigating associations of acculturation with disease risk should identify and intervene on those steps in the acculturation process that are most strongly associated with unhealthy dietary changes. Practitioners working with immigrants should determine the degree to which dietary counseling should be focused on maintaining traditional eating habits, adopting the healthful aspects of eating in Western countries, or both. *J Am Diet Assoc.* 2002;102:1105-1118.

The culture of the United States is sometimes described as “multiethnic” because people from all over the world choose the United States as their new home. In 1965, the US Congress passed amendments to the Immigration and Nationality Act that eliminated national origin, race, or ancestry as a basis for immigration to the United States (1). The resulting wave of immigration—mostly Asians and Hispanics—may be the largest in the 20th century (2). The US Census Bureau estimates that 28.4 million foreign-born persons resided in the United States in 2000, representing 10.4% of the total US population (3,4). Figure 1 shows the distribution of the US foreign-born population in 2000 by region of birth, illustrating that 51% were born in Latin America and 25.5% in Asia (3,4). Given this remarkable growth in the US immigrant population, the health status of racial/ethnic minorities has become an increasingly important public health issue.

Immigrants bring a rich cultural heritage to the host (or adopted) country with dramatically different beliefs, values, and customs. However, immigration to a new country can represent a substantial shift in a person's lifestyle and environment, and these changes can result in rapid modifications in chronic disease risk. For instance, Ziegler et al reported that Asian-American female migrants who had lived in the Western United States for a decade or longer had an 80% higher risk of breast cancer than more recent immigrants (5). These changes in disease incidence can be largely accounted for by changes in disease risk factors (6-8). For example, US-born Japanese-American women have considerably higher body fat than immigrant Japanese-American women (6). Overall, the evidence from studies strongly indicates that exposure to Western lifestyles increases risks of several major chronic diseases in migrants to the United States.

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**LATIN AMERICA 51.0**

Numerous changes can occur with immigration, including access to health care, physical activity, and diet. In particular, adoption of diets high in fat and low in fruits and vegetables is of concern because this dietary pattern is a risk factor for several major, chronic diseases (9-11). Therefore, an important public health objective would be to encourage new racial/ethnic minority groups to retain their traditional healthful eating patterns while adopting healthful dietary practices of their host country. To meet this objective, it is necessary to understand the process by which immigrants adopt the dietary practices of the host country—called “dietary acculturation”—and identify the factors that predispose and enable it to occur.

The purpose of this report is to give an overview of acculturation, define dietary acculturation and present a model for how it occurs, discuss measurement issues around dietary acculturation, review the literature relating acculturation to eating patterns, and provide a case study illustrating how information on acculturation can be used to design dietary interventions conducted in 2 markedly different immigrant groups. For this overview we focus on the current, major immigration movements to the United States (Asians and Hispanics) in relation to changes in eating patterns that increase risk of so-called lifestyle diseases—for example, obesity, hypertension, cardiovascular disease, and cancers. We use the term “immigrant” to denote foreign-born racial/ethnic minorities. Ethnic terms with “-American” are used to describe persons of that ancestry who reside in the United States.

### OVERVIEW OF ACCULTURATION

The term “acculturation” is commonly used to denote the process by which a racial/ethnic group, usually a minority, adopts the cultural patterns (eg, beliefs, religion, language) of a dominant/host group. Two generally accepted theories de-

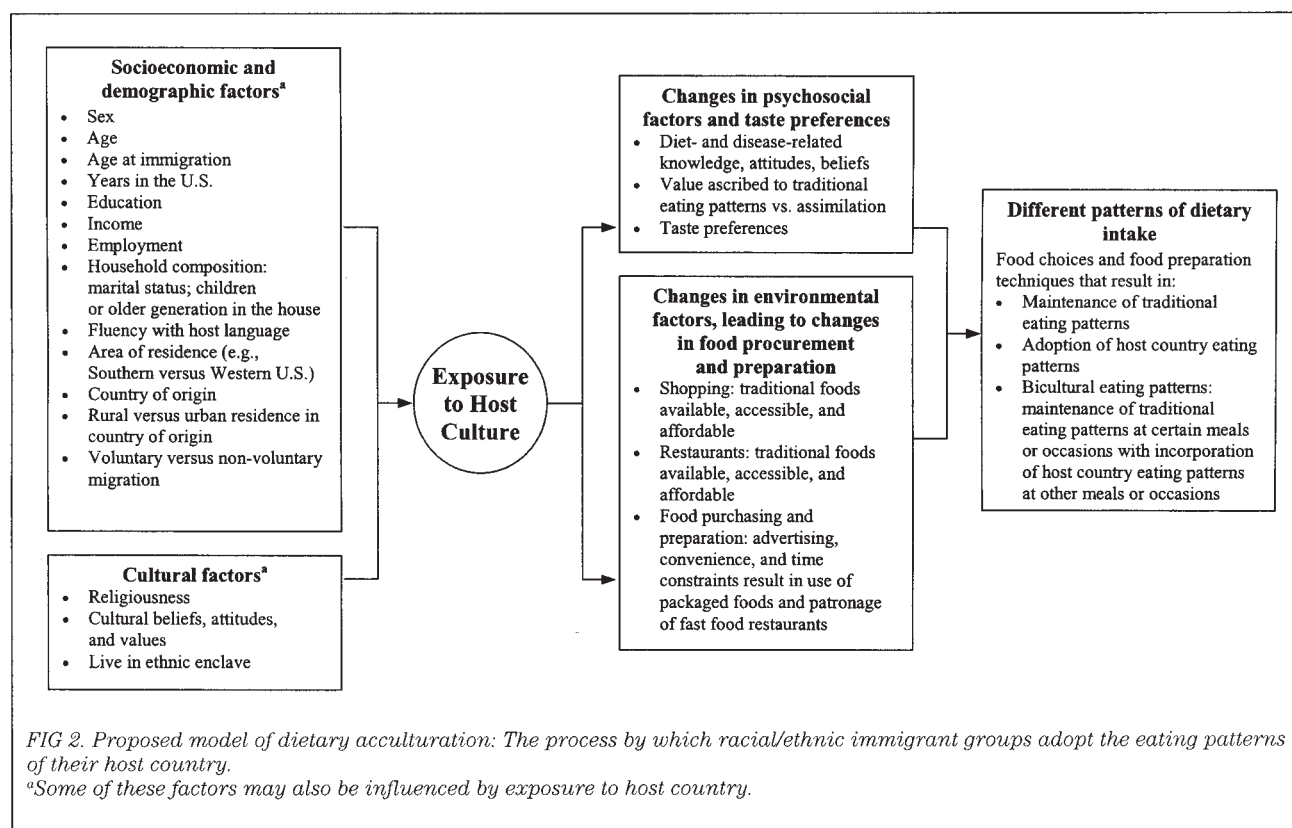
scribe this complex construct. Robert Park described acculturation as a series of distinct, irreversible stages (contact, competition, accommodation, and assimilation) where completion of one stage is required before moving to the next; however, Park’s model fails to accurately describe more recent immigrant groups (12). Milton Gordon described acculturation as a dynamic process consisting of 7 stages of assimilation (ranging from cultural to civic) with bidirectional movement between stages (12).

Regardless of theory, acculturation occurs at two levels. At the micro (individual) level, acculturation is referred to as “psychological” and refers to changes in attitudes, beliefs, behaviors (eg, diet), and values in individuals resulting from acculturation (13,14). At the macro (group) level, acculturation results in physical, biological, political, economic, and cultural changes in the acculturating group or in the society as a whole (13-15).

Several factors influence the facility for an individual or group to assimilate into a new society. Highly educated immigrants from urban areas and those with similar cultural or physical characteristics (eg, skin color) to the new country are less likely to experience cultural isolation or major lifestyle changes upon immigration. On the other hand, immigrants who situate in ethnic enclaves (ie, geographically close communities of people of the same ethnic group) or who migrate involuntarily (eg, refugees) may acculturate with considerably less speed and facility.

### INTRODUCTION TO DIETARY ACCULTURATION

“Dietary acculturation” refers to the process that occurs when members of a minority group adopt the eating patterns/food choices of the host country (16,17). For example, dietary acculturation for a Mexican immigrant to the United States



may be characterized by increased consumption of “Western” foods (eg, hamburgers) and a decreased consumption of whole grains and legumes (18). The host group may also adopt some of the foods and dietary practices of the minority group(s), as evidenced by the popularity of ethnic supermarkets and restaurants throughout most of the United States.

Dietary acculturation is multidimensional, dynamic, and complex and does not appear to be a simple process in which a person moves linearly from one end of the acculturation continuum (traditional) to the other (acculturated) (13-17). Rather, available research indicates that as part of the acculturation process, immigrants may find new ways to use traditional foods, exclude other foods, and/or consume “new” foods (17-23). For example, among many Asian immigrants, rice remains an important staple, but cereal, sandwiches, and milk may replace other traditional foods (19-21). Hispanic Americans may start to flavor the traditionally undressed side dish of chopped lettuce with salad dressing. Immigrants may also incorporate the foods available in the host country in preparing traditional meals. For example, 102 first-generation Chinese immigrants in Nebraska reported that they used US foods (eg, canned US vegetables) for preparation of Chinese dishes (20). Some studies have also shown that immigrants are more likely to consume traditional foods at dinner, whereas breakfast and lunch are more likely to be “Westernized” (19,23). Finally, some immigrants may fully adopt the dietary patterns of the host country.

Dietary acculturation can result in healthful and unhealthful dietary changes. For example, among Hispanic immigrants, drinking soda pop instead of traditional fruit-based beverages can be considered unhealthful, whereas consumption of fewer

highly saturated fats (eg, lard) is a healthful change (24). Therefore, not all dietary changes associated with acculturation are necessarily detrimental.

### PROPOSED MODEL OF DIETARY ACCULTURATION

Figure 2 shows a proposed model of dietary acculturation. Our model posits that there is a complex and dynamic relationship of socioeconomic, demographic, and cultural factors with exposure to the host culture. This set of characteristics predicts the extent to which new immigrants may change their attitudes and beliefs about food, taste preferences, and food purchasing and preparation. Ultimately, these factors can lead to changes in dietary intake.

Several studies have shown that longer residence in the host country, high education and income, employment outside the home, having young children, and fluency in the host language results in increased exposure to mainstream culture and, consequently, acculturation (13-17,19-24). Exposure to host culture (through television, books, friendships, and so forth) may lead to changes in diet- and disease-related knowledge, attitudes, and beliefs; values ascribed to traditional eating patterns; and/or taste preferences. For example, advertisements in fashion magazines emphasizing a slim figure may alter perceptions of body image among immigrant teenage girls (25,26), and exposure to nutrition messages can modify beliefs about diet and chronic disease risk (27,28). Another consequence of immigration is exposure to a new food supply, which can lead to changes in food procurement and preparation. For instance, unavailability of traditional foods and ingredients will likely result in increased consumption of the foods of host country (19). Similarly, if traditional foods are expensive and

SINGLE-ITEM MEASURES OF GENERAL ACCULTURATION	EXAMPLES OF QUESTIONS	COMMENTS
<b>Residency</b> <ul style="list-style-type: none"> <li>■ Length of residency in host country</li> <li>■ Length of residency in country of origin</li> <li>■ Place of birth</li> </ul>	<ul style="list-style-type: none"> <li>■ How long have you lived in the United States?</li> <li>■ How long did you live in Korea?</li> <li>■ Where were you born?</li> </ul>	<ul style="list-style-type: none"> <li>■ Commonly and successfully used for assessing general acculturation in many studies</li> <li>■ Provide a global measure of exposure to host culture</li> <li>■ Have the advantage of being short, factual questions that do not require interpretation by respondent</li> <li>■ Are very nonspecific and therefore may misclassify a respondent's level of acculturation</li> </ul>
<b>Language</b> <ul style="list-style-type: none"> <li>■ Proficiency</li> <li>■ Preference</li> </ul>	<ul style="list-style-type: none"> <li>■ What language do you usually speak, read, and write?</li> <li>■ What language do you prefer to speak, read, and write?</li> </ul>	<ul style="list-style-type: none"> <li>■ Commonly used questions that are short, simple, and nonspecific</li> <li>■ Provide valuable information for many public health and intervention settings regarding the need for interpreters and translated materials</li> </ul>
<b>Generation Level</b> N/A	<ul style="list-style-type: none"> <li>■ Where was your mother/father born?</li> </ul>	<ul style="list-style-type: none"> <li>■ Simple, factual question; only indirectly measures exposure to host culture</li> </ul>
<b>Friendship Preferences</b> N/A	<ul style="list-style-type: none"> <li>■ Who do you associate with in the outside community— mostly people of your same background, US citizens, or both equally?</li> </ul>	<ul style="list-style-type: none"> <li>■ Intended to assess respondent's degree of ethnic identification with host or original culture</li> </ul>
<b>Self-Identification</b> N/A	<ul style="list-style-type: none"> <li>■ How do you identify yourself (eg, Chinese, American, or bicultural)?</li> </ul>	<ul style="list-style-type: none"> <li>■ Has the advantage of allowing participant to assess own degree of acculturation</li> <li>■ Very open to interpretation by respondents</li> <li>■ Social desirability may influence responses</li> </ul>
<b>Acculturation Scales</b> Acculturation Rating Scale for Mexican Americans (source: reference 30; Cuellar et al)	<b>Scale Description and Characteristics</b> 20 items with 4 subscales: language, familiarity, usage, and preference; ethnic identification and generation; reading, writing, and cultural exposure; ethnic interaction	<b>Comments</b> <ul style="list-style-type: none"> <li>■ Have widespread use in studies of acculturation and have been validated in comparison with single-item questions</li> <li>■ Because they assess many domains related to acculturation, they are less likely to misclassify respondents than single-item questions</li> <li>■ May be too long to be practical for some research or programmatic applications</li> <li>■ Except for the scale developed by Anderson et al (reference 32), they also do not specifically address issues related to dietary acculturation</li> </ul>
Suinn-Lew Asian Self-Identity Acculturation Scale (source: reference 31, Suinn et al)	21 items with 6 dimensions: language, identity, friendship choices, behaviors, geographic history, attitudes	
Acculturation Scale for Southeast Asians (source: reference 32, Anderson et al)	13 items with 2 subscales: language proficiency; language, social, and food preferences	
Short Acculturation Scale for Hispanics (source: reference 33, Marin et al)	12 items with 3 subscales: language use, media preferences, social interactions	

FIG 3 (part 1). Scales and indexes that have been used to study dietary acculturation among US immigrants.

**Food-Based Assessments****Food lists:**

Participants identify the foods they usually eat now vs when they were in their country of origin from a food list

**Dietary acculturation scales:**

Instruments specifically designed to measure changes in dietary patterns

**Scale Description and Characteristics**

Yang et al (20) compiled a list of 47 food items common in Chinese and US cuisine. Respondents indicated (yes/no) whether they ate the foods in the past month; score derived by summing responses

Satia et al (17) developed a list of 15 food items and dietary behaviors reflective of traditional Chinese behavior and of Westernization of eating patterns; two subscales—Chinese and Western—were identified; scores were derived by obtaining the mean of nonmissing responses for each scale

**Comments**

■ Both measures assess dietary acculturation by directly measuring the outcome of dietary acculturation (ie, traditional vs Western eating patterns or both)

■ Do not assess other steps or factors in the process of dietary acculturation and may therefore need to be supplemented with other instruments when the objective is to design effective dietary interventions

FIG 3 (part 2). Scales and indexes that have been used to study dietary acculturation among US immigrants.

time-consuming to prepare, it may be more convenient and affordable to eat prepackaged dinners or to frequent fast food restaurants (19,22). Studies in immigrant populations indicate that these environmental factors are among the most commonly cited reasons for dietary acculturation (19,22,23).

Sociodemographic and cultural factors, exposure to host culture, and changes in diet-related psychosocial and environmental factors can cumulatively affect the dietary intake of immigrants in 3 principal ways. Immigrants may maintain traditional dietary patterns, completely adopt host country foods and dietary behavior, or incorporate host country eating patterns into their diet while maintaining some traditional dietary practices (biculturalism).

Cultural factors may directly influence dietary acculturation independent of exposure to host culture or changes in psychosocial and environmental factors. For example, a female Chinese immigrant with extensive exposure to the mainstream may not fully adopt US eating patterns if she lives with her mother-in-law, because Chinese older adults typically prefer a traditional diet and have a strong influence on the household diet (27,29). Although this hypothetical immigrant has characteristics that predict full acculturation, she is likely to have bicultural eating patterns.

**ASSESSING LEVEL OF DIETARY ACCULTURATION**

Most commonly used acculturation scales and indexes have been developed and validated in social science and psychological research, and some have been applied to studies examining dietary behavior. Figure 3 shows that there are 3 major approaches to measuring dietary acculturation in the literature: single-item measures of general acculturation, acculturation scales, and food-based assessments.

The major limitation of the single-item measures is that they are quite general, focusing on items such as length of residence in the host country, language proficiency, generation level, and so forth. Although these items may yield a general assessment of acculturation, they may not provide the kind of specific information needed for designing health-promotion programs, such as dietary interventions and education programs.

Acculturation scales are considerably more comprehensive and measure several facets of exposure to the host country; therefore, they are less likely to misclassify a person's level of acculturation. They do not typically include diet-

specific acculturation indicators, however. In addition, most of these scales were validated against single-item measures and demographic characteristics rather than any type of "gold standard" (30-33). Finally, validation samples have usually consisted of homogenous, nonrepresentative populations such as college students (31,33) and hospital patients (30,33).

The two food-based measures (food lists and dietary acculturation scales) are promising, as they assess dietary acculturation by measuring eating patterns. Therefore, they directly assess the outcome of dietary acculturation—that is, adoption of the eating patterns of the host country, maintenance of traditional diets, or both. However, these food-based measures do not assess other steps or factors (eg, psychosocial factors) in the process of acculturation (Figure 2), which is necessary for the design of effective dietary interventions.

**A REVIEW OF STUDIES EXAMINING ASSOCIATIONS OF DIET WITH ACCULTURATION IN ASIANS AND HISPANICS IN THE UNITED STATES AND CANADA**

We conducted a Medline search using the subject headings "acculturation," "adaptation," "assimilation," "diet," and "nutrition" to identify published investigations of diet and acculturation. In addition, we searched the table of contents and abstracts of one nonindexed journal—*Journal of Nutrition Education*—but we limited this search to studies published in 1985 through 2001. We only reviewed studies that measured both diet and acculturation, but we placed no restrictions on sample size or study design.

Figure 4 gives results from 18 published studies, 9 each of Asian and Hispanic immigrants in the United States and Canada. All studies were cross-sectional, and most presented associations of level of acculturation (usually dichotomized as "low" or "high") with food intake, nutrient intake, and/or some measure of diet behavior (eg, frequency of consumption of US foods). There was striking heterogeneity in dietary and acculturation assessments across studies. Because there was little consistency in dietary measures and outcomes, specifics and the original publications are provided for further detail in Figure 4.

Overall, most of these studies found some statistically significant associations of level of acculturation with diet. Unfor-

Authors, Year of Study (reference no.)	Population (participant characteristics, n)	Acculturation Indexes/Scales	Dietary Measures and Main Outcomes	Main Findings
Satia et al, 2001 (17)	Chinese Americans and Chinese Canadians in Seattle and Vancouver, BC, Canada; n=244; 100% women; mean age=52 years; 21% with more than high school education	Dietary Acculturation Scale (foods/behaviors associated with Western and Chinese diets; age at immigration; media (eg, music, newspapers, television) preferences	Fat-related dietary habits were measured with a diet habits questionnaire. Current fruit and vegetable consumption and changes in fat and fruit/vegetable intake were assessed using questionnaires developed for this population	Significant associations of Western acculturation with (higher) fat-related dietary habits and increased fruit and vegetable intake since immigration using the Dietary Acculturation Scale ( $P<.01$ ); no association between other indexes (age at immigration and media preferences) and diet were found ( $P>.05$ )
Bermúdez et al, 2000 (24)	N=711 Hispanics and 226 non-Hispanic whites from Puerto Rico, Dominican Republic, and "other" (Cuba and Central and South America); all participants $\geq 60$ years; 58% of Puerto Ricans, 68% of Dominicans, and 63% of "others" were women	Modified Cuellar scale (indexes include language preference and familiarity, ethnic identification, ethnic interaction, cultural exposure)	Single 24-hour dietary recall to assess total energy and macronutrient intake; foods ranked to determine contribution to total macronutrient intake; specific food sources of energy, total fat, and carbohydrates	More acculturated Hispanics consumed fewer ethnic foods and had similar dietary habits to non-Hispanic whites. More acculturated participants had lower intake from complex carbohydrates and higher intake from simple sugars. More acculturated Hispanics ate less rice and beans, but more added sugars, cakes, and pastries
Lee et al, 1999 (21)	Korean Americans; nationwide sample; n=348; 42% women; mean age=41 years (range: 17 to 90 years); 90% of those who worked had white-collar jobs; 74% were married	English proficiency; US education; length of residency in the United States	A food frequency questionnaire (FFQ) assessed consumption of Korean, US, and common foods and fat intake. Food group consumption frequency, dietary variety; dietary diversity was measured via FFQ	Acculturation indexes were significantly positively correlated with frequency of consumption of US foods (Pearson's $r=0.15$ to $0.31$ ) and negatively correlated with frequency of consumption of Korean foods ( $r=-0.31$ to $-0.46$ ). Fat intake, dietary quality, and dietary diversity did not vary by acculturation status

FIG 4 (part 1). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Pan et al, 1999 (22)	College and junior college students from Taiwan, China, Hong Kong, Japan, and Korea living in Florida; 89% were from Taiwan or China; n=63%; 54% women; age range: 21 to 35 years; 64% were unmarried; length of residency in the United States=6 months to 10 years	Length of residency in the United States	A self-administered questionnaire measured consumption of grains, vegetables, fruit, meat, dairy products, fats/sweets, and mixed dishes. Information regarding number of meals eaten per day, frequency of snack consumption, and dining out was also collected	Immigration to the United States was associated with statistically significant increases in the frequency of consumption of fats/sweets, dairy products, and fruits and significant decreases in consumption of meats and vegetables. Among participants who had lived in the United States for more than 3 years, 85% had changed their eating patterns since immigration, compared with 38% of those who had been in the United States for 1 year or less.
Raj et al, 1999 (23)	Asian Indians in New York and Washington, DC; n=73; 63% women; >94% born in India; all participants aged ≥20 years	Length of residency in the United States: recent residents (≤10 years) and longtime residents (>10 years)	A dietitian-administered questionnaire assessed current food habits and changes in consumption of specific, common US, and Indian foods since immigration	Longtime residents reported mostly eating Indian foods for dinner and weekend meals, in contrast with recent residents. Longtime residents also reported a significant ( $P<.05$ ) reduction in consumption of foods high in saturated fat (butter, milk, yogurt, and ghee) when compared with recent immigrants
Goslar et al, 1997 (38)	N=1,420 Mexican-American, 388 Cuban-American, and 542 Puerto Rican respondents to the Hispanic Health and Nutrition Examination Survey (HHANES)	Acculturation measured with language preference for speaking, reading, and writing	Mean estimates of energy, sodium, potassium, calcium, magnesium, fiber, and alcohol from single 24-hour dietary recall. Serum sodium/potassium ratio	Acculturation, diet, and body mass index (BMI) strongly influenced blood pressure. Serum sodium/potassium ratio was a stronger predictor of blood pressure than diet alone
Woodruff et al, 1997 (39)	N=132 Hispanic adults; 60% women; mean age=28.7 years; 33% were married and 44% had lived in the United States <3 years; mean years of education=9.8 years; 45% were employed outside the home	Acculturation score (modified from Marin scale; based on language preference and ethnicity of social contacts). Participants dichotomized into low and high acculturation	Mean scores on 12-item nutrition knowledge test; beliefs about diet and dietary intentions; mean scores on Knapp fat/cholesterol avoidance scale	Highly acculturated participants had significantly ( $P<.05$ ) higher fat avoidance compared with those with lower acculturation. Higher acculturation was also associated with stronger belief that diet is related to health among women but was associated with weaker diet-health benefits in men. Nutrition knowledge was low for all participants

FIG 4 (part 2). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Huang et al, 1996 (34)	Japanese Americans living in Hawaii; n=7,959; 100% men	Place of birth (Japan vs Hawaii); total years lived in Japan; self-reported current diet (Asian or mixed vs Western)	A 24-hour recall was used to ascertain current dietary intake (fat, protein, carbohydrate, and total energy). Information on physical activity and BMI was collected via interviews	Overall, less-accultured men (ie, those born in Japan, who lived in Japan for 10 or more years, and who consumed a primarily Asian diet) consumed a lower percentage of energy from fat and animal protein, ate a higher percentage of energy from carbohydrates, were more physically active, and had a lower BMI compared with more-accultured men (ie, those born in Hawaii, who had lived in Japan for less than 10 years and consumed a Western diet)
Hung et al, 1995 (35)	Vietnamese Americans in California; n=1,011; 45% women; median age=37 years (range: 18 to 85 years); 70% were married; most were recent immigrants and had less than high school education, low English proficiency, and low income	Length of residency in the United States	A questionnaire adapted from the California Dietary Practices Survey measured cooking behavior; consumption of high-fat, high-cholesterol foods and high-sodium foods; fruit and vegetable intake; and alcohol consumption	Recent immigrants were more likely to consume eggs and salty foods ( $P<.01$ ). Number of years since immigration was not a significant predictor of consumption of deep-fried foods or meat. Mean daily consumption of fruits and vegetables=3.1 servings

FIG 4 (part 3). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Otero-Sabogal et al, 1995 (18)	844 Hispanics and 510 non-Hispanic whites from Kaiser Permanente and 806 Hispanics and 436 non-Hispanic whites from census tract-based areas in San Francisco; among Hispanic groups, 50% were women, and among non-Hispanic whites, 59% were women; age range: 35 to 74 years; 60% to 70% of Hispanics were foreign-born and not well acculturated; non-Hispanic whites had more education, higher education, and were more likely to be married	5-item language scale assessed level of acculturation	11 diet-related items from the National Health Interview Survey and a modification of the Knapp fat/cholesterol-avoidance scale were used to assess percentage of the sample who reported eating specific foods on the previous day, percentage who reported fat-avoidance behaviors, and odds of Hispanics consuming specific foods on previous days compared with non-Hispanic whites.	Low-accultured participants reported statistically significantly ( $P<.05$ ) greater frequency of eating rice, beans, and whole milk, but less oatmeal/cereal on the previous day, and significantly greater use of lard/meat fat in cooking and always removing skin from chicken. In the Kaiser Permanente sample, less-accultured Hispanics were more than 3 times as likely to eat rice on the previous day, and 1½ times more likely to eat beans and whole milk and remove the skin from chicken compared with more-accultured Hispanics. In the census tract-based sample, less-accultured Hispanics were twice as likely to eat fruit, rice, and beans, and about 1½ times more likely to drink milk, eat red meat, and remove the skin from chicken, compared with non-Hispanic whites.
Balcazar et al, 1995 (40)	Hispanic women; n=571; mean years of education = 12 years for the 55% educated in the United States and 6 years for the 45% educated in Latin America	General acculturation index, with higher score indicative of more acculturation (indexes include language preference, friendship preference, ethnic pride)	8-item food consumption checklist; assessment of beliefs and attitudes about diet were used to test associations of diet with health benefits	Low-accultured women believed in weak associations of diet with health. Compared with high-accultured women, low-accultured women ate more foods cooked in lard, fewer fruits and vegetables, and more beans and legumes.

FIG 4 (part 4). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Guendelman and Abrams, 1995 (41)	N=475 first-generation and 898 second-generation Mexican-American female respondents from HHANES and 2,236 non-Hispanic white female respondents from the second National Health and Nutrition Examination Survey	Generational status	A 24-hour dietary recall estimated energy, protein, calcium, iron, zinc, vitamins A, C, and E, and folic acid. Nutrient adequacy ratios of protein, vitamins, and minerals intake were compared with Recommended Dietary Allowances	First-generation Mexican-American (less-acculturated) women consumed significantly ( $P<.05$ ) more protein, carbohydrate, cholesterol, vitamins A and C, folic acid, calcium, and iron, compared with second-generation Mexican-American and non-Hispanic white women. In general, first-generation Mexican-American women had higher nutrient adequacy ratios compared with other respondents, suggesting better-quality diets
Schultz et al, 1994 (36)	18 US-born, 20 foreign-born Chinese, and 18 white Americans in San Diego, Calif; 100% were women; mean age=24 years; all US-born Chinese were second and third generation; 70% of foreign-born Chinese had lived in the United States $\leq 23$ months	Place of birth (ie, United States vs China)	4-day food records were used to ascertain intake of total energy, protein, fat, and vitamins and minerals. Nutrition attitudes and knowledge were measured with an 18-item instrument	US-born Chinese had the highest total energy intake whereas foreign-born Chinese had the lowest ( $P=.02$ ). Mean percent of energy from fat was about 34% for all groups, and mean protein and carbohydrate intakes were similar for all groups. Nutrition knowledge about fat was low and did not differ among the 3 groups. Among participants, 77% of white Americans, 50% of US-born Chinese, and 20% of foreign-born Chinese stated that nutrition usually influenced their food choices.
Winkleby et al, 1994 (42)	333 Hispanic adults; subsample of Stanford 5-City Project	Primary language spoken at home (Spanish-speaking at home meant less-acculturated)	FFQ; 24-hour recalls to estimate energy, percentage of energy from fat, saturated fat, carbohydrates, dietary fiber; intake of specific foods (eg, cured meats, cheese, red meat, added fats, fried foods, whole grains, whole milk beans)	More-acculturated Hispanics began to approximate non-Hispanic whites for percentage of energy from fat, saturated fat, carbohydrates, and dietary fiber. Statistically significant differences in all food groups between Spanish-speaking Hispanics and whites except fried foods

FIG 4 (part 5). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Elder et al, 1991 (43)	N=471 Hispanic and white adults in San Diego, Calif; 76% Hispanic; 71% and 57% of low- and high-acculturated Hispanics, respectively, were women; 62% of non-Hispanic whites were women; mean age: 38.9 years, 33.5 years, and 47.7 years for low-acculturated Hispanics, high-acculturated Hispanics, and non-Hispanic whites, respectively; Hispanics had significantly ( $P<.05$ ) less education and income compared with non-Hispanic whites	Modified/abbreviated Cuellar acculturation scale (indexes include language preference and familiarity, ethnic identification, ethnic interaction, and cultural exposure).	Castro scales used to measure saturated fat/cholesterol-avoidance, fiber consumption, and use of low- and high-energy foods	Low-acculturated Hispanics were least likely to avoid fat compared with high-acculturated Hispanics and whites, but low-acculturated Hispanics were most likely to have higher fiber consumption (eg, corn tortillas and beans). Low-acculturated Hispanics were more likely to eat high-energy foods.
Solis et al, 1990 (44)	Mexican- and Cuban-American and Puerto Rican adults aged 20 to 74 years who participated in HHANES; 57% women; 60% had $\leq 12$ years education	Modified Cuellar scale (eg, ethnic identification and interaction, language preference/familiarity, and cultural exposure)	Food checklist; diet index score based on extent to which diet was balanced and amount of junk food consumed	Acculturation was inversely associated with diet score (ie, more-acculturated participants had less dietary balance and ate more junk food)
Hrboticky et al, 1984 (37)	Chinese Canadians; n=54 (36 born in Hong Kong and 18 born in Canada); 100% adolescent boys; age range: 14 to 16 years; mean number of household members=5.8	Generation level and language use	Flavor, health value, and prestige perception profiles of 46 Canadian foods were assessed using 5-point Likert-type scales.	Compared with first-generation participants, second-generation boys and those with more-acculturated patterns of language use gave higher hedonic flavor and prestige ratings to dessert, snack, and fast foods, and could better discriminate between nutrient-poor and -rich foods.
Yang et al, 1979 (20)	Chinese Americans in Lincoln, Neb; n=104; 44% female; 30% were younger than 25 years; 54% married; 63% had no children; 33% fluent in English; 70% from Taiwan	A food-related Composite Adaptation Score (eg, like/dislike US foods, accessibility to Chinese foods) assessed changes in food habits. Information on English-speaking ability, friendships with Americans, and country of origin was also collected	24-hour dietary recalls; a day's typical menu; changes in consumption of 47 items used in Chinese and US cuisine	No statistically significant differences in Composite Adaptation Scores based on English-speaking ability, country of origin, or US friendships ( $P>.05$ ). Most respondents ate a US breakfast and lunch but a traditional Chinese dinner. Women with high Composite Adaptation Scores (ie, more changes in food intake) ate fewer foods common in the Chinese diet (eg, pork, soy, poultry, and rice), whereas US foods (eg, potatoes, cheese, ice cream, and beer) were used more frequently.

FIG 4 (part 6). Review of studies examining diet and acculturation in Asians and Hispanics in North America.

Unfortunately, there was no consistent direction of effect between level of acculturation and dietary intake. For example, among studies that measured fat intake or fat-related dietary patterns, Lee and Hung (21,35) found no association between acculturation and fat intake; Woodruff, Balcazar, and Elder (39,40,43) reported that lesser-acculturated Hispanic immigrants were more likely to eat high-fat foods; and Satia, Pan, and Huang (17,22,34) found a positive association between length of time in North America and fat intake. Results for fruit and vegetable intake were similarly inconsistent. These results point to problems in measurement of acculturation and dietary intake, differences in dietary patterns across various racial/ethnic groups, limitations in trying to investigate the process of change using cross-sectional designs, and an incomplete understanding of dietary acculturation. Furthermore, none of the studies performed a comprehensive assessment of all the exposure variables described in our proposed model of dietary acculturation (Figure 2), although those that measured demographic and psychosocial variables found these factors to be important predictors of dietary intake (22,23,34,37,39,40).

Studies investigating the association of migration and acculturation with disease risk should identify and intervene on those steps in the acculturation process that are most strongly associated with unhealthy dietary changes

Because of the lack of consistency in study designs and findings, we are unable to draw conclusions about the effects of dietary acculturation on overall diet quality, immigrant-associated dietary patterns, and chronic disease risk. Nevertheless, taken together, the data from these studies suggest that a better understanding of dietary acculturation offers a valuable opportunity to intervene more effectively on diet and health among racial/ethnic minority groups in the United States. There is a need for collaboration among dietetics professionals and social and behavioral scientists to establish new paradigms for research efforts in this important area.

## APPLICATIONS OF ACCULTURATION TO DIETARY INTERVENTIONS

Two nutritional health-promotion studies conducted in the San Diego area offer contrasts in approaches to tailoring a dietary intervention to level of acculturation in immigrant communities. "Language for Health" was a 4-year effort to improve the heart health of immigrants through lower-fat and lower-cholesterol diets (45). This program was extended to Hispanics (87%), Asians, Eastern Europeans, and other participants enrolled in English-as-a-second-language (ESL) programs sponsored by local community college districts. Thus, the participant group was characterized by heterogeneity and the desire to learn English and (presumably) to acculturate. Food Guide Pyramid (46), fat, cholesterol, recipe modification, and "smart shopping" messages were embedded in the overall curriculum, and thus were presented by trained ESL teachers in basic English. Given the nature of this communication and the variety of ethnic and national backgrounds of the participants, the program emphasized the basics of US diets rather than ethnicity-specific foods. The program enjoyed modest success, as participants maintained higher nutrition knowledge and "fat-avoidance" behaviors in contrast with a control group at a 6-month follow-up (47).

In marked contrast, "Secretos de la Buena Vida" (Secrets of the Good Life) targets Hispanic American girls and their families who are primarily Spanish-speakers and live in communities in which use of the Spanish language and Mexican cultural forces remain predominant. This study emphasizes the use of "promotoras," Spanish-speaking volunteer change agents from these same communities who have received special training on how to communicate nutritional messages to their neighbors. Promotoras provide informational, instrumental, and emotional support to their charges and are able to tailor communication messages to them after assessing their home environment and living situation. Promotoras also deliver highly attractive, color print materials tailored to the nutritional habits and preferences indicated by the participants. These print materials suggest "health" as just a part of the overall benefits to be derived by dietary change; other benefits communicated include savings in time and money and maintenance of tradition and flavor. Although program implementation is in its early stages, initial receptivity has been quite good (48).

## SUGGESTIONS FOR FUTURE DIETARY ACCULTURATION RESEARCH

The dietary acculturation model presented in this report offers a way for nutrition researchers and practitioners to understand this complex construct; however, it is likely incomplete. Researchers need to conduct quantitative, longitudinal studies to determine the relative importance of various determinants in influencing acculturation-associated dietary changes and the impacts of those changes on health status.

Methodological work is also needed to design instruments that more accurately measure the various steps or factors in the process of acculturation. These include sociodemographic and cultural characteristics, diet-related changes in psychosocial and environmental factors, changes in taste preferences, and changes in patterns of dietary intake.

## RESEARCH APPLICATIONS

### Research Design

■ Studies investigating the association of migration and acculturation with disease risk should identify and intervene on

those steps in the acculturation process that are most strongly associated with unhealthful dietary changes.

■ Well-accepted behavioral models developed in white populations may need to be modified for some minority groups. For example, the Health Belief Model—which posits that people are most likely to take health-related action when they perceive themselves to be susceptible (49)—may not be applicable to a population that considers disease a matter of fate.

■ Health promotion programs for racial/ethnic minorities should be targeted differently depending on level of dietary acculturation. For instance, less-acculturated Chinese immigrants should be encouraged to maintain healthful Chinese eating patterns that emphasize consumption of vegetables and seafood, whereas acculturated Chinese immigrants should be advised to make healthful modifications to foods consumed because of Westernization (eg, purchasing lean cuts of meat).

### Exposure and Outcome Assessment

■ To design targeted and effective dietary interventions, assessment of dietary acculturation should include an evaluation of the steps in the acculturation process, commonly used measures of general acculturation, and specific (ie, food-based) indicators of dietary acculturation in the population of interest.

■ Dietary assessment instruments should measure traditional dietary patterns and indicator foods and behaviors associated with Westernization of the diet. To identify biculturalism, response options should allow respondents to select both traditional and host country practices. For less-studied populations, it may be necessary to conduct qualitative or formative research to identify typical dietary habits and salient cultural, environmental, and psychosocial predictors of diet (19).

### Data Analysis

■ Researchers who include immigrants in their study samples should measure acculturation as well as socioeconomic and demographic characteristics. Because there is likely confounding of acculturation with education and income, it is important to identify the independent effects of acculturation on diet to appropriately interpret study results.

### PRACTITIONER APPLICATIONS

■ Dietetics professionals working with new immigrants can use the model of dietary acculturation to better understand the complexity of factors affecting food choices by their clients.

■ To better understand where a client is in the process of dietary acculturation, a careful individual assessment is needed, taking into account personal and environmental characteristics. This assessment can be an important part of the following:

- Knowing what questions to ask about determinants of, barriers to, and changes in eating patterns. For example, household composition (ie, whether parents or children live in the home) may be critical to understanding the dietary patterns of some Asian Americans.
- Making sure that advice given does not directly contradict deeply held beliefs of the client, resulting in loss of credibility for the dietetics professional.
- Determining the degree to which dietary counseling should be focused on maintaining traditional eating habits and/or adopting the healthful aspects of Western eating.

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## QUESTION OF THE MONTH

### Do cranberries aid in the treatment of Urinary Tract Infections?

Urinary Tract Infection (UTI) occurs when microorganisms adhere to the opening of the urethra and begin to multiply. *Escherichia coli* (*E. Coli*), normally present in the colon, accounts for 85% of UTIs. UTIs are far more prevalent in women than in men, particularly older women, with recurrences being common (1).

UTIs are typically treated with antibacterial drugs, but an increasing concern over antibiotic resistance led researchers to look at the cranberry as an alternative. Initially research focused on the acidification of urine as a means of UTI control and prevention. However, urine acidification was not supported by the research.

A 1994 study concluded that there was something specific to the cranberry that prevented bacterial adhesion (2). The compounds believed to be responsible have been identified as proanthocyanidins. Findings published in the June 19, 2002 issue of the *Journal of the American Medical Association* (JAMA) indicate scientists have investigated regular consumption of cranberry juice cocktail and cranberry proanthocyanidins extract and concluded they exhibited antiadhesion properties and may offer

protection against certain antibiotic resistant bacteria that cause UTIs (3). The National Center of Complementary Medicine and Alternative Medicine has recently approved funding to support further research on the role of cranberry in the prevention and treatment of UTIs. A detailed Project Concept Review of the intended research is available online at <http://nccam.nih.gov/research/concepts/consider/cranberry.htm>.

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