Fruit and Vegetable Consumption of Older Mexican-American Women is Associated with Their Acculturation Level

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Little is known about the association between acculturation and fruit and vegetable (FV) consumption among older Mexican-American (MA) women. Environmental and lifestyles changes experienced by immigrants to the United States may markedly affect their diet and health and increase their risk for chronic diseases. Our objectives were to: 1) describe FV consumption by ethnicity, acculturation, and sociodemographic characteristics, and 2) compare effects of acculturation and sociodemographic variables on FV intake in a population of older MA and non-Hispanic White (NHW) women from the Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) Study. This report examines baseline FV intake of 346 underinsured women aged 50–76 years, assessed through 24-hour dietary recalls. Acculturation was measured with a five-item Likert-type scale. Twenty percent of more acculturated MA women, 24% of less acculturated MA women, and 36% of White women consumed ≥5 servings of FV servings per day. Fruit and vegetable (FV) intake was associated with acculturation, education, and smoking status. Being more acculturated was associated with lower consumption of FVs among MAs, while having a higher education and no smoking was associated with higher intakes of FV servings among NHWs. Public health efforts to improve the intake of FVs among MA women should be sensitive to their acculturation status. (*Ethn Dis*. 2006;16:89–95)

Key Words: Eating Behavior, Hispanic, Mexican American, Middle-Aged Women, Migration

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Introduction

In the United States, positive and negative risk factors for chronic disease in the Hispanic population are frequently discussed in relation to acculturation. Acculturation is the adoption of attitudes, values, and behaviors of the mainstream culture by persons not from that culture.[1] When immigrants shift from traditional eating habits to those of their adopted countries, risks for chronic disease may increase.[2–5] For example, Mexican Americans (MAs) born in the United States who speak mostly Spanish have markedly different risk factor patterns than their counterparts who speak mostly English.[6] In several studies, acculturation is strongly associated with socioeconomic status (SES), yet when adjusted for SES, the relationship between acculturation and health status or health behavior weakens or disappears altogether.[7,8]

Diet is one risk factor that appears to be particularly affected by acculturation, but how dietary changes occur is not clear. Identifying the correlates of diet is critical to understanding the relationship between socioeconomic acculturation and dietary acculturation.[2,9] Because of the inverse relationship between fruit and vegetable (FV) consumption and risk for stroke, coronary heart disease,[10–15] diabetes,[16] and other chronic diseases,[17–19] FV intake is of particular importance in chronic disease prevention. Daily consumption of FVs varies by acculturation as well as gender, age, ethnicity, income, and education.[7,20,21] Less-acculturated MAs have reported consuming more servings of FV[7] than the general US population. This observation substantiates the idea that acculturation in MAs leads to lower FV consumption because Mexican diets tend to include more FV than American diets. Understanding how acculturation, independent of SES, affects food intake is crucial for developing effective dietary interventions.

Identifying the correlates of diet is critical to understanding the relationship between socioeconomic acculturation and dietary acculturation.[2,9]

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Methods

Subjects

Participants were uninsured women aged ≥50 years who were primarily Hispanic (mostly MAs), had incomes under 200% of the federal poverty level, and were part of the Arizona Well-Integrated Screening and Evaluation for Women Across the Nation (AZ WISE-

WOMAN) study. Lay health workers and providers from two Tucson clinics recruited the participants.[22,23] All women who participated in the program were deemed medically eligible to carry out physical activities by a medical practitioner and signed an informed consent form. The institutional review boards of the University of Arizona and Arizona Department of Health Services approved all study protocols. The purpose of the AZ WISEWOMAN project was to test the effectiveness of three interventions using patient-provider communication, social cognitive theory, and social support theory to increase consumption of FVs and physical activity. No intervention effect or FV intake change was observed.[22,23] The WISEWOMAN project enrolled 361 women; this paper reports on baseline data from 346 participants for whom ethnicity was defined as either MA or NHW and for whom acculturation (MA only) scales were available. Women selected for this study were no different than those that were not selected, except the latter were more likely to have completed high school.

Acculturation

A modified version of the Acculturation Rating Scale for MA (ARSMA) was used.[1] The scale measures movement of cultural orientation from the Mexican culture to the US culture.[1] Previous application of this scale indicates it is reliable and valid for MAs.[24–26] All items are measured on a five-point Likert-type scale. The language items were rated from one (only Spanish) to five (only English), while cultural identity was rated from one (very Mexican) to five (very Anglo). Responses on traditions were rated from one (always follow Mexican customs) to five (always follow American customs). Assessment of pride in heritage ranged from one (very proud) to five (no pride). The items were averaged to obtain an overall measure of acculturation with a range of values from one to five. For analysis and determining characteristics of our participants, we created two categories of acculturation based on the mid cutoff score, less acculturated (<1.62) and more acculturated (≥ 1.62), and created an additional category for NWHs.[27,28]

Sociodemographic and Lifestyle Data

Data on age, education, income, marital status, family size, employment, and cigarette smoking were collected by standardized questionnaire for all participants. High body mass index (BMI), calculated from measured height and weight, was defined as ≥ 25 (kg/m^2).[29]

Dietary Methods

Three 24-hour dietary recalls were attempted for each participant, with the goal of obtaining dietary intake for one weekend day and two weekdays. Bilingual staff conducted the initial 24-hour dietary recall face-to-face and the remaining two 24-hour dietary recalls over the telephone. Participants were not given prior notification, standard protocols for probing methods for food preparations, brand names, and ingredients were used, and information was recorded on food eaten from midnight to midnight on the previous calendar day.[22,23,30] Dietary recall data were entered and nutrients estimated with the Nutrient Data System for Research (NDS-R) software version 4.05_33 (Nutrition Coordinating Center [NCC], University of Minnesota, Minneapolis, Minn, July 2002). Not all participants completed three 24-hour recalls; 59% completed all three, 23% completed two, and 18% completed one. An initial analysis showed no significant FV intake differences between individuals with one, two, or three recalls; therefore data were combined. The comparative analyses of participants with different numbers of recalls were reported previously.[22] Two vegetarians reported very high intakes of FVs at baseline (17.2 and 26.5 servings). These outliers were removed from the analyses because they did not reflect the intakes of their counterparts.

Estimation of FV Intake

Total servings of fruits and vegetables were tallied by using the definitions and portions sizes from the National Cancer Institute (NCI) 5 a-Day program, which are derived from the Dietary Guidelines for Americans. Legumes were included in the calculation of FV but foods not meeting the criteria of the 5 a-Day program promotable foods, including French fries, fried potatoes, pickled vegetables, olives, coconuts, avocados, and vegetable-based snack foods were excluded.[22,31]

Statistical Analysis

The coefficient α was used to measure internal consistency reliabilities for the acculturation scale.[32] Baseline levels of FV consumption were assessed and compared by demographic characteristics. Significance testing was performed with chi-square (using Fisher exact test because of the small frequencies) and analysis of variance (ANOVA) (adjusting for multiple comparisons). Also trend test across ordered groups was performed.

To evaluate associations at baseline between FV consumption and sociodemographic characteristics, linear regressions were conducted on a random half of the participants. The results from these models were then validated against the other half of the data. Bivariate analyses were also performed by ethnic groups, and significant factors were retained in subsequent multivariate analyses; continuous independent variables were used when available (acculturation, age, education, and income). Coefficients of FV intakes were adjusted for energy intake and then for significant factors as potential confounders, this adjustment was done for each ethnic group. Interactions of acculturation with other sociodemographic characteristics were modeled in

the subgroup data; no interactions were noted.

We adopted an alpha level of .04 for model analyses to decrease the risk of type I error while considering our sample size within categories and the multiple statistical tests. The dependent variable, FV servings, was log-transformed by the square root to improve normality and to stabilize variance. Data on the prevalence of FV consumption are presented in the original units (servings), and coefficient data in the regression table are presented as transformed values. Intercooled Stata version 7 (StataCorp, College Station, Tex, 2001) was used for all analyses.

Table 1. Sociodemographic characteristics of less acculturated and more acculturated Mexican-American and non-Hispanic White participants in AZ WISEWOMAN

Characteristic	Total Participants (*n*)* *N*=346	% MA† Less Acculturated *n*=172	% MA† More Acculturated *n*=87	% MA† All *n*=259	% NHW *n*=87	MA‡	MA vs NHW§
Age, years							
50–59	226	65	63	65	68		
≥60	120	35	37	35	32	.76	.57
Education, years							
0–3	121	61	17	46	1		
4–11	97	26	46	33	14		
12+	121	10	36	19	84	.00	.00
Annual income, $							
≤4999	67	22	23	22	11		
5000–9999	128	30	41	34	47		
≥10,000	144	45	36	42	40	.17	.03
Marital status							
Married/ cohabiting	154	53	46	51	26		
Single/ divorced/ separated	123	26	43	32	47		
Widowed	44	13	7	11	18	.03	.00
Employed							
Yes	107	20	36	25	48		
No	238	80	63	75	52	.01	.00
Smoking							
Yes	45	9	18	12	16		
No	299	91	79	87	84	.02	.34
High BMI							
Yes	269	78	86	81	69		
No	66	19	10	16	29	.08	.01
Fruit and vegetable intake, servings/day							
<5	256	76	80	77	64		
≥5	90	24	20	23	36	.038	.02

* Numbers may not total 346 because of missing values.
† Acculturation score range 1–5. 1=Hispanic less-acculturated and 5=Hispanic more-acculturated.
‡ Chi-square test difference between Mexican-American acculturation categories and sociodemographic categories.
§ Chi-square test difference between Mexican Americans vs non-Hispanic Whites and sociodemographic categories.
BMI=body mass index. MA=Mexican American. NHW=non-Hispanic White.

RESULTS

Sociodemographic Characteristics

The mean age for 346 participants included in these analyses was 57.5 ± 5.0 years (range 50–76 years). Most had not graduated from high school (Table 1). Less than half (42%) had a family income >$10,000, 45% were married or cohabiting, 31% were currently employed, and mean household size was 2.5 (data not presented). Mean FV consumption was 3.84 servings/day (median 3.38). The acculturation scale was reliable (coefficient α .82). Forty-nine percent of participants were classified as less-acculturated MA, 25% more-acculturated MA, and 25% NHW.

Acculturation

Distribution of demographic characteristics of less-acculturated and more-acculturated participants differs significantly by education, marital status, employment, and smoking status (Table 1). Proportions of the two acculturation groups differed significantly from the NHW participants in educational achievement, income, marital status, employment, BMI, and consumption of more than five FVs per day. Most (84%) NHW women completed 12 years of school, but only 36% of more-acculturated MA and 10% of the less-acculturated MA had done so (chi-square 176, $P \leq .001$). Less-acculturated women were more likely to be at the extremes of our household earnings categories (chi-square 8.4, $P = .02$); more often were married or cohabiting and less often single, divorced, or separated (chi-square 18, $P \leq .001$); and were more likely to be unemployed (chi-square 23, $P \leq .001$), be nonsmokers (chi-square 3, $P = .07$), and have a higher BMI (chi-square 3, $P = .07$) than NHW. Less-acculturated women less frequently ate more than five servings of FVs a day (chi-square 4, $P = .05$) than NHW. More-acculturated MA were also less likely to be widows

Table 2. AZ WISEWOMAN social, cultural, and health-related characteristics and their relationship with FV consumption at baseline, by Mexican-American Acculturation Group and non-Hispanic Whites adjusted for multiple comparisons

Characteristic	% Eating ≥5/Day	Mean FV Servings a Day* (Mean ± SD)		
		Less Acculturated *n*=172	More Acculturated *n*=87	Non-Hispanic White *N*=87
Age, years				
50–59	24	3.69 ± 2.59	3.67 ± 2.77	3.99 ± 3.00
≥60	29	4.17 ± 2.51	3.43 ± 1.97	4.27 ± 1.88
Education, years†				
0–3	19	3.47 ± 2.21	2.70 ± 1.81	1.46 ± .00
4–11	31	4.42 ± 3.09	3.53 ± 2.26	3.16 ± 2.19
≥12	37	5.07 ± 2.83‡§	4.09 ± 3.01	4.30 ± 2.73
Annual income, $				
≤4999	21	3.82 ± 2.66	3.02 ± 1.85	4.85 ± 4.06
5000–9999	25	3.82 ± 2.42	3.61 ± 2.36	3.79 ± 2.64
≥10,000	30	3.96 ± 2.69	3.90 ± 2.98	4.19 ± 2.31
Marital status				
Married/cohabiting	26	3.85 ± 2.42	3.87 ± 2.91	3.81 ± 2.76
Single/divorced/ separated	25	3.79 ± 2.63	3.24 ± 2.11	4.08 ± 2.75
Widowed	29	4.83 ± 3.20	2.88 ± .75	3.65 ± 2.00
Employed				
Yes	22	4.02 ± 2.53	3.09 ± 2.29	3.90 ± 2.72
No	28	3.82 ± 2.58	3.87 ± 2.61	4.25 ± 2.67
Smoking				
Yes	18	3.43 ± 2.50	3.78 ± 3.66	3.00 ± 2.70
No	28	3.90 ± 2.58	3.54 ± 2.22	4.29 ± 2.65‡§
High BMI				
Yes	25	3.89 ± 2.59	3.64 ± 2.62	3.61 ± 2.16
No	29	3.82 ± 2.50	2.95 ± 1.22	5.05 ± 3.50‡§

* Values are means ± SD, significance values are based on log-transformed servings of FV/day.
† Chi-square test difference between 5/day and sociodemographic category.
‡ $P \leq .05$ test of difference within ethnic/acculturation groups and sociodemographic categories.
§ $P \leq .05$ test of difference across acculturation groups and sociodemographic categories.
FV=fruit and vegetable; BMI=body mass index.

(chi-square 9, $P=.01$), to have a higher BMI (chi-square 0, $P=.002$), and eat more than five servings a day (chi-square 6, $P=.02$) than NHW. Progressive trends were noted for education, marital status, employment, and smoking status (data not presented).

Diet, Acculturation, and Sociodemographic Factors

An average of 27% of participants ate at least five FVs per day. A significantly higher proportion (36%) of NHW consumed at least five FVs per day than the acculturation groups (chi-square 6.3, $P=.043$). The FV consumption was diverse across sociodemographic characteristics (Table 2). Education was positively associated with mean intake of FVs and the proportion eating at least five FVs per day (chi-square 12, $P=.002$).

After adjusting for multiple comparison, average daily intake of FVs between ethnic/acculturation groups and sociodemographic factors demonstrated no significant differences. Within-group analyses indicated that less-acculturated MA with higher education levels ($P=.019$) and nonsmokers and normal-BMI NHWs ($P=.030$ and $P=.039$, respectively) had significantly higher servings of FVs a day.

Multivariate Models

After adjustment for potential confounders, higher acculturation of MA women was significantly associated with decreased consumption of FVs (Table 3). A positive association between educational status and the intake of FVs was present for participants with more education in both ethnic groups. In addition, smoking was negatively associated with intakes of FVs, particularly among NHWs.

DISCUSSION

This study was designed to examine the relationship between acculturation and FV consumption in a sample of uninsured MA women aged ≥50 years and compared their demographic and dietary patterns to a group of NHW women. The mean intake of FVs and the percentage of study participants who consumed at least FVs per day were comparable with results from other report,[33] including those from the Behavioral Risk Factor Surveillance System Arizona for 1998 and 2002.[34]

Cuellar's modified acculturation scale[1] indicated that most MA women in our study had low levels of acculturation, a finding consistent with previous studies of other Hispanic elderly populations in the United States.[27,35] The distribution of participants in the mid-range of our income categories was higher for MA who were more acculturated and for NHW, but the actual income mean was higher for less-acculturated MA than for the other groups. Despite their slightly higher income, their FV intake was similar to that of other groups; lower intake of FVs among more-acculturated MA has been reported elsewhere.[7]

Contrary to findings for NHW women, more financial resources did not translate to greater FV intake. This finding may suggest that higher incomes may lead women to convenience foods

Table 3. Relationship of selected sociodemographic factors to FV consumption for AZ WISEWOMAN participants from linear regression models*

Characteristic		MA b	MA *P* Value		NHW b	NHW *P* Value
Acculturation	†	−.12	.039			
	‡	−.13	.029			
	§	−.22	.002		—	—
Education	†	.02	.110	†	.08	.006
	‡	.01	.337	‡	.09	.005
	§	.03	.048	‖	.09	.002
Smoking	†	−.08	.550	†	−.43	.061
	‡	−.07	.602	‡	−.43	.060
	§	−.06	.623	‖	−.49	.038

* Significance values are based on log-transformed servings of FV a day.
† Linear regression, unadjusted
‡ Linear regression adjusted for energy intake
§ Linear regression adjusted for energy intake, acculturation, and education
‖ Linear regression adjusted for energy intake, education, and smoking
FV=fruit and vegetable; MA=Mexican American; NHW=non-Hispanic White.

Contrary to findings for NHW women, more financial resources in the less-acculturated group did not translate to greater FV intake.

and foods eaten away from home: foods that may be of lower nutritional quality. This phenomenon has been suggested by other researchers.[4,7] More-acculturated MAs appeared to be eating fewer FV based foods, while the less-acculturated and NHW participants shared similar consumption of FVs. Our findings are contrary to those of a previous study that found that NHW ate fewer FVs than Hispanics.[7] As our participants were limited to low-SES women, the results may reflect particulars about socioeconomic commonalities within a narrow SES range.

Low FV consumption and changes in dietary patterns associated with acculturation have been associated with increased BMI, greater waist circumference, and decreased overall health over time.[3,36] The persistent low FV intake and increased BMI in the AZ WISEWOMAN participants may increase the health risks associated with unhealthy diet and obesity.

Acculturation, as noted in other studies, appears to be an independent predictor of diet,[7] yet careful interpretation is needed since adjusting for other demographic factors affected the association between acculturation and FV intake. Furthermore, the group of participants who had a higher mean income and lower intake of FVs may have had more acquisition power and more food availability and security, which may have influenced food selection. In addition, education level may strongly influence access to the American lifestyle,[3] and affect diet acculturation in this population.

Incorporating the effects of acculturation in an intervention should be done with caution, as acculturation has a confounded relationship with other factors. The Mexican diet includes a wide variety of native FVs such as corn, chilies, beans, and squash.[37] Evaluating the degree to which traditional foods were incorporated in participants' diets was beyond the scope of this study, but most women consumed fewer than the recommended five or more FVs per day. The study of acculturation and its relationship to healthy behaviors is complex. Dietary patterns, food availability, convenience, social structure, health concerns, purchasing power, and food preparation responsibilities must be considered in order to make appropriate inferences in this population. Collecting qualitative data about health beliefs and barriers to consumption of FVs might have enhanced our ability to determine effects on dietary intake.

Alternatively, the acculturation scale may have been too insensitive to detect differences in diet or might need all the components of an extensive acculturation scale to properly address the relationship with FV intake. As reported by Norman and colleagues, the definition of acculturation and how it is measured influences results related to dietary habits.[38] The fact that our more-acculturated category had fewer participants also may have obscured our ability to make inferences. Even so, a significant effect of acculturation was found, which only eliminated the possibility of a type II error. Additionally, some of the limitations of the 24-hour dietary recalls should be considered. Future research can benefit from more extensive consideration of acculturation and more complete diet assessment, which would likely include more than one method to collect diet intake data (ie, diet history or food frequency questionnaires).

Maintaining a nutritious diet is difficult in low-income older populations, which tend to be less educated or solitary.[39–41] In 2000, 39% of AZ females ate the recommended amount of FVs,[34,42] but only 25% of the women in AZ WISEWOMAN ate the recommended amount. Continued efforts to explore patterns of food intake over time are needed, and the interaction effect between sociodemographic factors, such as acculturation and education, should be considered. Furthermore, an improved understanding of the dietary beliefs and practices of

people in various stages of the acculturation continuum is necessary to develop and implement dietary interventions for immigrants. We must promote diets that include both traditional and modern foods and that focus on adopting or maintaining healthful dietary patterns that will satisfy the biological, emotional, and social needs of the diverse Hispanic groups in the United States.

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