Dietary Intake among Mexican-American Women: Generational Differences and a Comparison with Whit Resource ID# 5141

Dietary Intake Among Mexican-American Women: Generational Differences and a Comparison with White Non-Hispanic Women

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ABSTRACT

Objectives. Although Mexican Americans consume diets that may protect them against adverse health, dietary advantages may disappear with increased acculturation. This study examined whether the nutrient intake of second-generation Mexican-American women of childbearing age deteriorates compared with that of first-generation Mexican-American women and approximates that of White non-Hispanic women.

Methods. Data on the absolute and relative intake of eight nutrients were obtained from a 24-hour recall and compared among 475 first-generation and 898 second-generation Mexican-American women, and among 2326 White non-Hispanic women.

Results. Although first-generation Mexican-American women were of lower socioeconomic status than were second-generation or White non-Hispanic women, they had a higher average intake of protein; vitamins A, C, and folic acid; and calcium than the other two groups. Whereas the mean adequacy ratio of the eight nutrients studied was highest in first-generation Mexican women, it was lowest in their second-generation counterparts.

Conclusions. First-generation Mexican women stand a markedly lower risk of eating a poor diet than second-generation Mexican women, whose nutrient intake resembles that of White non-Hispanic women. (*Am J Public Health.* 1995;85:20–25)

Introduction

There is growing awareness that variations in dietary practices among ethnic groups may help to explain interethnic differences in morbidity and mortality. Previous research suggests that the dietary practices and nutrient intake of Mexican-American women may protect them against lung and breast cancer.[1–3] Furthermore, the finding that Mexican Americans have low rates of low birthweight despite their low income and education suggests an "epidemiological paradox," which could also be explained by dietary practices.[4,5]

Mexican Americans, who comprise 62.3% of all Hispanics, constitute the fastest growing minority group in the United States. This growth is attributable to higher fertility rates than those observed in other ethnic groups and sharp immigration increases, particularly in border states such as California. It has been shown that dietary behaviors are sensitive to cultural changes that occur with migration.[6] With acculturation, food choices begin to resemble those of White non-Hispanics; for example, whole-fat milk and corn tortillas are replaced by low-fat milk and bread, and alcohol and tobacco consumption increases.[6,7] These behaviors may be implicated in the worsening health status, such as increased rates of low birthweight, observed among the more acculturated Hispanics.[5] As yet, the effects of acculturation on nutrient intake have not been examined. However, such an examination is warranted, particularly among Mexican-origin women of childbearing age, given their high fertility rates and the impact of diet on pregnancy outcomes, milk production, and body weight.[8] Moreover, an understanding of how acculturation changes dietary intake may help us plan and implement more effective health promotion programs for culturally diverse populations.

In this paper, we use two National Center for Health Statistics (NCHS) surveys to test two hypotheses: (1) that the nutrient consumption of second-generation Mexican-American women deteriorates in comparison with that of first-generation Mexico-born women, and (2) that the nutrient intake of second-generation Mexican-American women approximates that of White non-Hispanic women. In addition, we identify risk factors for each ethnic group that contribute to their eating a potentially inadequate diet, and we discuss what these imply for policy and practice.

We chose to focus on protein, zinc, iron, folic acid, and calcium, not only because these nutrients are related to pregnancy outcome[8,9] but also because the literature indicates that American women tend to fall below the recommended dietary allowances of zinc, folic acid, and calcium.[10] Our examination of fat; cholesterol; vitamins A, C, and folic acid; and calcium reflects the relationship of these factors to pregnancy as well as to the development of chronic diseases, heart disease, various cancers, and osteoporosis.[9]

Methods

Sample

Data on Mexican Americans were obtained from the 1982–1984 Hispanic

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TABLE 1—Sociodemographic Characteristics of First- and Second-Generation Mexican-American Women of Childbearing Age from the HHANES and Non-Hispanic Whites from the NHANES II

	First-Generation Mexican Americans (n = 475)		Second-Generation Mexican Americans (n = 898)		White Non-Hispanics (n = 2326)	
	Weighted Mean or %	SE	Weighted Mean or %	SE	Weighted Mean or %	SE
			Weighted mean			
Age at interview, y	29.3[b]	0.48	27.2[a]	0.31	28.3[b]	0.19
Education	7.8[a]	0.18	11.3[b]	0.22	12.8[c]	0.074
Weight, kg	61.7	0.40	61.8	0.60	61.4	0.29
Height, cm	158.9[a]	0.32	158.9[a]	0.47	163.8[b]	0.17
Quetelet index	24.4[b]	0.18	24.5[b]	0.29	22.9[a]	0.12
Live births, n	2.3[c]	0.074	1.7[a]	0.12	1.4[b]	0.046
			Weighted proportion			
Poverty index: below 1.00	0.383[a]	0.034	0.282[b]	0.022	0.113[c]	0.010
Works at job or business	0.401[a]	0.017	0.501[b]	0.017	0.509[b]	0.013
Married	0.659[b]	0.022	0.509[a]	0.032	0.574[a]	0.014
Perceived health						
Excellent/very good	0.173[a]	0.010	0.424[b]	0.019	0.711[c]	0.013
Poor/fair/good	0.827		0.576		0.289	
Reproductive status						
Preconceptional	0.778[a]	0.022	0.834[a]	0.010	0.898[b]	0.006
Pregnant	0.074	0.017	0.051	0.011	0.032	0.005
Lactating	0.029	0.005	0.021	0.006	0.016	0.004
Postconceptional	0.119	0.023	0.094	0.011	0.054	0.004
Smokes	0.188[a]	0.009	0.208[a]	0.014	0.350[b]	0.011

[a,b,c]Groups sharing a common superscript are not significantly different from each other at α = .05.

Health and Nutrition Examination Survey (HHANES); that on White non-Hispanics were obtained from the 1976–1980 National Health and Nutrition Examination Survey (NHANES II). Detailed descriptions of sampling procedures and response rates have been published elsewhere.[11,12] The HHANES contains representative samples of three Hispanic subpopulations, including 9445 Mexican Americans living in the Southwest. All adult women of Mexican birth or origin and aged 16 to 44 years were initially included in this study if they were interviewed in the household and examined in a mobile examination unit. Out of 1807 participants, 434 (24%) were excluded because they lacked information on generational/acculturation status, dietary intake, or reproductive status, which were the key variables studied. Current reproductive status was of interest because it relates to variations in nutrient requirements. The final sample consisted of 1373 Mexican-American women of childbearing age. Compared with the excluded survey participants, women included in this analytic sample were poorer and less likely to be married, had less education, and had higher gravidity and lower body mass index. On average, they also consumed more vitamin A and folate than the excluded group.

The NHANES II included 10 580 White non-Hispanic women, 2360 of whom were aged 16 to 44. Of these, 2326 had information on dietary consumption and reproductive status and thus were included in the sample. These individuals were not significantly different from the excluded group in their sociodemographic characteristics or dietary intake except that they consumed significantly more vitamins A and E.

Variables, Data Collection Procedures, and Data Analysis Techniques

Dietary data were obtained from a single 24-hour recall (using a standard technique) of the types and amounts of all foods consumed on the previous day. Besides energy, the nutrients studied include protein; calcium; iron; zinc; and vitamins A, C, E, and folic acid. In general, nutrient values were based on the NCHS nutrient composition databases. However, since these values were not available from NHANES II for folic acid, vitamin E, and zinc, they were obtained from the National Cancer Institute.

Dietary intake of each nutrient was examined both as mean absolute intake and as a mean percentage of intake relative to the recommended dietary allowances (RDAs)[13] using a nutrient adequacy ratio. The nutrient adequacy ratio, which was truncated at 100% to avoid the possibility that individuals with very high intake would compensate for those with low intake, is calculated as a woman's reported intake of each nutrient divided by the recommended dietary allowance specific to that woman's reproductive state.

We also examined the mean adequacy ratio score of protein and the seven vitamins and minerals studied. Briefly, this ratio, which is a quantitative measure of dietary quality that has been described elsewhere,[14] is the averaged sum of the nutrient adequacy ratios of the eight nutrients. A diet that provides 100% or more of the recommended dietary allowances would be scored at 100%. Women who reported consuming less than 50% of the recommended dietary allowances for the eight nutrients on the previous day were classified as belonging in a "low intake group." This very low cutoff was selected to reflect both the increased variability in the estimate of individual intake inherent in a single 24-hour recall and the fact that individual intakes below the recommended dietary allowance do not necessarily reflect undernutrition.[15,16] The objective was to compare interethnic differences in the proportion of low-intake individuals rather than

TABLE 2—Mean Dietary Intake of Selected Nutrients, by Ethnicity and Generational Status for Mexican American Women

	First-Generation Mexican Americans (n = 475)		Second-Generation Mexican Americans (n = 898)		White Non-Hispanics (n = 2326)	
	Mean	SE	Mean	SE	Mean	SE
Energy, kcal	1722.2	36.5	1637.3	28.7	1653.9	17.1
Protein, g	74.3^{c}	1.7	68.3^{b}	1.6	63.9^{a}	0.84
Carbohydrate, g	205.2	4.0	184.8^{a}	2.9	186.8^{a}	2.1
Total fat, g	68.6	2.2	68.7	1.9	67.6	0.92
% of calories as fat	35.3^{ab}	0.5	36.8^{c}	0.44	36.1^{ab}	0.20
Cholesterol, mg	352.5^{c}	8.7	305.5^{b}	11.5	267.1^{a}	5.1
Vitamin A, IU	6347.4^{b}	432.2	4240.8^{a}	228.0	4596.5^{a}	179.8
Vitamin C, mg	104.1^{b}	4.7	84.1^{a}	3.9	87.9^{a}	2.5
Vitamin E	7.9	0.5	7.3	0.3	7.5	0.2
Folic acid, µg	266.5^{b}	12.2	205.5^{a}	5.2	200.2^{a}	3.9
Calcium, mg	778.8^{b}	23.8	644.5^{a}	32.5	677.7^{a}	16.3
Iron, mg	11.7^{b}	0.3	10.6^{a}	0.2	10.9^{ab}	0.2
Zinc, mg	11.1^{b}	0.3	10.6^{ab}	0.7	10.2^{a}	0.2

[a,b,c]Groups sharing a common superscript are not significantly different from each other at α = .05.

TABLE 3—Mean Nutrient Adequacy Ratios (NARs)[a] and Mean Adequacy Ratios Scores (MARs),[b] by Ethnic Status

	First-Generation Mexican Americans (n = 475)		Second-Generation Mexican Americans (n = 898)		White Non-Hispanics (n = 2326)	
	Mean	SE	Mean	SE	Mean	SE
NAR protein	0.92^{d}	0.009	0.88^{c}	0.006	0.89^{c}	0.004
NAR vitamin A	0.71^{e}	0.017	0.61^{c}	0.015	0.66^{d}	0.008
NAR vitamin C	0.78^{d}	0.014	0.69^{c}	0.012	0.71^{c}	0.008
NAR vitamin E	0.70	0.020	0.68	0.012	0.70	0.007
NAR folic acid	0.82^{d}	0.020	0.75^{c}	0.010	0.77^{c}	0.006
NAR calcium	0.70^{e}	0.024	0.57^{c}	0.014	0.61^{d}	0.009
NAR iron	0.66^{d}	0.017	0.63^{c}	0.005	0.65^{cd}	0.006
NAR zinc	0.73^{d}	0.009	0.66^{c}	0.010	0.67^{c}	0.007
MAR, eight nutrients	0.75^{e}	0.012	0.68^{c}	0.008	0.71^{d}	0.005

[a]Mean percent of intake relative to the Recommended Dietary Allowances for that intake, specific to the woman's reproductive state. The NARs were truncated at 1.0.
[b]Averaged sum of the NARs of the eight nutrients.
[c,d,e]Groups sharing a common superscript are not significantly different from each other at α = .05.

estimate the absolute proportion of each ethnic group that had low intakes.

To study the effects of acculturation on dietary intake, the sample was stratified by generational status, which was determined by the birthplace of the subjects and their parents. To allow for sufficient sample size, the original three-generation coding given in the data tape was collapsed into two groups: first generation, defined as subjects born in Mexico whose parents were born outside the United States, and second generation, defined as subjects born in the United States who had at least one parent born in Mexico or of Mexican descent. Other variables included sociodemographic characteristics such as age at interview, number of years of education, poverty index,[12] employment status, marital status, and number of live births, in addition to weight in kilograms, height in centimeters, self-assessed health status, and reproductive status. This last variable classified women into four groups: preconceptional; currently pregnant; currently lactating; and postconceptional—that is, currently not pregnant or lactating and within 1 year of delivery.

Weighted means or proportions were computed on the sociodemographic variables, absolute dietary intakes, and nutrient adequacy ratios for each of the three groups. Standard errors adjusted for complex design effects (due to sample clustering) were also obtained for these estimates using the Super Carp program.[17] Since the above statistics were obtained from two different study designs (and thus involved different strata, primary sampling units [PSUs], weights, etc.), the complex design effect adjustments were performed separately for Mexican Americans and White non-Hispanics. Differences among the three groups were evaluated by performing independent sample t tests with 8 degrees of freedom. These statistical tests are likely to be "conservative" because, if this truly were a single survey, it would have resulted in many more degrees of freedom; however, this approach was suggested by the NCHS since the HHANES data set had only eight strata (with two PSU/strata). It was also desirable to use a conservative approach, considering the many statistical tests performed.

Logistic regression was used to examine the predictors of low dietary intake in the three groups. Separate regression models allowed for independent determinations of the predictors of low dietary intake for Mexican Americans and White non-Hispanics. Interaction terms between generational status and other sociodemographic characteristics were tested in the model for Mexican Americans, but no terms were found to be statistically significant. All estimates were weighted using the "examined weights" provided in each survey.[18] The impact of complex design effects on these logistic analyses are discussed further on.

Results

The sociodemographic profiles differed markedly among first- and second-generation Mexican-American women and White non-Hispanic women (Table 1). First-generation Mexican Americans were the least educated, the poorest, the least likely to work for earnings, the most likely to be married, and the least likely to perceive their health as excellent or very good. They also had the highest number of live births. Second-generation Mexican-American women were the youngest (mean of 27.2 years compared with 29.3 years for first-generation Mexican Americans and 28.3 for White non-Hispanics) and had a higher proportion of unmarried women. In contrast, White non-Hispanic women were significantly more educated, less likely to be poor, more likely to perceive their health as excellent or very good, but also more likely to smoke than the two generations of Mexican-American women. Furthermore, compared with Mexican Americans, non-Hispanic Whites were taller, had a lighter body mass, and were less likely to have been pregnant, recovering from pregnancy, or lactating within the last 12 months prior to the interview.

As shown in Table 2, first-generation Mexican-American women, on average, consumed, significantly more protein, carbohydrates, cholesterol, vitamins A and C, folic acid, and calcium than second-generation Mexican-American or White non-Hispanic women. Second-generation Mexican-American women resembled White non-Hispanic women with respect to their average intake of carbohydrates, vitamins A and C, folic acid, calcium, and iron. Of the three groups, White non-Hispanic women, on average, consumed the least amount of protein, carbohydrates, and cholesterol. No marked differences were found in the average intake of calories, vitamin E, or total fat across the three groups.

Differences in the quality of the diets in each group were assessed by comparing the proportion of average intake of each nutrient relative to the recommended dietary allowance for that nutrient considering the woman's reproductive state (the nutrient adequacy ratio). For example, Table 3 shows that each group consumed approximately the same proportion of the recommended dietary allowance for vitamin E (70%). However, first-generation Mexican-American women had higher nutrient adequacy ratios than second-generation Mexican-American or White non-Hispanic women for protein and all the nutrients except iron; for iron, the ratio was similar to that of White non-Hispanics. For several nutrients, the nutrient adequacy ratio of second-generation Mexican Americans was not different from that of Whites. However, US-born Mexican Americans were observed to be most inadequate in their intake of vitamin A and calcium, while the mean adequacy ratio of all eight nutrients was highest for the first-generation Mexican Americans.

Women at risk for poor dietary intake were defined as those consuming, on average, less than 50% of the recommended dietary allowances for the eight selected nutrients on the previous day. Table 4 identifies the predictors of a poor dietary intake in Mexican-American and White non-Hispanic women. The results show that after adjusting for smoking, pregnancy status, and other sociodemographic factors, second-generation women were significantly more likely to be at risk for a poor diet than first-generation women. In addition, women who negatively perceived their health status were more likely to be at risk for poor intake. Adjusting for energy (kilo calories) did not significantly alter these results.

TABLE 4—Predictors of Low Dietary Intake[a] for Mexican American Women (n = 1092) and White Non-Hispanic Women (n = 1893)

	Mexican Americans		White Non-Hispanics	
Predictors	Adjusted Odds Ratios	95% Confidence Interval	Adjusted Odds Ratios	95% Confidence Interval
First generation vs second generation	0.36	0.23, 0.55	...	...
Excellent or good health	0.66	0.46, 0.94	0.75	0.56, 1.00
Education	0.96[b]	0.90, 1.01	0.89[b]	0.84, 0.95
Poverty index (continuous)	1.05[b]	0.92, 1.20	0.85[b]	0.75, 0.95
Age	0.99[b]	0.96, 1.02	0.97[b]	0.95, 0.99
Height, cm	1.00[b]	0.98, 1.03	0.96[b]	0.94, 0.98
Currently smoking	1.15	0.79, 1.67	1.69	1.29, 2.20
Body mass index	1.01[b]	0.98, 1.05	1.03[b]	1.00, 1.06
Live births, no.	1.05[b]	0.93, 1.18	1.02[b]	0.91, 1.13
Pregnant or lactating	0.97	0.54, 1.75	0.72	0.37, 1.41
Employed at job or business	1.08	0.77, 1.51	1.02	0.77, 1.34

[a]Defined as having consumed an average of less than 50% of the Recommended Dietary Allowances for the eight nutrients on the previous day.
[b]Per 1 unit of change in the predictor variable.

To determine whether these regression estimates would remain statistically significant considering the design effects (due to sample clustering) of the HHANES,[18] we took the following steps:

1. We computed the single design effect for each of the variables listed in Tables 1 to 3 for Mexican Americans and found a mean design effect of 1.47 (range: 0.7 to 2.9).

2. For those findings that were statistically significant, we determined a "worst-case scenario"—that is, the value that the complex design effect would need to take for the estimate to no longer be statistically significant.

3. We compared the worst-case scenario findings with the observed design effects in step 1 to evaluate whether these "significant results" were likely to remain significant. We determined that, for the effect of generational status on low dietary intake to become nonsignificant, it would require a complex design effect of 5.81. Since this far exceeds the maximum value observed (2.9), we conclude that this result remains statistically significant, adjusted for complex design effects. On the other hand, for the effect of health status on poor intake to become nonsignificant, it would require a design effect of 1.4; thus, after adjusting for complex design effect, this result might no longer be statistically significant.

For White non-Hispanic women, the results of the regression analysis show that poverty, youth, a low education, a low stature, a high body mass index, smoking, and a fair or poor health status increase the risk for a poor diet (Table 4). The results were similar when energy was included in the model. The design effects of the NHANES sampling approach were evaluated. Considering that the design effects for White non-Hispanics ranged from 0.3 to 2.6 (based on the variables listed in Tables 1 to 3), smoking, education, and height would require design effects greater than 3.1. Therefore, we conclude the statistical significance remains after adjusting for complex design effects. Since age and poverty index would require design effects of 1.7 and 2.0, respectively, these are most likely unaffected by complex design effects. Body mass and perceived health status, however, would require design effects of only less than 1.2 to become nonstatistically significant. Adjusting for energy consumption did not alter the results for the two ethnic groups.

We determined which relationships were significantly different among the three groups of women by testing a model that included all the groups by predictor variable interaction terms. Only interaction terms involving height, poverty, and education were found to be statistically significant. Specifically, height and education were important predictors of diet quality for White non-Hispanics but not for Mexican Americans. Low income was positively associated with inadequate diet in non-Hispanics and negatively associated with it in first-generation Mexican Americans. For second-generation Mexican Americans, there was no relationship between income and diet quality.

Discussion

This report, comparing two population-based NCHS surveys, indicates that, despite having a much lower socioeconomic status, first-generation Mexican-American women have a healthier nutrient intake than second-generation Mexican-American women or White non-Hispanic women of childbearing age. First-generation women were observed to have a higher average intake of protein, vitamins (A, C, and folic acid), and calcium relative to the recommended dietary allowance standards than the two other comparison groups. They also had the highest mean adequacy ratios for the eight nutrients studied. On this basis, we conclude that less acculturated women consume more protein, carbohydrates, vitamins, and calcium.

As Mexican-origin women move from the first to the second generation, the quality of their diet deteriorates and approximates that of White non-Hispanic women. Second-generation Mexican-American women stand a much higher risk of eating a poor diet than first-generation women, even after energy consumption, smoking, and other sociodemographic factors are controlled. Furthermore, relative to recommended dietary allowance standards, second-generation Mexican-American women have a much lower intake of calcium and vitamin A than the other two groups.

Although there is no evidence of substantial differences in nutrient requirements among various ethnic groups,[8] this study corroborates previous evidence of ethnic differences in food choices and, consequently, in the mean intake of certain nutrients.[19-21] Moreover, even though previous studies indicate a significant vitamin A deficiency in Mexican Americans, this study shows this not to be the case in first-generation women.[20] However, Mexican-American women in both generations reported a higher consumption of cholesterol; this is a potential risk factor for cardiovascular disease,[8] although so far there is little evidence that the incidence of cardiovascular mortality is higher in Mexican Americans than it is in Whites.[7]

Net of other factors, the multivariate regression models indicate that the cultural determinant implied in generational status is a strong predictor of low dietary intake for Mexican-American women, whereas a structural determinant such as education is a predictor for non-Hispanic Whites only. Income exerted no effect on the diet quality of second-generation Mexican Americans, but it had an opposite effect on first-generation Mexican Americans compared with White non-Hispanics. For first-generation Mexican Americans, food choices deteriorated as income increased, perhaps because women adhered less to a traditional Mexican diet. Further studies are needed to determine whether the effects of economic factors on diet vary by ethnicity and acculturation. Our finding that first-generation women have higher nutrient intakes, presumably attributable to a traditional diet, could hold the key to designing interventions that protect traditional dietary practices.

Since this study was based on a single 24-hour recall, the estimates that were obtained are less reliable as descriptors of individuals' usual intake as would be estimates generated by a food frequency assessment or multiple dietary recalls.[15,16] This is because of normal day-to-day variability in dietary practices. Therefore, we created our dietary intake groups knowing that their classification based on such a recall would likely cause some individuals to be misclassified and would thus probably obscure differences between groups even if such differences do exist.[22] Accordingly, our findings are at best preliminary. However, the strong differences we found in our logistic regression results should stimulate future studies to confirm these findings. Such studies should use more appropriate ways to classify the dietary practices of individuals of different ethnic groups and to control random error. In addition, the comparison of the three groups for nutritional adequacy assumes that the probability of misclassification is equal in all three groups. But bias could conceivably arise owing to differences in recall[23] and misclassification may not always be nondifferential,[24] further cautioning us to treat these findings as preliminary.

A related issue is that the nutritional databases used for the two surveys were not identical because food composition changed over time, possibly contributing somewhat to the observed differences in intake. Furthermore, our results are not representative of the entire Mexican-American population living in the Southwest since 24% of the subjects in the HHANES were excluded because of missing data. But even considering these limitations, the findings of strong differences in dietary intake between first- and second-generation women should not be ignored. Again, we believe these findings should stimulate studies to measure directly the influence of acculturation on dietary practices.

Assuming that our preliminary findings are true, another important conclusion that can be drawn from this study relates to the epidemiological paradox. In a previous study of generational differences in low birthweight among Mexican-origin women in the HHANES, Guendelman et al. found that first-generation women had a much lower rate of low birthweight (3.9) than second-generation women (6.1).[5] Such differences in reproductive outcome could be partly accounted for by the marked differences in dietary intake and smoking that we observed between the two generations of Mexican-American women in this study. Unfortunately, the HHANES did not follow women through their pregnancies, so we were unable to examine directly the relationship between maternal diet and infant birthweight. Future studies of generational differences in dietary intake should examine the possible effects of dietary intake on reproductive outcomes. Studies of dietary usage across different reproductive stages may help us both to determine whether the quality of women's diets change and to identify which factors contribute to poor dietary intake at each stage. Furthermore, longitudinal studies of dietary intake that assess women over a longer period of time are needed to monitor changes and obtain reliable estimates. The assessment of the dietary practices of the Mexican-American population may reveal important protective behaviors associated with improved health outcomes. □

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