Acculturation and Low Birthweight among Latinos in the Hispanic HANES

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Abstract: Self reports from 1,645 Latino mothers of Mexican descent who participated in the Hispanic Health and Nutrition Examination Survey (HHANES) were used to relate the birthweight of their infants to the HHANES acculturation index. After controlling for parity, a one point increase on the acculturation scale was found to be associated with a 1.19 (95% CI = 1.05, 1.34) increase in risk of maternal low birthweight (LBW) (1.98 risk increase for four points). The estimated relative risk increased to 1.34 (1.12, 1.60) with controls for age at interview, wealth, city size, and years of education; controlling for current smoking status reduced the relative risk to 1.31. US-born respondents were also at increased risk relative to Mexican-born, but this relation was explained by acculturation. The effect of education was found to depend on level of acculturation. Years of education was unrelated to risk among the Mexican-oriented, while increased education was associated with reduced risk in the US-oriented. These results suggest that factors associated with a Mexican cultural orientation may be protective against the risk of LBW. (*Am J Public Health* 1989; 79:1263–1267.)

Introduction

Concern about the relatively high rate of infant mortality in the United States has focused attention on the epidemiology of low birthweight (LBW), the major predictor of mortality in the first year of life.[1] In this regard, Latinos of Mexican descent present a surprising pattern. On the one hand they have one of the highest birthweight-specific fetal and neonatal mortality rates for LBW births of any ethnic group in the United States.[2] This finding is consistent with their status as a medically underserved minority,[3] and it may reflect a lack of medical intervention in the perinatal period.[4,5] On the other hand, the infant mortality rate for Latinos of Mexican descent is comparable to other Whites and is half that of Blacks.[6] This paradox has been explained by recent data on the distribution of LBW among Latinos.[2,6] Latinos of Mexican descent have one of the lowest risks of LBW births of any racial or ethnic group on which data are available. Thus, data on the prenatal experience of Latinos of Mexican descent may be informative concerning the conditions under which certain social and demographic risk factors lead to increased risk of LBW and infant mortality.[2]

In addition to a more favorable birth experience among Latinos relative to other US ethnicities and minorities, recent studies have indicated that nativity status (country of birth) of California Latino mothers is associated with the distribution of infant birthweights within the Latino population.[2] Furthermore, this association favors those mothers born in Mexico even though they are generally of lower socioeconomic status than those born in the United States.[6] This pattern of findings may be explained by at least two models: 1) Latino mothers who migrate are healthier than those who do not migrate; 2) birth in Mexico is merely a marker for a lifestyle that is protective against negative social influences on pregnancy outcomes. The purpose of this study is to explore the consistency of these competing explanations with data on Latino mothers from the Hispanic Health and Nutrition Examination Survey (HHANES).

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Methods

The HHANES was conducted by the National Center for Health Statistics during 1982–84.[7] Three separate Latino populations (Cuban, Mexican, and Puerto Rican) within the United States were sampled. Data for the current study came from the Mexican respondents included in the Medical History portion of the HHANES.

The degree to which respondents have taken on the social and cultural characteristics of either a Mexican or US orientation was assessed using an index of acculturation. The index consisted of eight variables selected from an index of 21 variables developed by Cuellar in 1980 for Mexican Americans.[8] These eight variables were measured by 18 survey items concerned with various aspects of acculturation. Four of the acculturation variables measure language preference, three measure ethnic identification, and one measures nativity status. The first seven variables were scored from 1 (Mexican-orientation) to 5 (US-orientation); the nativity variable ranged from 1 (respondent and parents born in Mexico) to 4 (respondent nor parents born in Mexico). The acculturation score is the arithmetic mean of the scores for the eight variables (i.e., total score/8). The resulting scale ranges from 1.0 (Mexican-orientation) to 4.9 (US-orientation). For purposes of the current study, this index was also disaggregated into a seven-item non-nativity acculturation index (ranging from 1.0 to 4.9) and a nativity index (ranging from 1 to 4).

The mother's status with regard to an LBW birth was assessed from three questionnaire items:
1) "What is the total number of live births you have had?"
2) "Did the (only) child weigh less than 5 1/2 pounds (2,500 grams) at birth?"
3) "How many of your children (who were born alive) weighed less than 5 1/2 pounds (2,500 grams) at birth?"

Female respondents were classified as mothers if they indicated one or more live births in the first item. A mother was then classified as a LBW mother if she indicated one or more LBW births in either of the latter two questions (no = 0, yes = 1).

Smoking status was determined from the questions: "Do you currently smoke cigarettes?" Level of education was measured by reported years of education. Wealth index was measured by the ratio of average household income for the past 12 months over the poverty threshold income for 1982. Scores of less than 100 were below the poverty level for 1982. City size was an ordinal variable with 8 categories ranging from 1 (cities over 1,000,000) to 8 (towns less than 10,000).

The data were analyzed using logistic regression because the dependent variable was dichotomous. The model used was the following:[9]

$$\ln(\text{odds}\{\text{Maternal LBW}\}) = \alpha\ P1 + \beta_1\ P2 \ldots + \beta_x\ ACC + \beta_{x+1}\ AGEI$$

Where maternal LBW, parity of one (P1) and parity of two (P2) are dichotomous variables, and acculturation score (ACC) and age at interview (AGEI) are continuous variables. The CATMOD procedure in the software package SAS was used to analyze the data. Survey weights were incorporated by dividing each individual weight by the mean survey weight of all the Latino mothers analyzed yielding an average sample weight of one. Design effects were not incorporated in the analysis. The degrees of freedom for estimating the design effects in Hispanic HANES are small and therefore yield unstable point estimates. Test statistics generated using unstable point estimates of the variance could be misleading. However, the use of logistic regression for the analysis causes the design effect to converge on 1.0. In addition, including variables related to survey design (e.g. age, sex) also causes the design effect to converge on 1.0.*

Results

Total births ranged from one to 15. Mothers were eliminated from the analysis if data were unavailable on total births, acculturation index, or number of LBW births. One mother reported 11 births of which 11 were LBW births. The next highest number of reported LBW births was 4. The mother with 11 low birthweight births was 58 years old, born in the US, had an acculturation score of 2.0, and a survey weight above the average. She was the only case deleted from the analysis.

The 1,645 mothers reported a total of 6,216 births. Of these births, 299 were reported as LBW births. The overall proportion of LBW infants (4.8 percent) was comparable to the proportion of LBW infants for Mexican-Americans found by Williams[2] (4.7 percent) and Ventura[6] (5.3 percent) in cross-sectional analyses of California state and national vital records, respectively, in 1981. The percentage of LBW infants among Mexican born respondents in the HHANES (3.9 percent) was also comparable with that found by Williams (4.2 percent), as were the proportions of LBW infants among United States born respondents (5.5 percent) when compared with Williams (5.2 percent). However, the proportions of LBW infants among US-born (6.3 percent) and Mexican-born (5.0 percent) mothers reported by Ventura were higher than those found both by Williams and in the HHANES.

The distribution of the mothers on the acculturation index was bi-modal which may reflect the presence of two fairly distinct subpopulations of Latinos of Mexican descent (Figure 1). To explore the characteristics of these two subgroups defined by this distribution the mothers were dichotomized, those equal to or below an acculturation score of 2.4 were designated as Mexican-oriented and those above 2.4 designated as US-oriented (Figure 1). Demographically, Mexican-oriented mothers had a higher mean parity and lower means for years of education and income. Behaviorally, Mexican-oriented mothers were less likely to report current smoking of cigarettes (Table 1).

*Personal communication with Lester Curtain of the National Center for Health Statistics.

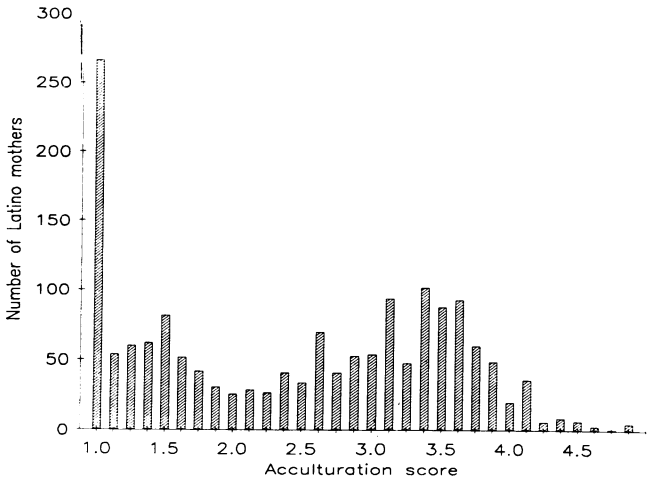

FIGURE 1—Distribution of all Latino Mothers in Hispanic HANES by Acculturation Score (n = 1.645)

TABLE 1—Variable Means by Cultural Orientation

Demographic/ Behavioral Variables	Mexican-Orientation			US-Orientation		
	n	Mean	S.D.	n	Mean	S.D.
Years of education	731	6.05	3.82	914	10.27	3.29
Wealth index (<100 poverty)	661	138.8	96.6	840	191.5	135.6
Age (years) at interview	731	42.1	14.3	914	38.5	14.0
City size (1 = urban, 8 = rural)	680	3.75	2.24	824	5.22	2.35
Parity (# live births)	731	4.24	2.95	914	3.41	2.44
Mexican-born (0 = no, 1 = yes)	731	.735	.447	914	.130	.334
Current Smoker (0 = no, 1 = yes)	731	.194	.396	914	.281	.450

The percentage of LBW mothers in the survey was 13 percent (11 percent among the Mexican-oriented women, 14 percent among US-oriented women). Mexican-oriented women were at lower risk of maternal LBW status within all parity groups except after primiparity (Figure 2).

When LBW status of mothers was logistically regressed on the acculturation score the coefficient for acculturation was positive ($\hat{\beta}$ = .080, S.E. = .067) but close to zero (Table 2). When parity was added to the model, the acculturation coefficient increased in magnitude ($\hat{\beta}$ = .172, S.E. = .071), reflecting the tendency of greater parity among Mexican-oriented women to mask the relation between LBW risk and acculturation. The regression coefficients for demographic variables (education, wealth index, age at interview, and city size) were all near zero with parity controlled.** However, current smoking status had a strong positive effect ($\hat{\beta}$ = .355 S.E. = .160) and remained so ($\hat{\beta}$ = .396, S.E. = .168) with controls for acculturation score. Notably, the positive effect of acculturation score on maternal LBW status was reduced ($\hat{\beta}$ = .157, S.E. = .071) after controlling for current smoking status (Table 2).

Education was the only variable that had a substantial

**Data available on request to author.

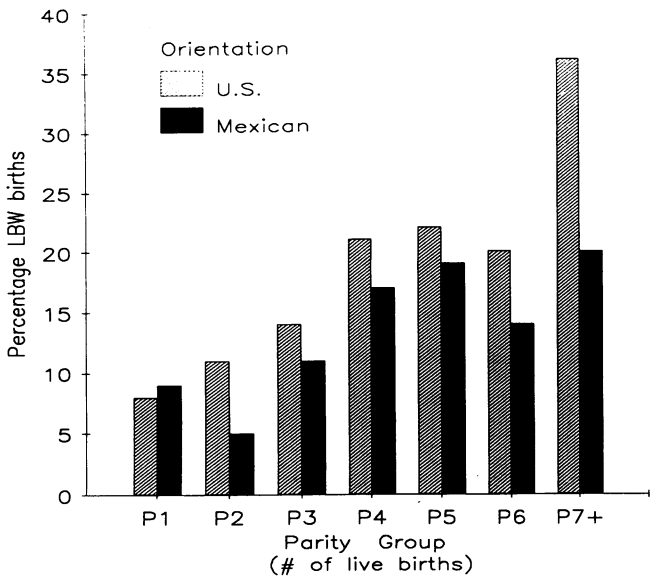

FIGURE 2—Percentage of Mothers with Low Birthweight Births for each Cultural Orientation by Parity Group

interaction with acculturation (Table 3). The interaction effect was negative ($\hat{\beta}$ = −.063, S.E. = .021) as was the main effect of education ($\hat{\beta}$ = −.069, S.E. = .026) while the main effect of acculturation ($\hat{\beta}$ = .234, S.E. = .081) was positive. This indicates that the effect of years of education on maternal LBW status varies with acculturation status. Specifically, years of education has no effect on maternal LBW status for Mexican-oriented women but a negative effect among US-oriented women (Figure 3).

To explore the independent effect of nativity, this component of the acculturation index was removed and maternal LBW status was logistically regressed on nativity and parity. The effect of nativity on risk was positive ($\hat{\beta}$ = .116, S.E. = .055), and increased ($\hat{\beta}$ = .158, S.E. = .068) with controls for demographic variables. The acculturation index with the nativity variable removed (i.e., a non-nativity based acculturation index) was also positive and substantial both controlling for parity ($\hat{\beta}$ = .196, S.E. = .082) and controlling for parity and the other demographic variables ($\hat{\beta}$ = .311, S.E. = .113). When both the nativity variable and the non-nativity acculturation variable were included in the analysis the effect of nativity was reduced to near zero ($\hat{\beta}$ = .030, S.E. = .089) while non-nativity acculturation status remained correlated with maternal LBW status ($\hat{\beta}$ = .160, S.E. = .132). This relation was more pronounced when demographic and behavioral variables were added to the model. The effect for nativity remained small ($\hat{\beta}$ = .043, S.E. = .100) while the effect for non-nativity based acculturation increased ($\hat{\beta}$ = .259, S.E. = .165) (Table 4).

For ease of interpretation and additional assurance that the results are not the result of model specification all independent variables were dichotomized and reentered into the regression equation. The model including acculturation score and parity indicated that the risk of maternal LBW among US-oriented Latinos was 1.64 times that of the Mexican-oriented mothers. This relative risk increased to 1.86 when all covariates were included in the model.

Discussion

This study confirms the previously reported reduced risk of LBW among the Latino mothers born in Mexico relative to Latino mothers of Mexican-descent born in the United States.[2,6] However, this association was weaker than that between measured acculturation and maternal LBW risk, and became negligible when the non-nativity acculturation variable was included in the regression model.

The self-reporting of pregnancy outcome involves recall error. The recall period in the HHANES is as long as 50 years, and no queries were made concerning whether or not an accurate birthweight was supplied to the mother at the time of delivery. As a result, overestimating birthweight by Mexican-oriented women could account for these results. However, a similar reporting bias was felt to be responsible for the low perinatal mortality rates for Latino infants of Mexican-descent when the data from linked birth and death certificates first became available.[11,12] It was subsequently shown by Williams in California that these low rates could not be the result of a systematic bias from underreporting by Mexican mothers.[2] It is therefore noteworthy that in the HHANES the proportion of mothers' self-reports of low birthweight, both overall and among the Mexican- and US-born subgroups, were not substantially different than that

TABLE 2—Logistic Regression Coefficients and Standard Errors for each Numbered Model by the Independent Demographic Variables Included in the Model

Model	(1) n = 1645	(2) n = 1645	(3) n = 1645	(4) n = 1630	(5) n = 1501	(6) n = 1504	(7) n = 1645	(8) n = 1363	(9) n = 1363
Demographic Variables									
Acculturation	.080(.067)	.172(.071)	.177(.072)	.230(.084)	.182(.076)	.176(.075)	.157(.071)	.252(.092)	.228(.093)
Age at interview	.	.	.003(.006)	.	.	.	.	.004(.007)	.003(.007)
Years of education	.	.	.	−.031(.023)	.	.	.	−.021(.026)	−.020(.026)
Wealth index	.	.	.	.	−.001(.001)	.	.	−.001(.001)	−.001(.001)
City size	.	.	.	.	.	.005(.030)	.	−.029(.031)	−.027(.031)
Current smoker status	.	.	.	.	.	.	.355(.160)		.396(.168)
Parity = 1	.	*	−2.77(.349)	*	*	*	*	*	*
Parity = 2	.	*	−.303(.248)	*	*	*	*	*	*
Parity = 3	.	*	.276(.242)	*	*	*	*	*	*
Parity = 4	.	*	.775(.253)	*	*	*	*	*	*
Parity = 5	.	*	.762(.294)	*	*	*	*	*	*
Parity = 6	.	*	.477(.373)	*	*	*	*	*	*
Parity = 7+	.	*	1.16(.299)	*	*	*	*	*	*

*Parity was controlled with seven dichotomous dummy variables. Model 3 is demonstrating all the coefficients for that model.
Note: All the coefficients included in a model are shown in the column below the model number except as noted. The independent variable is maternal LBW status.

TABLE 3—Logistic Regression Coefficients and Standard Errors for each Numbered Model by the Independent Variables and Interaction Variable

	Model				
	(1)	(2)	(3)	(4)	(5)
Interaction[Φ]	−.063(.021)	.007(.005)	.000(.001)	.012(.031)	−.058(.079)
Acculturation score − 3	.234(.081)	.179(.071)	.188(.078)	.230(.080)	.184(.081)
Years of education − 8 years	−.069(.026)	.	.	.	.
Age of interview −39 years	.	.008(.007)	.	.	.
Wealth index − 170 score	.	.	−.001(.001)	.	.
City size − 4.9 score	.	.	.	−.004(.036)	.
Current smoker status	.	.	.	.	.388(.158)
Parity	*	*	*	*	*

ΦInteraction of acculturation and the other independent variable included in the model with maternal LBW status.
*Parity was controlled using seven dichotomous dummy variables.
NOTE: All the coefficients included in a model are shown in the column below the model number except as noted. The independent variable is maternal LBW status.

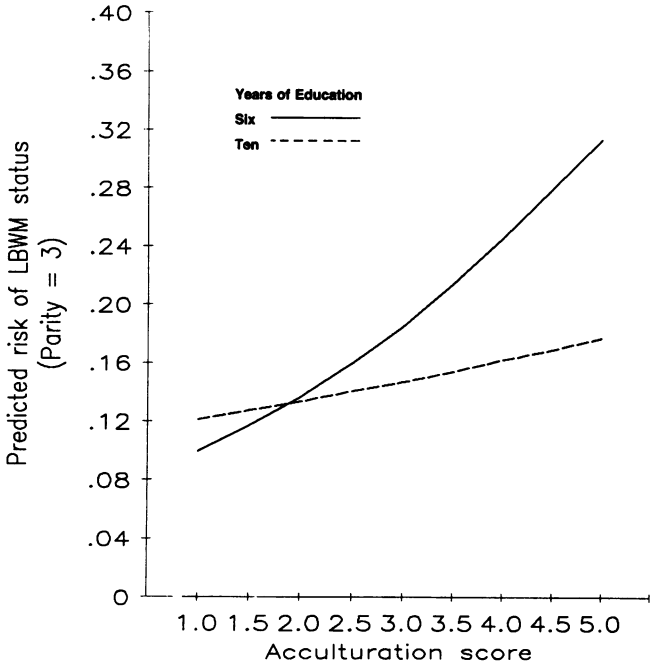

FIGURE 3—Predicted Risk of Maternal LBW Status by Acculturation Score and Years of Formal Education Demonstrating the Interaction of Acculturation and Education
Model: ln (Odds{Maternal LBW}) = $\alpha + \beta_1$*(P3) + β_2*(ACC-3) + β_3*(EDUC-8) + β_4*((ACC-3)*(EDUC-8))

found by Williams in California. Furthermore, numerous studies have found that birthweight is recalled with a high level of accuracy by mothers many years after the birth.[13–16]

Controlling for demographic risk factors in the regression model did not change the magnitude of effect of acculturation on maternal LBW status, in fact the effect became stronger. It may be that acculturation status acts as a marker for certain values, beliefs or lifestyles which protect these women from negative birth outcomes associated with the demographic pattern they possess.[2] Where formal education has little effect on maternal LBW status in Mexican-oriented mothers, it is negatively associated with maternal LBW status in US-oriented mothers. This observation is consistent with previous studies.[6,17] A study of infant mortality in Israel found that level of formal education in an out-group was directly related to infant mortality contrasted with the inverse relationship in the general population.[18]

Behaviorally, Latinos of Mexican descent demonstrate better nutrition, fewer premarital births, lower rates of smoking and alcohol use, and higher regard for parental roles when compared to other Whites.[2,19–22] Consistent with such findings, a higher proportion of the US-oriented Latino mothers responded that they currently smoked. Cigarette smoking was the only independent variable other than parity that has a strong effect on maternal LBW status both before and after controls for acculturation were added to the model. The effect of acculturation status, on the other hand, was reduced slightly by controlling for current smoking status, a behavior associated with the US orientation. The fact that the designation is an assessment of smoking status at the time of survey and not an indication of prenatal smoking probably

TABLE 4—Logistic Regression Coefficients and Standard Errors for each Numbered Model by the Independent Nativity Variables Included in the Model

Model	(1) n = 1645	(2) n = 1645	(3) n = 1645	(4) n = 1363	(5) n = 1424	(6) n = 1424
Nativity Variables						
Non-Nativity based acculturation score	.196(.082)	.	.160(.132)	.311(.113)	.	.259(.165)
Nativity (1 = Mexico, 4 = United States)	.	.116(.055)	.030(.089)	.	.158(.068)	.043(.100)
Age at interview	.	.	.	.003(.007)	.003(.007)	.003(.007)
Education	.	.	.	−.015(.027)	.004(.025)	−.013(.027)
Wealth index	.	.	.	−.001(.001)	−.001(.001)	−.001(.001)
City size	.	.	.	−.025(.035)	−.024(.036)	−.028(.036)
Current smoker status	.	.	.	.376(.175)	.396(.174)	.396(.174)
Parity	*	*	*	*	*	*

*Parity is controlled with seven dichotomous dummy variables.
NOTE: All the coefficients included in a model are shown in the column below the model number except as noted. The independent variable is maternal LBW status.

attenuates the association. Also, since no other behavior variables were controlled in the analysis, current smoker status could be a marker of a group of behaviors related to smoking and positively associated with maternal LBW status. This situation would exaggerate the apparent effect of this variable in the analysis.

Lack of prenatal care is often cited as a risk factor for LBW. However, Mexican-born Latinos have a lower rate of LBW than their US-born counterparts despite the fact they are more likely to receive late or no prenatal care.[6] These findings, together with those reported here suggest that Mexican-orientation is associated with behaviors or lifestyle predating pregnancy which are more important determinants of LBW than prenatal care. Thus utilization of prenatal care services among Latinos of Mexican descent may be associated with a lifestyle that places them at risk of LBW. Utilization of prenatal care may become more likely with the loss of Mexican values and beliefs which are protective against LBW.

These analyses demonstrate that Latinos of Mexican descent are not a homogeneous group with regard to risk for LBW. Furthermore, Mexican cultural orientation acts as a marker for a lifestyle which is associated with a favorable prenatal experience among these Latino mothers. Such an effect is seen primarily in the highly Mexican-oriented Latinos and lost when one moves away from this cultural orientation. It is noteworthy that conventional demographic risk factors for LBW, such as formal U.S. education, only become important for Latinos of Mexican descent as they move away from the Mexican orientation. This may be due to the lack of influence of these factors in the social environment that developed the culture which gave rise to the values and beliefs making up the Mexican orientation.

The components of the Mexican orientation which may provide protection are important from a prevention standpoint. Especially in light of the observation that this orientation may ameliorate the impact of demographic risk factors. Some possible components of the Mexican orientation that need further investigation include nutrition, familial integration, smoking and alcohol use, and out-of-wedlock births. How Latinos lose those attributes which proscribe adverse health behaviors and/or how they develop attributes which do not effectively proscribe them may be critical to our understanding of LBW.

ACKNOWLEDGMENTS

The authors thank the individuals at the National Center for Health Statistics who helped make the completion of this paper possible. Special thanks to Lester Curtin at the NCHS and Ray Palmer at the Institute for Prevention Research for their technical assistance which was invaluable.

My deepest gratitude goes to Cathy Scribner for cultivating a maternal model in a woefully paternal culture.

The first author was supported by a fellowship from the National Cancer Institute, National Research Service Award T32-CA09492 during the conduct of the reported research.

This study was presented at the US-Mexico Border Health Conference, Chihuahua, Mexico, June 7, 1988.

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