Underserved Populations; Nutrition

Household Food Insecurity and Dietary Intake Among Mexican-American Women Participating in Federal Food Assistance Programs

Angela Hilmers, MD, MS; Tzu-An Chen, PhD; Karen W. Cullen, RD, DrPH

Abstract

Purpose. *To explore the association between food insecurity and dietary intake among Mexican-American women after controlling for sociocultural and economic factors including participation in federal food assistance programs.*

Design. *Cross-sectional.*

Setting. *Three cities in Texas.*

Subjects. *Seven hundred seven Mexican-American women (26–44 years).*

Measures. *Demographics, anthropometrics, acculturation, and food security status were obtained using validated measures. Dietary intake was assessed by a 24-hour dietary food record.*

Analysis. *Logistic regression was used to examine the association between individual and household characteristics on food security status. One-way analysis of covariance tested the association between food security status and dietary intake after adjusting for socio-demographic variables, acculturation, body mass index, participation in federal food assistance programs, and energy intake.*

Results. *About 77% of food-insecure women participated in at least one federal food assistance program. Each additional child in the household increased the odds of being food insecure by 25%. A higher proportion of obese women was found in the food-insecure group. No significant differences in dietary intake were found by food security status.*

Conclusion. *Food insecurity did not negatively influence dietary intake independently of women's participation in federal food assistance programs. Food security did not ensure consumption of nutritionally adequate foods. Educational and food assistance programs need to be optimized to facilitate enrollment and improve the nutritional status of this ethnic group, food secure or not. (Am J Health Promot 2014;28[6]:e146–e154.)*

Key Words: Food Insecurity, Mexican-American Women, Dietary Intake, Federal Food Assistance Programs, Prevention Research. Manuscript format: research; Research purpose: relationship testing; Study design: nonexperimental; Outcome measure: behavioral; Setting: local community; Health focus: nutrition; Strategy: incentives; Target population age: adults; Target population circumstances: education/income level, geographic location, race/ethnicity

PURPOSE

Food insecurity exists when there is uncertainty about future availability of nutritionally adequate and safe food for an active and healthy life.[1,2] Its prevalence in the United States has increased in the past decade for all major race and ethnic groups. There was a slight decline in 2005, then a steady increase to its current level of 14.6% in 2008, which has remained unchanged since.[3] Rates were below the national average for households with married couples with children (13.9%), households with no children (9.9%), households headed by white non-Hispanics (11.4%) or multiple races (12.7%), and households with incomes above 185% of the poverty line (7.0%).[3] In contrast, 26.2% of Hispanic households and 35.1% of Hispanic households with children headed by females experienced food insecurity, rates that are significantly greater than the national average.[3] Because food insecurity often results from financial resources insufficient to acquire nutritionally adequate food,[4] Hispanic women living in poverty may be at greater risk for dietary deficien-

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cies and adverse health outcomes. In addition, individual and household characteristics such as acculturation[5] and household composition[3] may have cumulative impacts on the food security status and dietary quality of this population. Given that dietary intake among Hispanic women is influenced by a number of social, cultural, and economic factors, the relationship between food insecurity and dietary adequacy should be assessed while taking into account the potential confounders.

Hispanic women living in households with incomes below the poverty line are more likely to experience food insecurity.[6,7] Although socioeconomic status is its most common risk factor,[4] individual characteristics such as acculturation have also been associated with food insecurity and low dietary quality among Hispanics.[8] Acculturation is a multidimensional and multidirectional process during which immigrants and their descendants learn, adopt, and modify behaviors, beliefs, and values.[9,10] Acculturation has been associated with a number of unfavorable changes in health behaviors including a decline in dietary quality.[11–13] Highly acculturated Hispanic women were more likely to consume fewer servings of fruits and vegetables and reported greater intakes of saturated fat per day compared with those with lower acculturation patterns.[14–16] Greater acculturation levels were also related to higher consumption of sugar and sugar-sweetened beverages, added fats, and sodium.[10,14] Socioeconomic status seemed to modify the association between acculturation and nutrition-related outcomes.[17] Low socioeconomic status led to less healthful food intake, restricted access to environments that enabled healthier lifestyle choices, and higher obesity rates.[18] Therefore, lower acculturation might be protective among women living in poverty through the retention of their traditional healthier food intake patterns and adherence to social norms. On the other hand, higher socioeconomic status may result in an increase in purchasing power, but without educational and social advancements, Hispanic women may be more likely to engage in American sociocultural practices, decrease their dietary quality, and experience higher mortality rates when compared to their less-acculturated counterparts.[19]

Measures of acculturation such as second-language proficiency have been employed to examine migration-related changes in diet and other lifestyle habits.[11] Limited English proficiency has been linked to a greater risk of food insecurity.[20] Food insecurity is also impacted by household composition.[3] Households with children and households headed by single women are vulnerable groups likely to experience very low food security in which reductions in food intake and disruption in their normal eating patterns occur.[3]

Coping strategies such as participation in nutrition assistance programs may reduce the severity of food insecurity and its impact on nutrition.[21–24] The Supplemental Nutrition Assistance Program (SNAP), formerly called the Food Stamp Program, is one of the three largest federal nutrition assistance programs in the United States.[25] About 51% of eligible Hispanic households participate in this program that aims to reduce the severity of food insecurity by providing dietary support and education to low-income families.[25] These noncash benefits are not included in the poverty calculation, which is based solely on household composition and income.[26,27] The Special Supplemental Nutrition Program for Women, Infants, and Children and the Head Start Program serve about 41.2% and 58.55% of primarily low-income Hispanic families respectively.[28,29] One important component of these programs is the provision of health and nutrition education classes to promote healthy eating and improve families' ability to make healthier choices. Participation of Hispanic women in these and other federal food programs must be considered when evaluating the impact of food insecurity on dietary intake, as these programs may contribute to changes in household dietary intake and behavior.[27,30]

Despite growing consensus about the negative association between food insecurity and dietary quality, there is limited evidence for Hispanic women. Previous studies investigating the effect of food insecurity on women's diets did not report results by ethnicity,[31] or their samples did not include Hispanic women.[32,33] The studies also differed by the type of measure used to assess food insecurity[31] and the micronutrient deficiencies found.[31–33] Some studies did not include food groups as part of the dietary assessment[31] nor did they consider acculturation as an important predictor of dietary quality.[31–33]

Mexican-Americans represent 63% of the Hispanic population in the United States.[34] In this study, we examined the association between household food insecurity and total dietary intake (food groups and nutrients) among Mexican-American women while controlling for participation in federal food assistance programs, acculturation, body mass index (BMI), and household income and composition. In addition, we explored the individual and household characteristics likely to be associated with food insecurity in this population. Given previous evidence of an inverse relationship between food insecurity and dietary and nutritional quality, we hypothesized that food-insecure Mexican-American females would consume a much less healthy diet. Diet quality was characterized by compliance with dietary recommendations and guidelines for different food categories (i.e., milk/dairy, whole-grain products, vegetables, and fruit) and diet in general. A diet high in nutrient-poor foods, such as sugar-sweetened beverages, and low in nutrients essential for women of childbearing age (e.g., calcium, folate, Vitamin D) was considered of poor quality.

METHODS

Design

This cross-sectional study involved baseline data from Mexican-American women participating in the Texas Expanded Food and Nutrition Education Program (EFNEP). Ethical approval was obtained from the Institutional Review Boards at Baylor College of Medicine, Houston, Texas, and Texas A&M University, College Station, Texas. All participants provided informed written consent.

Sample

Participants were 707 nonpregnant, nonbreastfeeding Mexican-American women who were part of a study that evaluated a modified curriculum incorporated into the EFNEP.[35] The EFNEP is a program that assists low-income families in acquiring the knowledge and skills necessary to maintain a nutritionally balanced diet.[36] Participants were recruited from EFNEP sites in three Texas cities: Houston, Austin, and San Antonio.[35] Details of the evaluation study have been described elsewhere.[35] The inclusion criteria were the following: (1) self-reported Hispanic or Latino ethnicity; (2) aged 14 to 45 years; (3) English or Spanish speaking; (4) nonpregnant; (5) nonbreastfeeding; (6) complete information on food security status.

Measures

Demographic and Socioeconomic Characteristics. Participants completed a demographic and information survey available in English and Spanish. Spanish-translated surveys were revised for accuracy, cultural suitability, and clarity by trained bilingual EFNEP paraprofessionals. Bilingual trained data collectors administered the surveys.

Age, last month's income, and current participation in federal food assistance programs were recorded. The number of children and a variable indicating whether the household was headed by a single adult were used in describing household composition. Participant's preferred language to answer the survey was used as a proxy measure of acculturation. The selection of either English or Spanish was interpreted as dominance and proficiency with that language. Based on their selection, language preference was then divided into three categories: Spanish only (low acculturation), Spanish and English, and English only (high acculturation). Language remains a strong connection to Hispanic heritage and values and constitutes an important part of the phenomenon of acculturation.[36] Language captures the changing degree of functional integration into the mainstream culture and is less difficult to measure than behavioral components such as values and norms.[37]

Anthropometric Measures. Height and weight were obtained by trained study staff following a standard protocol. Height without shoes was measured twice to the nearest .1 cm using a stadiometer (Shorr Height Measuring Board; Olney, Maryland, 2008). Body weight with light clothing and without shoes was measured twice to the nearest .1 kg using an electronic, self-calibrating digital scale (Seca 770 Model scale; Vogel and Halke, Hamburg, Germany, 2008). The average value of the two measurements of height (cm) and the average value of the two measurements of weight (kg) were used to calculate women's BMI using the formula weight (kg)/height (m^2). Following Centers for Disease Control and Prevention guidelines, overweight was defined as a BMI of 25.0 to 29.9 and obesity was defined as a BMI of 30.0 or higher.[38]

Food Security Status. The abbreviated six-item form of the U.S. Department of Agriculture (USDA) Core Food Security Module was administered to assess household food security status.[39] The six-item form uses a subset of the standard 18-item survey and has shown adequate reliability.[31] The abbreviated scale has been shown to correctly classify households across three levels of food security status (food secure, low food secure and very low food secure). This applies to households both with and without children. Furthermore, the prevalence estimates of food insecurity and very low food security are only minimally biased relative to those based on 18-item or 10-item modules.[40] In this study, the abbreviated form was employed given the large sample size and to minimize respondent burden. Participants were categorized into three levels of food security based on the number of affirmative responses according to USDA guidelines[40]: food secure (0–1), low food secure (2–4), and very low food secure (5–6). The latter two groups were combined to form the food-insecure group.

Dietary Intake. Dietary intake was assessed by one 24-hour dietary food record developed by the EFNEP to perform dietary assessments of clients participating in nutrition education programs in Texas.[41] Research staff members were trained in each city to administer the 24-hour recall in a group setting. Significant correlations have been observed between a group-administered recall and observational data, suggesting that the group method is as effective in assessing dietary intake as the individual administered recalls.[41] Each consenting participant completed the 24-hour dietary record as part of their normal EFNEP class protocol. All dietary data were analyzed using the Nutrition Data System for Research software version 2006 (Nutrition Coordinating Center, University of Minnesota, Minneapolis, Minnesota).

Analysis

Chi-square tests were conducted to examine differences in participants' characteristics by food security status. Logistic regression analysis was used to investigate the association between the number of adults and number of children in the household, last month's total household income, acculturation, and BMI on food security status. One-way analysis of covariance (ANCOVA) was employed to test whether household food security status was associated with dietary intake. Socio-demographic variables, acculturation, BMI, participation in federal food assistance programs, and energy intake served as the covariates. Preliminary analyses were conducted to test the underlying assumption of normality and homogeneity of regression slopes. The latter was examined by testing the increment in R2 , the percent of variance in the dependent variable explained collectively by all of the independent variables, by adding the interaction terms between the group and the covariates. There was a trivial departure from normality for some outcome variables such as desserts, snack chips, and vitamin B12. However, this violation has only a slight effect on the type I error rate.[42] Furthermore, ANCOVA is robust with respect to violations of the normality assumption.[43] No violation of homogeneity of regression slopes was found. Adjustments were made for energy intake by adding it as one of the

Table 1
Participant Characteristics by Food Security Status†

Characteristics	Food Secure (n = 381)	Food Insecure (n = 326)
Age, mean (SD), y	35.10 ± 9.38	35.63 ± 9.17
No. of adults in household, No. (%)		
1	20 (5.75)	29 (10.00)
2	242 (69.54)	187 (64.48)
3+	86 (24.71)	74 (25.52)
No. of children in household, No. (%)*		
1	83 (21.78)	65 (19.94)
2	153 (40.16)	97 (29.75)
3+	145 (38.06)	164 (50.31)
Last month income, No. (%)*		
≤$1000	136 (35.70)	143 (43.87)
>$1000–2000	188 (49.34)	161 (49.39)
>$2000	57 (14.96)	22 (6.75)
Acculturation, No. (%)		
Spanish only	153 (54.55)	109 (61.13)
English only	186 (44.87)	173 (38.52)
Spanish and English	2 (0.59)	1 (0.35)
Participation in at least one FFAP, No. (%)		
Yes	276 (72.44)	251 (76.99)
No	105 (27.56)	75 (23.01)
BMI, No. (%)*		
Normal	76 (20.00)	39 (12.04)
Overweight	128 (33.68)	103 (31.79)
Obese	176 (46.32)	182 (56.17)

† Cells may vary because of missing values. FFAP indicates federal food assistance program (Special Supplemental Nutrition Program for Women, Infants, and Children; Supplemental Nutrition Assistance Program; Head Start; Temporary Assistance for Needy Families; Food Distribution Program on Indian Reservations; child nutrition programs); and BMI, body mass index.
* $p < 0.05$.

covariates in the model to correct for underreporting, as suggested by other studies using self-reported measures of dietary intake.[44,45] Separate models were used for each dependent variable (food groups and nutrients), and their adjusted means and standard errors were calculated for food-secure and food-insecure groups. Clinical significance was defined as the smallest difference in dietary values that would lead to clinically important effects, either beneficial or harmful. Alpha was set at <.05. Analysis was performed with Statistical Analysis Systems (version 9.3, 2011; SAS Institute Inc., Cary, North Carolina).

RESULTS

Sample Characteristics

A total of 737 nonpregnant, nonbreastfeeding Mexican-American women were eligible from the evaluation study. Thirty women were excluded because of missing information on their food security status, leaving a sample of 707 women (Table 1). The proportion of women who did not participate in at least one federal food assistance program tended to be higher in excluded subjects ($p < .0001$). Participants' mean age was 35.19 years (SD = ±9.15). The mean BMI of women in this study was 31.61 (SD = ±7.53) and 84% were overweight or obese. Most women lived in households with two adults (67.24%) and with three or more children (43.71%). The monthly income of about half of the participants ranged between $1000 and $2000 (49.36%). A greater proportion of food-secure women presented higher levels of acculturation compared to food-insecure women (44.87% vs. 38.52%); however, differences were not statistically significant.

About 46% of women were food insecure, and within this group, 77% participated in federal food assistance programs. When comparing participation by food security status, the difference was not statistically significant ($\chi^2 = 1.91$, $p = .19$). A different pattern was observed when examining food security status by SNAP participation only. A higher proportion of SNAP participants were food insecure compared to nonparticipants (57.95% vs. 41.84%, $\chi^2 = 13.44$, $p < .001$, data not shown). Food-insecure women had more children (≥3) and lower incomes than food-secure women ($\chi^2 = 11.69$, $p = .003$ and $\chi^2 = 13.57$, $p = .001$, respectively). Food security status was also significantly associated with BMI ($\chi^2 = 10.32$, $p = .005$). There were more overweight or obese women in the food-insecure group compared to the food-secure group.

Food Security Status

Results of the conditional logistic regression model (Table 2) showed that the number of children in the household (odds ratio [OR]: 1.25; 95% confidence interval [CI]: 1.06–1.47; $p < .01$) and the last month's income (OR: .9995; 95% CI: .9993–.9998; $p < .0001$) were significantly associated with food security status. Holding other variables fixed, each additional child in the household increased the odds of being food insecure by 24.57%. Other socio-demographic variables and BMI did not predict food security status.

Food Insecurity and Dietary Intake

The results of ANCOVA, the observed and adjusted means, along with the standard errors are shown in Table 3. After controlling for socio-demographic characteristics, acculturation, BMI, total energy intake, and participation in federal food assistance programs, no significant differences by food group were found between food-secure and food-insecure women. Energy intake was well below that required to support a normal weight; this trend was found in both the food-secure and food-insecure groups. For nutrients, food-insecure women consumed on average 27.59 μg less folate than their food-secure counterparts. In all other macronutrient and micronutrient categories, including total energy, there were no differences. Both groups reported consuming di-

Table 2
Logistic Regression Analysis Predicting Food Insecurity†

	Odds Ratio	χ^2	95% CI	*p*
Number of adults	1.06735	0.5373	0.89664–1.27056	0.4636
Number of children	1.24572	7.0184	1.05883–1.46559	0.0081*
Last month income	0.99953	16.2481	0.99931–0.99976	<0.0001*
Acculturation	0.84516	3.1376	0.70162–1.01808	0.0765
BMI group: normal weight vs. obese	0.63483	3.7776	0.37479–1.07530	0.1513
BMI group: overweight vs. obese	0.74719		0.50365–1.10848	

† CI indicates confidence interval; and BMI, body mass index.
* $p < 0.05$.

ets containing less than the recommended daily amounts of fiber; vitamins A, C, and D; folate; calcium; and dairy products, but consumed sufficient vitamin B12 and iron. Both groups consumed higher than recommended amounts of sodium and saturated fat.

Table 3
Dietary Intake by Food Security Status†

Dietary Intake	Food Secure	Food Insecure	Current Recommendations‡
Food groups			
Milk, oz	4.84 ± 0.37	4.99 ± 0.42	16–24
Fruit, servings/d	0.77 ± 0.07	0.82 ± 0.08	1.5§
Juice 100%, oz	0.48 ± 0.06	0.39 ± 0.07	
Whole grain, oz	1.63 ± 0.12	1.49 ± 0.14	3
Desserts, servings/d	0.37 ± 0.05	0.40 ± 0.05	—
Snack chips, servings/d	0.10 ± 0.03	0.04 ± 0.03	—
Sweetened beverages, oz‖	8.41 ± 0.69	9.01 ± 0.79	—
Regular vegetables, servings/d	1.81 ± 0.10	1.72 ± 0.11	2–2.5
Nutrients			
Energy, kcal¶	1543.17 ± 35.86	1508.66 ± 40.95	1800–2200
Calories from fat, %¶	32.22 ± 0.59	31.02 ± 0.67	20–30
Calories from saturated fatty acids, %	11.04 ± 0.24	10.68 ± 0.27	<10
Total dietary fiber, g	15.12 ± 0.45	15.06 ± 0.51	25
Vitamin A, μg/d#	562.91 ± 62.67	549.11 ± 71.49	700
Vitamin C, mg/d	69.92 ± 4.10	69.31 ± 4.67	75
Vitamin D, μg/d	3.33 ± 0.16	3.04 ± 0.19	15
Total folate, μg/d*	355.97 ± 9.39	328.38 ± 10.72	400
Vitamin B-12, μg/d	3.87 ± 0.44	3.93 ± 0.50	2.4
Calcium, mg/d	631.03 ± 18.68	616.66 ± 21.31	800
Iron, mg/d	12.58 ± 0.31	12.24 ± 0.36	8.1
Sodium, mg/d	2555.47 ± 45.86	2642.40 ± 52.32	<2300

† Adjusted means ± SE. Adjusted for socio-demographic variables, body mass index score, Supplemental Nutrition Assistance Program participation, and energy intake.
‡ Recommended Dietary Allowances and Adequate Intake for micronutrients (Institute of Medicine)[50,54] and dietary guidelines for food groups (The U.S. Department of Health and Human Services–U.S. Department of Agriculture).[51]
§ 1 cup of fruit, 100% fruit juice, or ½ cup of dried fruit can be considered as 1 cup from the fruit group.
‖ Includes sodas, energy drinks, sports drinks, and fruit drinks (contain added sugars).
¶ Total energy intake was not modeled as a covariate for energy and calories from fat.
# As retinol activity equivalents.
* $p < 0.05$.

DISCUSSION

Summary

The objectives of this study were to examine the relationship between food insecurity and the dietary intake of Mexican-American women and to explore the factors likely to be associated with food insecurity in this population. A surprising result was that no significant differences in dietary intake were observed between food-secure and food-insecure women. Although food insecurity has been associated with lower dietary quality in previous research, this study did not find a particular pattern for the intakes of food-insecure Mexican-American women. Considering the social, economic, and cultural context in which eating occurs may help elucidate the extent to which food insecurity affects diet. Similar results have been reported in a study using national data where, in addition to socioeconomic variables, participation in food assistance programs was considered.[46] The difference in folate consumption by food security status, although statistically significant, was too small to be considered clinically consequential and was low in both groups. Some studies have associated intakes of <400 μg/d with low acculturation,[47,48] but in this study reduced folate intakes were still present after adjusting for acculturation level. The Hispanic population has the highest rates of any U.S. ethnic group of the two most common forms of neural tube defects, spina bifida and anencephaly.[49] It is recommended that females of childbearing age consume at least 400 μg/d of folic acid in the form of supplements or fortified foods, in addition to a folate-rich diet.[50] Folic acid intake of both the food-secure and food-insecure groups fell far short of this recommendation. Consumption of sodium in both groups was above the recommended guidelines of less than 2300 g/d.[51] This is of particular concern considering that Hispanics have higher rates of hypertension-related morbidity and mortality.[52] Past research has suggested that food-insecure women select highly processed foods, which have high sodium content.[53–55] In this study, however, differences in sodium consumption by food

security status were not statistically significant.

Sweetened beverages were consumed in greater quantity than milk. Dairy consumption was far below the recommended three to four servings a day.[51] These less healthful beverage patterns have been related to deficiencies in calcium and vitamin D, among other important micronutrients, as well as increased prevalence of hypertension.[56,57] Food insecurity did not worsen these deficiencies in micronutrient intake that seem to be prevalent among Hispanic women in other studies.[58] Because the likelihood of having osteoporosis among Hispanic women aged ≥50 years is 1 in 10,[59,60] it is imperative that attention be given to ensure adequate intakes of calcium and vitamin D in this population. Because Hispanic women have a 31% greater likelihood of having osteoporosis,[59] understanding the factors that influence the consumption of dairy foods can help in the prevention and management of chronic disease. Nutrition education is needed to help improve dairy food intakes. Fruit intake, including consumption of 100% fruit juice, was below the recommended intake for women of reproductive age.[51] Consumption of vegetables and whole grains did not meet the minimum requirements, whereas intake of saturated fat exceeded the current guidelines.[51]

Intake of iron and vitamin B12 exceeded the current recommendations.[61] These findings, particularly in regards to iron, are in contrast to other studies where low iron intakes were found to be prevalent among Hispanic women.[62,63] Research has linked food insecurity to deficiencies in iron intake among adolescents[64] and the elderly.[65] In this study, the age range of the participants was 23 to 45 years and all women achieved adequate iron intakes independent of their food security status.

Total dietary fiber intake was below the recommended guidelines in both groups. In addition, healthy sources of dietary fiber such as fruit, vegetables, and whole grains were not consumed in adequate amounts. Dietary fiber and its sources are essential components of a healthy diet and help to reduce the risk of cardiovascular disease, obesity, and type 2 diabetes, conditions that are highly prevalent among Hispanics[66] and have been linked to very low food security.[67] Dietary intakes in very low food-secure individuals were not examined because of the small proportion of women who fell into this category.

No significant differences were observed in total energy intake by food security status. This finding is consistent with other studies[68] although previous research has reported significantly lower energy intakes among food-insecure women.[69] An unexpected total energy intake below the estimated average energy requirement was observed in both groups. The most plausible explanation is underreporting, a recurrent problem in nutrition surveys.[70,71] Underreporting of energy intake may affect estimates of nutrient intakes depending on the micronutrient content of the food items omitted from the survey.[72] Because it is not clear how this can affect the estimated vitamin and mineral intake, adjustments for energy intakes have been recommended to adequately assess dietary intake in the presence of possible underreporting, which was performed in the analysis.[42,43] The results of this study were in agreement with previous research in Hispanics showing similar deficiencies in micronutrient intake.[73] However, we were not able to show significant differences in dietary quality and intake between food-secure and food-insecure individuals in our sample. These results were quite surprising given previous research in other populations.

Food-insecure women were more likely to be obese (BMI ≥30) compared to their food-secure counterparts. Several hypotheses have been proposed to explain the association between food insecurity and obesity in adults. First, it has been suggested that childhood food insecurity may have long-term effects leading to obesity in adulthood.[74–76] Second, food-insecure adults may be more likely to rely on low-cost, energy-dense foods[7] and decrease their fruit and vegetable purchase and consumption, significantly increasing their risk for obesity.[9] This study could not verify this assertion as there were no significant differences noted in total energy, fruit, or vegetable consumption. Finally, food insecurity has been associated with psychological and behavioral changes, such as preoccupation with food, overcompensation, anxiety, stress, depression, and physical limitations in adults, all of which may also lead to obesity.[77]

Although food insecurity status is known to be shaped by economic resources, not all low-income women in our sample were food insecure, suggesting that food insecurity is not the result of any one single factor, but is multifactorial. In addition, the last month's income did not appear to be an accurate measure of food insecurity risk. Not enough information was available in this study to calculate a wealth index. However, asset ownership and wealth have been considered more reliable indicators of poverty than income.[78] Whereas income is a short-term measure critical for meeting daily living expenses, wealth allows families to overcome financial hardships and has been largely used in other studies, mainly in developing countries.[78] Future studies should explore this proposition and examine whether household wealth index can better predict food insecurity risk among Hispanic families. The number of children in the household significantly increased the risk of being food insecure. Households headed by a single adult and acculturation, in contrast with other reports,[1] did not appear to be strongly associated with food insecurity. Previous research has shown higher rates of food insecurity and hunger among households participating in SNAP than among nonparticipating eligible households.[79–82] When comparing SNAP participants only, Mexican-American women who participated in SNAP were more likely to experience food insecurity. However, this association was no longer significant when participation in other federal food assistance programs in addition to SNAP was considered. This may suggest that the level of need in these families' households was greater, and the receipt of benefits from one program cannot fully compensate for the depth of their food insecurity. Not all women in this study benefited from these programs. This reflects the current barriers (federal rules that limit

eligibility, linguistic barriers, lack of awareness of the nutrition benefits among others, etc.) to participation among eligible low-income Hispanics,[83] a problem that needs to be addressed.

Strengths and Limitations

The strengths of this study are the large sample size, the balanced distribution of participants in the food-secure and food-insecure groups, and the objective measures used to assess BMI. Analyses were adjusted for important variables associated with diet among Hispanics in addition to participation in federal food assistance programs, strengthening the observed differences in dietary intake by food security status. The limitations include a cross-sectional design that prevented drawing causal inferences. Although the six-item scale has been considered adequate for research purposes, there is a slight loss in sensitivity and specificity.[40] It does not measure the most severe levels of food insecurity and does not ask about conditions of children in the household.[40] The dietary assessment tool used in this study has inherent limitations.[84] A single 24-hour dietary food record, although helpful in assessing dietary intake in population groups, may not be representative of individual nutrient intakes because of day-to-day variability in the diet. Further limitations are the potential for recall bias and underreporting, as was observed for energy intake. Underreporting has been associated with low income, higher BMI, higher social desirability, and lower education levels.[70,71] Most of these characteristics are prevalent in this sample. However, underreporting appeared to be consistent across all subgroups in the study. The effect of participation in at least one federal food assistance program might be biased because of the systematic difference found between the subjects included. The use of preferred language as a proxy for acculturation may be problematic as it is a simple indicator of a very complex adaptation process involving attitudes, cognitive factors, and personality.[37,85] Nevertheless, language use is a central part of the acculturation process and numerous studies have previously used this proxy measure.[13,14,86–88]

Significance

This study makes an important contribution towards understanding the nutritional and health consequences associated with food insecurity among Mexican-American women. Food insecurity did not appear to negatively affect Mexican-American women's overall dietary intake. Furthermore, household food security status did not necessarily translate into consumption of nutritionally adequate foods. Public health and dietary education efforts should continue to address the disparate nutritional needs of Mexican-American women independent of their food security status, acculturation level, and participation in federal food assistance programs. Further research is needed to assess the cumulative effects of food insecurity on dietary intake using prospective designs, more reliable measures of economic well-being than income, and repeated assessments of dietary intake to account for day-to-day variations. Improved and cost-effective methods should be developed to measure dietary intake more accurately in epidemiologic studies to avoid underreporting. Finally, not all eligible low-income Mexican-American women, whether food secure or not, are benefiting from nutrition assistance programs. This suggests not only that there need to be process improvements to facilitate enrollment in FAPs, but that the support provided in these programs may not be adequate to meet the nutritional needs of the female Hispanic population that they are intended to reach.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Food insecurity has been associated with adverse nutritional outcomes in a number of studies. The influence of participation in food assistance programs and other individual and household characteristics on this relationship has not been established, particularly among Mexican-American women of childbearing age.

What does this article add?

Food security status does not necessarily translate into consumption of nutritionally adequate foods. Households headed by a single woman and acculturation did not appear to be strong predictors of food insecurity. Not all eligible low-income Mexican-American women, whether food secure or not, are benefiting from nutrition assistance programs.

What are the implications for health promotion practice or research?

Improving access to nutritious foods and providing dietary education are critical steps to address the disparate nutritional needs of Mexican-American women independent of their food security status, acculturation level, and participation in federal food assistance programs. Educational and food assistance programs need to be optimized to facilitate enrollment and improve the nutritional status of Mexican-American women at nutritional risk, food secure or not.

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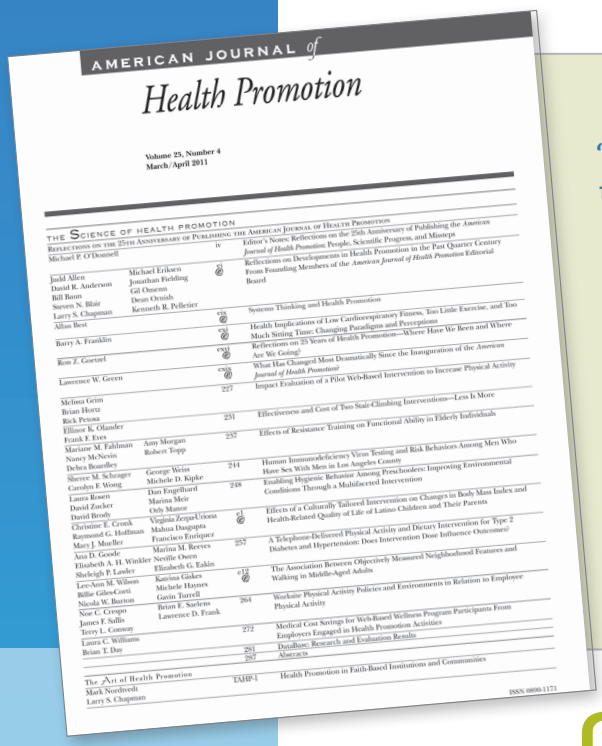
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