Nativity and Duration of Time in the United States: Differences in Fruit and Vegetable Intake Among Low-Income Postpartum Women

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Limited research has examined the association of diet with immigrant status, adjusting for multiple socio-demographic and contextual influences. Among 662 WIC-eligible postpartum women, those who were foreign-born and had lived in the United States for 4 or fewer years consumed 2.5 more fruit and vegetable servings daily than native-born women; this difference diminished with longer US residence. White women consumed 1 serving less than Latinas, and those speaking both English and Spanish at home consumed 1.4 servings more than English-only speakers after adjusting for other covariates. (*Am J Public Health.* 2007;97:1787–1790. doi:10.2105/AJPH.2005.074856)

Latinos are the largest and most rapidly growing minority group in the United States. In 2003, 22.5% of Latinos (9.1 million) were estimated to live below the federal poverty line.[1] Nevertheless, Latino immigrants tend to have lower mortality risk, better dietary quality, and lower obesity rates than do nonimmigrant groups of similar socioeconomic status. However, this relative advantage declines with length of US residence.[2–7] Factors hypothesized to account for these differences include behavioral characteristics, lifestyle, and social support.[2,8–10]

Greater fruit and vegetable consumption has been shown to reduce the risk of major causes of mortality and morbidity in the United States, including type II diabetes, heart disease, certain cancers, stroke, and obesity.[11–17] For women of childbearing age, optimal dietary intake not only influences nutritional status but also has implications for neonatal and infant development.[18]

We examined the association of nativity and length of time in the US with fruit and vegetable intake among a multiethnic sample of low-income, postpartum women.

METHODS

We used baseline data from surveys that were conducted among low-income women aged 18 to 44 years who resided in the Boston metropolitan area and western Massachusetts. The surveys were conducted in English or Spanish to 679 women who were enrolled in a randomized controlled trial of an educational intervention for postpartum women that aimed to improve diet and increase physical activity.[18,19] We analyzed baseline data from the intervention trial. Participants had a household income that was at or below 185% of the poverty line and were income-eligible for the Special Supplemental Food Program for Women, Infants, and Children (WIC)[20]; nearly all women were enrolled in WIC. The study protocol for the randomized controlled trial was approved by the institutional review boards of participating institutions.

We used a validated, semiquantitative, food-frequency questionnaire[21] to assess usual consumption of fruit and vegetables in the previous 4 weeks among low-income women aged 18 to 44 years who resided in the Boston metropolitan area and western Massachusetts.

The questionnaire was shown to be unassociated with racial/ethnic-related self-report bias[22] in a multiethnic sample randomly selected from participants in a health promotion trial.[23] Prior to our research, members of our team conducted focus groups of Latinos and Blacks to increase the salience of the food-frequency questionnaire among low-income, multiethnic women. Fruits and vegetables that were reported as being "regularly eaten" were added to the questionnaire. Total daily fruit and vegetable servings (excluding french fries) were calculated and summed from 20 questions.

We excluded results from participants that were missing responses to 3 or more questions related to fruits and vegetables, results that reported daily fruit and vegetable intakes of 20 or more servings, and those that reported daily energy intakes of fewer than 2510.4 or 20 920.0 or more kilojoules. The resulting analytic sample was composed of 662 women. We computed mean daily fruit and vegetable servings by sociodemographic and other characteristics for the entire sample and by nativity and adjusted for age. We developed sequential, ordinary least squares regression models of fruit and vegetable intake. We first examined associations with nativity and duration of US residence. In subsequent models we added race/ethnicity and indicators of social support, socioeconomic status, and neighborhood access.

Instrumental and emotional aspects of social support were measured through the subsection of the Medical Outcomes Survey scale, which consists of 8 questions, each answered on a Likert 5-point scale.[24] Socioeconomic status was assessed through household income, educational attainment and employment status. Two questions pertained to neighborhood access: one asked whether the respondent had access to more than 2 places to exercise in the neighborhood and the other questioned the amount of time it took respondents to get to the grocery store. The final model incorporated language acculturation and variables that demonstrated statistical significance or were theoretically relevant.

RESULTS

The mean daily servings by sociodemographic characteristics, social support, and indicators of fruit and vegetable access and availability are shown in Table 1. More than half of the women were born outside the United States and 67% spoke Spanish as their first or native language. Foreign-born mothers reported 6.3 daily servings of fruit and vegetables, whereas native-born women reported consuming 4 servings.

In the final multivariable regression model (Table 2), the mean daily fruit and vegetable

TABLE 1—Age-Adjusted Daily Mean Servings of Fruit and Vegetable Consumed by Women (N = 662), By Nativity and Sociodemographic Characteristics: Boston and Western Massachusetts, March 2001–January 2003

	All Women		Foreign-Born Women		Native-Born Women	
	No. (%)	Servings Mean, 95% CI	No. (%)	Servings, Mean (95% CI)	No. (%)	Servings, Mean (95% CI)
Overall	662 (100)	5.2 (5.0, 5.5)	366 (55)	6.3 (5.9, 6.6)	294 (44)	4.0 (3.7, 4.3)
Race/ethnicity						
Latina	477 (72)	5.7 (5.4, 6.0)	333 (91)	6.3 (5.9, 6.6)	142 (48)	4.5 (3.9, 5.1)
Black	49 (7)	4.8 (3.8, 5.8)	13 (4)	6.0 (4.3, 7.7)	36 (12)	4.4 (3.4, 5.4)
White	103 (16)	3.5 (2.8, 4.1)	6 (2)	5.0 (3.3, 6.7)	97 (33)	3.3 (2.9, 3.7)
Other	33 (5)	4.3 (3.2, 5.5)	14 (4)	5.7 (4.2, 7.3)	19 (6)	3.5 (2.1, 4.8)
Nativity, years in the United States						
Native-Born					299 (44)	4.0 (3.7, 4.4)
Foreign-born, in US ≥15 y			87 (24)	4.9 (4.3, 5.6)		
Foreign-born, in US 10–14 y			81 (22)	5.8 (5.1, 6.5)		
Foreign-born, in US 5–9 y			84 (23)	7.0 (6.3, 7.7)		
Foreign-born in US ≤4 y			107 (29)	7.0 (6.4, 7.6)		
Native language						
English	219 (33)	3.8 (3.4, 4.3)	15 (4)	4.7 (2.8, 6.5)	204 (70)	3.7 (3.3, 4.1)
Spanish	436 (67)	6.0 (5.6, 6.3)	347 (96)	6.3 (6.0, 6.7)	87 (30)	4.6 (4.0, 5.2)
Language spoken at home[a]						
English	32 (8)	3.6 (2.3, 4.9)	14 (4)	3.7 (1.7, 5.7)	18 (21)	3.4 (1.9, 5.0)
Spanish or other	271 (64)	6.3 (5.8, 6.7)	252 (74)	6.5 (6.1, 7.0)	19 (23)	3.3 (1.8, 4.9)
Spanish and English	122 (29)	5.9 (5.3, 6.6)	74 (22)	6.2 (5.4, 7.0)	47 (51)	5.4 (4.5, 6.4)
Income, $						
<10 000	229 (36)	4.9 (4.4, 5.3)	128 (36)	5.6 (4.9, 6.2)	101 (34)	3.8 (3.2, 4.3)
10 000–20 000	133 (21)	5.1 (4.5, 5.6)	68 (19)	6.3 (5.5, 7.2)	64 (22)	3.8 (3.1, 4.4)
>20 000	161 (25)	5.2 (4.7, 5.8)	69 (20)	6.7 (5.9, 7.6)	91 (32)	4.2 (3.6, 4.8)
Didn't know or refused	118 (18)	5.8 (5.2, 6.4)	86 (25)	6.5 (5.7, 7.3)	32 (11)	3.9 (2.9, 4.9)
Education						
Less than high school	221 (34)	5.6 (5.1, 6.1)	138 (39	6.7 (5.5, 6.5)	83 (28)	3.5 (2.8, 4.1)
High school or GED	231 (35)	5.1 (4.6, 5.5)	125 (35)	5.9 (5.3, 6.6)	105 (36)	4.1 (3.6, 4.6)
Vocational or some college	171 (26)	5.0 (4.5, 5.5)	82 (23)	6.1 (5.3, 6.9)	88 (30)	4.1 (3.5, 4.7)
Undergraduate or postgraduate degree	30 (5)	4.3 (3.1, 5.6)	13 (4)	4.7 (2.7, 6.7)	17 (6)	4.4 (3.0, 5.7)
Employment						
Was currently working at paying job	80 (12)	5.2 (4.4, 6.0)	31 (9)	6.9 (5.6 8.2)	49 (17)	4.0 (3.3, 4.8)
Was not currently working	580 (88)	5.2 (4.9, 5.5)	333 (91)	6.2 (5.8, 6.6)	245 (83)	3.9 (3.6 4.3)
Food sufficiency						
Sufficient	444 (67)	5.3 (5.0, 5.6)	252 (69)	6.4 (5.9, 6.8)	191 (65)	3.9 (3.5, 4.3)
Insufficient	218 (33)	5.1 (4.7, 5.6)	114 (31)	6.1 (5.4, 6.7)	103 (35)	4.1 (3.5, 4.6)
Access to more than 2 places to exercise in neighborhood						
Yes	281 (42)	5.1 (4.7, 5.5)	130 (36)	6.6 (5.9, 7.2)	151 (51)	3.9 (3.5, 4.4)
No	381 (58)	5.3 (5.0, 5.7)	236 (64)	6.1 (5.9, 7.2)	143 (49)	4.0 (3.5, 4.4)
Time to get to grocery store						
<10 min	292 (44)	5.1 (4.7, 5.5)	146 (40)	6.4 (5.8, 7.0)	145 (49)	3.9 (3.5, 4.4)
≥10 min	365 (56)	5.4 (5.0, 5.7)	216 (60)	6.3 (5.8, 6.8)	148 (51)	4.0 (3.5, 4.4)
Fruit and vegetable quality						
Average or poor	139 (21)	4.6 (4.0, 5.2)	61 (17)	5.7 (4.7, 6.6)	77 (26)	3.7 (3.1, 4.3)
Good	518 (79)	5.4 (5.1, 5.7)	300 (83)	6.5 (6.0, 6.9)	217 (74)	4.0 (3.6, 4.6)
Fruit and vegetable cost						
Average or poor	386 (59)	5.4 (5.1, 5.8)	220 (61)	6.7 (6.2, 7.1)	166 (56)	3.9 (3.5, 4.7)
Good	268 (41)	4.9 (4.5, 5.4)	138 (39)	5.8 (5.2, 6.4)	128 (44)	4.0 (3.0, 5.7)

Note. CI = confidence interval; GED = graduate equivalency diploma. Empty cells reflect models that did not include variables.
[a]Among women whose native language was not English.

intake was 2.5 servings greater among foreign-born women living 4 or fewer years in the United States, compared with their native-born counterparts. After adjusting for language acculturation, Latinas ate 1 daily serving more than White women. The sequential regression models are shown in Table 2 (models A, B, C, and D). As shown in Table 2, in model A, the initial difference of 0.9 additional servings of fruits and vegetables among foreign-born women who were in the United States for at least 15 years was attenuated once race/ethnicity was added to the regression model (model B). Model C shows that adjusting for all covariates besides that of language acculturation only slightly decreased values of fruit and vegetable intake for most native and foreign-born women (and slightly increased values of fruit and vegetable consumption for foreign-born women in the country for 4 or fewer years). Once language acculturation was included in the model (model D), we observed that fruit and vegetable consumption among foreign-born women who had lived in the United States for 15 or more years was virtually the same as that of native-born women.

DISCUSSION

After we adjusted for socioeconomic status, social support, and perceived access and availability of fruits and vegetables, we found that low-income, foreign-born women consumed more fruit and vegetables than did native-born women. Sequential model building showed that differences by nativity were accounted for by length of US residence, Latino race/ethnicity, and language acculturation. This is consistent with the literature on the Latino paradox that relates an erosion of culturally mediated norms and lifestyles to increases in overweight and chronic diseases.[2–5] Similarly, national data also showed greater mean intake of fruit and vegetables among Latinas compared with White and Black women.[25] The independent association of fruit and vegetable intake with "partial" language acculturation (i.e., speaking both Spanish and English at home) suggests that less linguistic isolation may promote healthy behaviors, perhaps through better access to foods or informational or other resources that promote healthy lifestyles.

TABLE 2—Multivariable Regression Models of Fruit and Vegetable Consumption Among Women: Boston and Western Massachusetts, March 2001–January 2003

	Model A[a]		Model B[b]		Model C[c]		Model D[d]	
	Parameter Estimate	*P*	Parameter Estimate	*P*	Parameter Estimate	*P*	Parameter Estimate	*P*
Intercept	4.1	<.001	4.5	<.001	1.7	.05	1.3	.15
Nativity, years in the United States								
Native born	Reference	...	Reference	...	Reference	...	Reference	...
Foreign-born, ≥15 y	0.9	.02	0.5	.26	0.4	.36	0.1	.85
Foreign-born, 10–14 y	1.7	<.001	1.3	.001	1.2	.004	1.1	.02
Foreign-born, 5–9 y	2.7	<.001	2.3	<.001	2.1	<.001	2.0	<.001
Foreign-born, ≤4 y	2.6	<.001	2.2	<.001	2.4	<.001	2.5	<.001
Age[e]	0.1	.002	0.1	.001	0.1	.02	0.6	.02
Race/Ethnicity								
Latina			Reference	...	Reference	...	Reference	...
White			–1.2	.001	–1.4	<.001	–1.0	.02
Black			–0.2	.72	–0.2	.73	0.2	.75
Other			–0.8	.17	–0.5	.4	–0.2	.72
Language spoken at home								
Native English							Reference	...
Spanish or other at home							0.3	.55
English at home							–0.4	.49
Spanish and English at home							1.4	.002
Support[f]								
Social					0.1	<.001	0.1	<.001
Tangible					0.7	.09	0.8	.06
Number in household					0.1	.5	0.04	.55
Income, $					Reference	...	Reference	...
<10 000								
10 000–20 000					0.3	.33	0.4	.26
≥20 000					0.7	.03	0.7	.02
Didn't know or refused					–0.2	.59	–0.1	.72
Obtained higher education					–0.4	.19	–0.4	.16
Food insufficient					0.2	.2	0.2	.18
Time to get to grocery store>10 min					–0.2	.46	–0.2	.45
Fruit and vegetable quality good					0.6	.06	0.5	.1
Fruit and vegetable cost good					–0.3	.2	–0.3	.23

[a] R^2 = .15, adjusted R^2 = .14
[b] R^2 = .16, adjusted R^2 = .15
[c] R^2 = .21, adjusted R^2 = .18
[d] R^2 = .23, adjusted R^2 = .20
[e] Age centered around the sample mean (27 years) so that when age = 0, it represents a woman aged 27 years.
[f] Level of support was measured using the subsections of the Medical Outcomes Survey scale.

Our study, conducted in a diverse WIC-eligible population, also underscores the potential relevance of the immigrant health paradox to US nutritional programs and policies. Nearly 40% of WIC participants in 2004 were of Latino origin.[26] Recent recommendations to revise the WIC food packages include provision of fruit and vegetables, which are not currently provided.[27] Providing nutrition counseling to promote fruit and vegetable consumption among young Latino families[28,29] may depend on understanding the diversity by nativity; acculturation, including duration of US residence; and linguistic isolation. ■

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Contributions

T. Dubowitz designed the study, performed the analyses, and wrote the article. S.A. Smith-Warner, D. Acevedo-Garcia, S.V. Subramanian, and K.E. Peterson helped design the study and interpret the findings.

Human Participant Protection

Our study was conducted with the approval of the human participants committee of the Harvard School of Public Health.

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