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## The Association between Acculturation and Prenatal Psychosocial Stress among Latinas

Lisa Chasan-Taber<sup>1</sup>, Nisha Kini<sup>2</sup>, Megan W. Harvey<sup>3</sup>, Penelope Pekow<sup>1</sup>, Nancy Dole<sup>4</sup>

<sup>1</sup>Department of Biostatistics & Epidemiology, School of Public Health & Health Sciences, University of Massachusetts, Amherst, MA.

<sup>2</sup>European Medical and Clinical Division, Terumo Europe NV, Interleuvenlaan 40, Leuven 3001, Belgium, Europe.

<sup>3</sup>Department of Rehabilitation and Disability Studies, Springfield College, Springfield, MA, USA.

<sup>4</sup>Carolina Population Center, University of North Carolina, Chapel Hill, NC

### Abstract

**Background:** Latinas experience high levels of stress in pregnancy, however few studies have investigated how acculturation affects pregnancy mental health among Latinas. The goal of this study was to determine if acculturation was associated with pregnancy stress among pregnant, predominantly Puerto Rican women.

**Methods:** Participants (n=1426) were enrolled in Proyecto Buena Salud, a prospective cohort study of Latinas. Acculturation on a bi-dimensional scale that allows for identification with both Latina and continental US cultures (i.e., bi-cultural vs. high or low acculturation) was measured in early pregnancy via the Psychological Acculturation Scale (PAS), language preference, and generation in the US. Stress was measured in early and mid/late pregnancy using Cohen's 14-item Perceived Stress Scale.

**Results:** After adjustment for risk factors, women with bicultural acculturation had significantly lower stress in overall pregnancy ( $\beta = -2.15$ , 95% CI  $-3.5, -0.81$ ) and in mid/late pregnancy ( $\beta = -2.35$ , 95% CI  $-3.92, -0.77$ ) as compared to women with low acculturation. There were no significant associations between proxies of acculturation (i.e., language preference and generation) and stress.

**Conclusions:** Bicultural psychological acculturation was associated with lower stress in pregnancy, while proxies of acculturation were not. Bi-dimensional measures of psychological acculturation should be considered in future studies of maternal mental health.

### Keywords

acculturation; stress; pregnancy; Latino; Hispanic

## Introduction

High stress levels are common during pregnancy, with prior studies indicating that up to 25% of pregnant women experience psychosocial stress (1). Prenatal psychosocial stress has been identified as a potential risk factor for preterm birth, low birthweight, and small for gestational age (SGA) (2). Stress has also been proposed as one explanation for differences in rates of low birth weight and preterm birth according to race/ethnicity with, for example, risk of these adverse pregnancy outcomes being 25% higher in Latina vs. non-Latina white women (3). Pregnant Latinas from the Caribbean Islands report approximately 21% higher mean levels of perceived psychosocial stress compared to non-Latina white pregnant women (4,5). This observation has significant public health implications as Latinas are the largest and fastest growing ethnic group in the US. The percentage of Latinas of childbearing age is projected to increase 74% by 2060, in contrast to an expected 35% decline among non-Latina whites over the same time period (6). However, to date, the majority of studies on psychosocial factors in pregnancy have been carried out among non-Latina whites.

Latinas from the Caribbean Islands (i.e., Puerto Ricans and Dominicans) constitute the largest Latina subgroup in the northeast US, the second largest group of Latinas in the US, and the fastest growing subgroup (7). Previous work has illustrated that the Puerto Rican population in the US have trajectories, experiences, and sources of stress that differ from those of other US Latino subgroups (8). As compared to other Latinas, Puerto Ricans and Dominicans experience the greatest health disparities (9). In addition, Puerto Ricans experience numerous socioeconomic stressors, including high poverty rates that are greater than non-Latina Whites and Latinas as a whole (9). Differences in migration patterns between Puerto Ricans and other Latino populations have been hypothesized to explain these differences, emphasizing the need to examine associations among Puerto Ricans (10). In a nationally representative sample, Puerto Ricans had the highest overall prevalence of mental illness of all Latino groups (39.0%), and nearly a third of Latinos (30.2%) had a psychiatric disorder over their lifetime (11).

It has been hypothesized that acculturation, defined as process of taking on the attitudes, behaviors and customs of the dominant culture, may influence perceived psychosocial stress. Indeed, while the widely reported “Hispanic paradox” refers to the observation that foreign nativity protects against negative health consequences, more recent studies have found that this paradox may not be generalizable across all Latino subgroups after adjusting for demographic and socioeconomic differences (12).

Acculturation is a transitional process that occurs as immigrant groups gain increasing exposure to the beliefs, traits, and lifestyles of the dominant culture. In some circumstances, acculturation may lead to more unfavorable social conditions such as societal and financial stressors that have been linked to poor health outcomes (13-15). Indeed, it has been theorized that some aspects of Latina culture may be protective of mental and physical health, and this protection may be lost with greater acculturation to the United States (16,17). Among Latinas, increasing levels of acculturation have been associated with higher body mass index (BMI), higher rates of depression, substance use and cigarette smoking, less exercise, and, in turn, greater risk of maternal complications (14).

The pathways through which acculturative change affects pregnant Latinas are not well understood. Ruiz presents a conceptual model of the impact of acculturation on biological, psychosocial, and health risks in pregnant women of Hispanic Origin (18). During pregnancy, more acculturated Latinas report higher levels of perceived stress and depressive symptoms, have less positive attitudes toward pregnancy, and are more likely to smoke cigarettes or use drugs as compared to less acculturated Latinas (19,20). It is unclear whether this pattern reflects a concurrent movement away from a Latina orientation to Anglo orientation or the differential influence of particular aspects of one or the other cultural orientation in particular (e.g. Latina or Anglo) in a bicultural manner (21).

Prior studies on the relationship between acculturation and psychosocial stress in pregnancy are sparse and were largely limited to Mexican American women (18,20,21). Prior studies also did not examine change in stress over the course of pregnancy. This is important as evidence suggests that stress responses decrease as pregnancy progresses, and these stress patterns influence health outcomes during pregnancy (22). Many used measures of acculturation and related proxies (e.g., length of time in the continental US) that treat acculturation as a concurrent movement away from culture of origin toward the new culture (21). In contrast, bi-dimensional measures of acculturation, such as the Psychological Acculturation Scale (PAS) (23) and others, allow for identification with both the US and the foreign culture. That is, while some may welcome the cultural beliefs and practices of the US culture, others may attempt to retain their culture of origin, and still others may develop bicultural identities (21). Recent studies on bicultural identity indicate that two cultural identities can be retained simultaneously and exert independent effects on social behavior and perceptions (24). In contrast, some have posited that, in contrast to other acculturation measures, English language proficiency may be a marker for mental health risk, as it indicates loss of positive cultural factors (11).

Therefore, the goal of this study was to determine if acculturation (i.e., psychological acculturation, generation in the continental US, and preferred language) was associated with psychosocial stress in both early and mid/late pregnancy in a sample of predominantly Puerto Rican women. Based upon prior studies of acculturation and anxiety among pregnant Puerto Rican women (25), we hypothesized that bicultural identification would be associated with lower pregnancy stress. We also hypothesized that proxies of acculturation such as language in the US generation in the US would be associated with higher levels of stress in pregnancy.

## Methods

We evaluated this association among participants in Proyecto Buena Salud (PBS). PBS was a prospective cohort study conducted from 2006–2012. The overall goal of PBS was to examine the relationship between physical activity, psychosocial stress, and gestational diabetes in Latina women of predominantly Puerto Rican heritage; study details have been previously published (4). In brief, women were recruited at prenatal care appointments in early pregnancy (before 20 weeks gestation) from a public obstetrics and gynecology clinic at Baystate Medical Center, a large tertiary care facility located in Western Massachusetts. Eligible participants were of Puerto Rican or Dominican heritage, defined as: 1) being born

in Puerto Rico or the Dominican Republic, 2) having a parent born in Puerto Rico or the Dominican Republic, or 3) having two grandparents born in Puerto Rico or the Dominican Republic. Women were excluded from participation if they: 1) were taking medications that could affect glucose tolerance, 2) had a multiple gestation, 3) had a history of chronic renal disease, hypertension or heart disease, and 4) were less than 16 years old or greater than 40 years old at enrollment.

Participants provided written informed consent approved by the Institutional Review Boards of the University of Massachusetts-Amherst and Baystate Health. Interviews were conducted by bilingual research staff in early (mean weeks gestation=12.4, SD=3.2) and mid/late (mean weeks gestation 21.3, SD=2.3) pregnancy either in-person or on the telephone in English or Spanish, according to the participant's preference. After delivery, medical records were abstracted for clinical characteristics of the current pregnancy and medical and obstetrical history.

### Assessment of Acculturation

Acculturation was measured at enrollment using the PAS (23). This bi-dimensional scale measures psychological attachment to both mainstream Anglo and Latino culture via 10 items using a Likert scale from 1 to 5, and allows for identification with both cultures. Example questions include “with which group of people do you feel you share most of your beliefs and values” and “which culture do you feel proud to be a part of.” Responses on each item were totaled and a mean overall acculturation score was calculated (possible range from 1 to 5). The PAS has high internal consistency in Spanish (0.90) and English (0.83) in Puerto Rican populations (23).

The mean overall acculturation score was considered as a continuous variable and also categorized as a 2-level and 3-level variable, respectively (25,26). For the 2-level variable, scores <3 indicated low acculturation, and scores ≥3 were considered high acculturation. For the 3-level variable, scores <3 indicated low acculturation, a score of 3 indicated bicultural acculturation, and scores >3 indicated high acculturation to Anglo-American culture.

To facilitate comparison with the prior literature, other proxy measures of acculturation were measured at enrollment, including generation in the continental US and preferred language (English or Spanish). Generation was defined as first (participant born in Puerto Rico/Dominican Republic), second (at least one parent born in Puerto Rico/Dominican Republic) or third (at least two grandparents born in Puerto Rico/Dominican Republic).

### Assessment of Stress

Psychosocial stress was measured in early and mid/late pregnancy using Cohen's Perceived Stress Scale (PSS-14) (27). The PSS-14 consists of 14 questions that address control over the demands of daily life such as “How often have you felt you were on top of things” and “How often have you felt nervous and stressed?” Participants answered each question on a 5-point scale, ranging from never (0) to always (4). Positively worded items were reverse scored and the rating over the 14 questions was summed for a total stress score ranging from 0–56. Higher scores indicate more perceived psychosocial stress. At each pregnancy time

point, stress was analyzed as a continuous variable. We also calculated an overall pregnancy stress score across the entire pregnancy by averaging the pregnancy time period scores.

Two stress change variables were created. The first was a continuous variable, calculated by taking the difference between the PSS from early to mid/late pregnancy. The second was a dichotomous variable that categorized the direction of change between early and the mid/late pregnancy PSS scores as either an increase or decrease/no change.

The PSS has demonstrated strong reliability in a diverse population of pregnant population ( $\alpha=0.88$  and  $0.88$  at 24–26 and 34–36 weeks gestation, respectively) and was highly correlated ( $r=0.75$ ) with depressive symptoms in this population (28). The Spanish version of the PSS has adequate test-retest reliability ( $r=0.73$ ), internal consistency ( $\alpha=0.81$ ), and validity with the Hospital Anxiety and Depression Scale (HADS) ( $r=0.71$  for HADS-distress and  $r=0.66$  for HADS-anxiety) (29).

### Assessment of Covariates

We considered sociodemographic, behavioral, and medical history risk factors that could confound the relationship between acculturation and stress. Sociodemographic and behavioral factors were collected at the early pregnancy interview using questions from the Pregnancy Risk Assessment Monitoring System (PRAMS) (30). These included age (16–19, 20–24, 25–29, 30 years), education (less than high school, high school graduate, some college/graduate school), number of adults in the household (0, 1, 2, 3), number of children in the household (0, 1, 2, 3), type of health insurance (no insurance, private insurance, public insurance), annual household income (<\$15,000, \$15,000-\$30,000, >\$30,000), living with a partner (no, yes), and cigarette smoking during pregnancy (no, yes). Trait anxiety was assessed in early pregnancy and state anxiety in mid/late pregnancy using the Spielberger State-Trait Anxiety Inventory (STAI). The STAI has been identified by a systematic review as the instrument with the highest validity and reliability to measure anxiety in pregnant women, compared to ten other commonly used instruments(31). The Spanish version has been validated and has an internal consistency reliability of 0.87 (32). Medical risk factors were abstracted from medical records and included parity (nulliparous, 1, 2), pregnancy complications (i.e., diagnosis of gestational diabetes, pregnancy induced hypertension, or preeclampsia in the current pregnancy), and number of prenatal care visits, and prepregnancy BMI (<18.5, 18.5-<25, 25-<30, 30 kg/m<sup>2</sup>).

### Statistical Analysis

We calculated descriptive statistics (means, standard deviations and frequencies) for the acculturation exposures, stress outcomes, and covariates of interest. Bivariate associations were calculated using t-tests, Chi-square tests, ANOVA, or linear regression as appropriate based upon the parameterization of the variables. Unadjusted and multivariable linear regression were used to examine the association between acculturation and the continuous stress scores in early and mid/late pregnancy. Similarly, unadjusted and multivariable logistic regression were employed to evaluate the association between acculturation and change in stress from early to mid/late pregnancy (dichotomous increase vs. decrease or no change). For multivariable models, *a priori*, we chose to use the change-in-estimate criterion,

in which confounders are defined as variables that alter the unadjusted exposure–outcome effect by a certain percentage. We used the recommended cutoff of 10% commonly cited in the literature (33). Based upon this method, age, education, living with a partner, and cigarette smoking were included in our final models. For covariates with missing values, we used the missing-indicator method, used for missing confounder data in etiologic research whereby a dummy variable is used in statistical models to indicate whether the value for that covariate was missing. Final models were assessed for assumption violations, including multicollinearity, and did not violate these assumptions. Analyses were conducted using SAS 9.4 (Cary, NC).

## Results

A total of 1,578 women were enrolled in Proyecto Buena Salud. Women were excluded from the analysis if they were missing data on all three exposure variables (PAS score, preferred spoken language, and generation in the US) ( $n=6$ ), or stress measures in both early and mid/late pregnancy ( $n=146$ ), resulting in a final dataset of 1,426 women.

The majority of participants were young (70.2% under 24 years of age) and almost half had not completed high school (45.4%) (Table 1). The majority had public health insurance (91.2%) and either low levels of income (30.1% <\$15,000) or did not know their annual household income, likely due to the fact that they were living with their parents or extended family. The majority were parous (56.7%) and 46.2% were overweight or obese.

Mean stress scores were 26.2 (95% CI: 25.8, 26.7) in early pregnancy and decreased to 24.3 (95% CI: 23.9, 24.7) in mid/late pregnancy (Table 2). The majority of participants had low levels of psychological acculturation (79.0% with PAS scores <3) but were more highly acculturated as indicated by proxies of language preference; 75.3% preferred to speak English and 53.4% were second or third generation in the US (Table 2).

We then evaluated perceived stress scores according to level of acculturation (Table 2). High (vs. low) levels of psychological acculturation were associated with lower stress in overall pregnancy and mid/late pregnancy. However, when we evaluated acculturation as a 3-level variable (high, bicultural, low), the association was U-shaped; stress was higher among women with high and low levels of acculturation and lower among bicultural women. Women who were first or second generation had significantly higher stress scores than third generation women in overall and early pregnancy. Neither preferred language nor the dichotomous measure of generation in the US (first vs. second/third generation) were significantly associated with stress at any pregnancy time point.

We then examined the relationship between acculturation and stress using linear regression (Table 3). After adjusting for age, education, living with a partner, and cigarette smoking, women with high levels of psychological acculturation had significantly lower stress in overall pregnancy ( $\beta = -0.94$ , 95% CI:  $-1.83, -0.06$ ) and in mid/late pregnancy ( $\beta = -1.30$ , 95% CI:  $-2.34, -0.26$ ) as compared to those with low levels of acculturation. When we evaluated psychological acculturation as a 3-level variable, this reduction in stress was limited to bicultural women. Specifically, women with bicultural acculturation had

significantly lower stress scores in overall pregnancy ( $\beta = -2.15$ , 95% CI:  $-3.50, -0.81$ ) and in mid/late pregnancy ( $\beta = -2.35$ , 95% CI:  $-3.92, -0.77$ ) as compared to women with low acculturation, with no significant decrease in stress observed for women with the highest levels of acculturation. There were no significant associations between psychological acculturation and stress in early pregnancy.

We then evaluated the association between proxies of acculturation and stress (Table 3). In unadjusted models, women who were second generation in the US had significantly higher levels of stress in overall pregnancy ( $\beta = 0.86$ , 95% CI:  $0.11, 1.61$ ) and in early pregnancy ( $\beta = 0.99$ , 95% CI:  $0.06, 1.92$ ) as compared to women who were first generation. However, these increases were attenuated and no longer statistically significant in multivariable models. Language preference for speaking/reading and the 2-level generation in the US variable were not significantly associated with stress in overall, early, or mid/late pregnancy.

Next, we analyzed the association between acculturation and change in stress from early to mid/late pregnancy (Table 4). In unadjusted and multivariable models, there were no significant associations between psychological acculturation and change in stress over pregnancy. Similarly, there were no statistically significant associations between language preference and generation in the US and change in stress over pregnancy.

## Discussion

In this prospective study of predominantly Puerto Rican women, after adjusting for important risk factors, women with bicultural levels of psychological acculturation had lower stress levels in overall and mid/late pregnancy as compared to women with low levels of acculturation. In contrast, women with the highest levels of acculturation did not have significantly different levels of stress as compared to women with low acculturation. In addition, there were no significant associations between proxy measures of acculturation such as English language preference and generation in the US and stress scores. Finally, there were also no significant associations between the acculturation measures and change in stress from early to mid/late pregnancy.

In our sample of Hispanic women, we observed mean stress scores of 26.2 in early pregnancy and 24.3 in mid/late pregnancy using the 14-item version of Cohen's Perceived Stress Scale (PSS-14). The use of different versions of this scale (e.g., the PSS-10 or the PSS-4) and different stress scales entirely (e.g., the Center for Epidemiologic Studies Depression Scale [CES-D]), make comparisons to the previous literature difficult. In addition, the majority of prior pregnancy studies did not include Hispanic women. However, our findings were higher than those observed by Laraia et al. who used the PSS-14 to evaluate stress before 20 weeks gestation among 606 participants (predominantly non-Hispanic white) who had incomes  $\leq 400\%$  of the poverty line (mean PSS-14 scores = 22.3, SD=8.14). Our scores were comparable to those reported among non-Hispanic white participants in the Stress in Pregnancy Study (SIPS) (mean PSS-14 scores = 26.4, SD=6.4) before 23 weeks gestation (34).

Prior studies which evaluated the association between acculturation and stress, were limited to samples of predominantly Mexican-American pregnant women (20,21). Zambrana et al. found that higher acculturation ( $r=0.196$ ,  $p<0.001$ ) and higher integration into the US ( $r=0.172$ ,  $p<0.001$ ) measured via the Cuellar scale were positively correlated with prenatal stress (PSS-8) at 30 weeks gestation while Mexican identity was negatively correlated ( $r=-0.146$ ,  $p<0.001$ ) (20). Campos et al. found that overall acculturation (ARMSA-II) scores were positively associated with stress (PSS-6) ( $r=0.06$ ,  $p<0.05$ ) at the first prenatal care visit while Mexican orientation was inversely associated with stress ( $r=-0.09$ ,  $p<0.001$ ) (21).

While we did not observe increased levels of stress with higher acculturation in our predominantly Puerto Rican sample, we did find that a bicultural identity was associated with decreased stress ( $\beta = -2.15$ ,  $p=0.002$ ). Similarly, in a prior study among the current study population, Barcelona de Mendoza found that Puerto Rican women with bicultural identification had significantly lower trait anxiety scores in early pregnancy  $\beta = -3.62$ , SE 1.1,  $p<0.001$ ) than low acculturated women (25), but did not evaluate the association with stress. Our observation of a decline of 2.15 points in the perceived stress scale (PSS) scores in overall pregnancy is equivalent to 0.30 standard deviations (based upon the observed standard deviations of 7.1 in early pregnancy and 7.3 in mid/late pregnancy) which falls in the range of a small to medium effect size as defined by Cohen (35) Prior studies have found that the size of the change in perceived stress was not as important as the simple presence of an increase or decrease in perceived stress. For example, Glynn et al. (22), in a study among 415 pregnant women (23% Hispanic) at 18–20 and 30–32 weeks' gestation found that any increase in perceived stress during pregnancy was a better predictor of preterm birth than the absolute levels of these variables at either of the gestational time points under study. Such shifts in the distribution of perceived stress could impact birth outcomes through a corresponding shift in the distribution of gestational length and birthweight as continuous outcomes.

The concept of bicultural straddling has been defined by Kao et al. as an ongoing process of adaptation resulting from living within two different cultural influences (36). It is an active process experienced by immigrants or children of immigrants as they balance influences from their original and adopted cultures. Few theories have been developed to effectively guide how this growing subpopulation is able to handle two different sets of cultural influences. In a review of the literature on the psychological impact of biculturalism, LaFromboise et al. concluded that those who develop bicultural skills may have better physical and psychological health than those who do not (37). This theory is consistent with our finding of a positive impact of bicultural acculturation on pregnancy stress.

Another possible explanation for the positive impact of bicultural acculturation on pregnancy stress is the complex interplay between biculturalism and other attitudes, values, and social patterns. For example, in a study among adolescents, Killoren et al. (38) found that biculturated adolescents (i.e., those with high levels of Mexican and Anglo involvement, familism values, and traditional gender role attitudes) had more favorable attitudes toward teen pregnancy (e.g., belief that having a child makes one important and earns the respect and admiration of others), and higher levels of family income, pregnancy intentions, pregnancy support, and educational expectations as compared to enculturated adolescents



(i.e., those with high levels of Mexican involvement and endorsement of familism values and traditional gender role attitudes, low levels of Anglo involvement).

In terms of proxies of acculturation, Ruiz et al. found that mean perceived stress (PSS-10) levels were higher among second (mean=19.4; 95% CI, 17.5–21.3) and third generation (mean=19.7; 95% CI, 18.5–20.9) predominantly Mexican American women as compared to first generation (mean=16.9; 95% CI, 16.2–17.6) women ( $p < .0001$ ) (18). Barcelona de Mendoza et al., in a prior study among the study population, found that Puerto Rican women with higher levels of acculturation as indicated by English language preference ( $\beta = 1.41$ , SE 0.7,  $p = 0.04$ ) and second or third generation in the US had significantly higher trait anxiety scores in early pregnancy ( $\beta = 1.83$ , SE = 0.6,  $p < 0.01$ ) (25). Similarly, in the current study we found that women who were second generation in the US had significantly higher levels of stress although these increases were no longer statistically significant in multivariable models. Differences in findings between measures of acculturation may be due to lack of congruence between length of time spent in the US and psychological attachment to the birth culture. Indeed, while the majority of our participants had low psychological attachment to the Puerto Rican culture (as most of the sample had low PAS scores), the majority of the sample preferred English and were second or third generation in the US.

We found that the impact of acculturation on psychosocial stress appeared to be greater in mid/late pregnancy as opposed to early pregnancy. Rates of stress have been found to decrease over the course of pregnancy, and predictors of pregnancy stress similarly vary according to pregnancy time period (39). Previous studies have observed pregnancy behaviors such as alcohol and smoking to be strong correlates of stress in early pregnancy while socioeconomic and acculturation factors are more important correlates of late pregnancy stress, perhaps when behaviors such as smoking have typically diminished (39).

There are strengths and limitations to our study. Strengths included the prospective design, the use of a bi-dimensional measure of acculturation, and the large sample of predominantly Puerto Rican pregnant women which contributes to the sparse literature on this understudied subgroup of Latinas. Our ability to evaluate within-woman change in perceived stress from early to mid/late pregnancy reduced the threat of confounding by baseline stress.

However, our study faces several limitations. Stress and acculturation were based upon self-report. Cohen's Perceived Stress Scale was not designed to be a diagnostic tool, and there are no established cut-points for high stress. Therefore, we were unable to evaluate the clinical importance of an increase in stress. It is also possible that women over- or under-reported their perceived level of stress, however the structured format of the interviews and the previous validation of the PSS minimize the threat of misclassification. Any misclassification that did occur is likely to be nondifferential and would bias the results towards the null.

Some participants were missing data on stress and acculturation. However, as sensitivity analyses showed no differences in descriptive characteristics between women who were missing stress and acculturation measures and those who were not, the impact of this missing data is likely minimal. Although we adjusted for a number of important

confounders, we lacked information on pre-pregnancy stress and prior history of stress; however, these factors have been strongly correlated with pregnancy stress. Finally, although we had information on measures of poverty such as health insurance, annual household income, and number of family members in the household, these variables did not qualify for inclusion in our multivariable models using the change-in-estimate procedure. Due to the limitations of this procedure, there remains the possible threat of confounding by these covariates.

Finally, the distribution of stress among Puerto Rican and Dominican women may differ from that found among non-Latinas or those from other Latina subgroups (e.g., Mexican Americans). In addition, acculturation may have a different association with stress depending on country/region of origin. Focus group findings among Puerto Ricans indicate that participants perceive poverty, food insecurity, lack of access to quality education, and unsafe environments as significant life stressors affecting maternal and child health (40) and are strongly implicated in their relatively high levels of psychological distress (8). Therefore, our findings may not be generalizable to non-Latina populations or other Latina subgroups.

## Conclusions

In conclusion, we found that women with bicultural psychological acculturation as measured by the PAS had lower stress in overall and mid/late pregnancy than less acculturated women, while proxies of higher acculturation (English language preference and generation in the US) were not significantly associated with stress in pregnancy. Our findings suggest that an integrated measure may be the most predictive of stress levels as compared to proxies of acculturation. These findings highlight the diversity of behaviors and values within a cultural context, and underscore the importance of examining multiple and bicultural indicators of acculturation among Latinas (38). Such an approach would provide a more complete picture of how pregnancy attitudes are embedded within the sociocultural context of pregnant women's lives.

Moving away from assumptions of the linear model of cultural acquisition, and the greater use of more sensitive measures of acculturation which include measures of biculturalism will facilitate future research. This research should also include the identification of modifiable predictors of bicultural acculturation, as research to date has focused primarily on the impact of acculturation on pregnancy psychological and health outcomes (37,41). A further understanding of biculturalism will inform the development of culturally sensitive intervention programs that are responsive to the struggles of immigrants to balance the norms of different cultural influences. In addition, our findings, and those of others, highlight the need to identify predictors of pregnant Latina's attitudes and cultural orientations, as well as their individual and family resources in identifying subgroups to target for these interventions.

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**Table 1.**

Characteristics of study participants; Proyecto Buena Salud, 2006-2012.

	<b>Total Sample (n=1426)</b>	
	<b>n</b>	<b>%</b>
<b>Sociodemographic Factors</b>		
Age		
16-19	445	31.2
20-24	556	39.0
25-29	255	17.9
30	170	11.9
Marital Status		
single/separated/divorced/widowed	1159	87.1
married	144	10.8
refused	28	2.1
Education		
< high school	647	48.2
high school graduate	425	31.7
some college/graduate school	269	20.1
Number of Adults in Household <sup>a</sup>		
0	0	0.0
1	339	25.5
2	632	47.6
3	358	26.9
Number of Children in Household <sup>a</sup>		
0	249	19.1
1	464	35.6
2	333	25.5
3	258	19.8
Health Insurance		
no insurance	5	0.4
private insurance	120	8.4
public insurance	1291	91.2
Annual Household Income		
<\$15,000	399	30.1
\$15,000-\$30,000	203	15.3
>\$30,000	93	7.0
Don't know/refused	633	47.7
Living with partner		
No	649	48.9
Yes	677	51.1
<b>Behavioral Factors</b>		

	<b>Total Sample (n=1426)</b>	
	<b>n</b>	<b>%</b>
Any smoking during pregnancy		
No	1184	83.9
Yes	228	16.1
<b>Medical History Variables</b>		
Parity		
Nulliparous	579	41.7
1	422	30.4
>2	386	27.8
Pregnancy Complications <sup>b</sup>		
No	1327	93.1
Yes	99	6.9
Number of prenatal care visits (mean, SD)	10.4	3.7
Prepregnancy Body Mass Index (kg/m <sup>2</sup> )		
underweight <18.5	86	6.2
normal weight 18.5-<25	658	47.5
overweight 25-<30	324	23.4
obese 30	316	22.8

Numbers may not add up to the sample total due to missing values

<sup>a</sup>Including the participant as appropriate: if <18 years, included as a child; if >18 years, included as an adult.

<sup>b</sup>Diagnosis of diagnosis of gestational diabetes, pregnancy induced hypertension, or preeclampsia in the current pregnancy

**Table 2.**

Perceived Stress Scores according to Level of Acculturation, Proyecto Buena Salud, 2006-2011

	Perceived Stress Score													
	Total Sample (n=1426)		Overall pregnancy			Early pregnancy			Mid/late pregnancy					
	n	%	mean	95% CI	<i>P</i> -value	mean	95% CI	<i>P</i> -value	mean	95% CI	<i>P</i> -value			
Psychological Acculturation Scale (PAS) (continuous score <i>B</i> )			25.0	24.6	25.4		26.2	25.8	26.7		24.3	23.9	24.7	
Psychological Acculturation Scale (PAS) (2-level)														
Low 3	1009	79.0	25.3	24.9	25.7	<b>0.046</b>	26.2	25.7	26.7	0.984	24.6	24.1	25.1	<b>0.014</b>
High 3	268	21.0	24.3	23.5	25.1		26.2	25.2	27.2		23.3	22.3	24.2	
Psychological Acculturation Scale (PAS) (3-level)														
Low (<3)	1009	79.0	25.3	24.9	25.7	<b>0.010</b>	26.2	25.7	26.7	0.250	24.6	24.1	25.1	<b>0.008</b>
Bicultural (3)	101	7.9	23.1	21.8	24.4		25.0	23.4	26.7		22.1	20.6	23.7	
High (>3)	167	13.1	25.1	24.1	26.1		26.8	25.6	28.0		24.0	22.8	25.2	
Language preference for speaking/reading														
Spanish	334	24.7	25.0	24.3	25.7	0.886	25.8	24.9	26.7	0.298	24.8	24.0	25.7	0.239
English	1016	75.3	25.1	24.6	25.5		26.4	25.8	26.9		24.2	23.7	24.7	
Generation in the United States														
First generation	646	46.6	24.6	24.1	25.1	0.072	25.8	25.2	26.5	0.102	24.0	23.4	24.6	0.346
Second or third generation	739	53.4	25.3	24.8	25.8		26.6	26.0	27.2		24.4	23.8	25.0	
Generation in the United States														
First generation	646	46.6	24.6	24.1	25.1	<b>0.019</b>	25.8	25.2	26.5	<b>0.026</b>	24.0	23.4	24.6	0.364
Second generation	658	47.5	25.5	25.0	26.0		26.8	26.2	27.5		24.5	23.9	25.1	
Third generation	81	5.9	23.7	22.2	25.2		24.7	22.8	26.5		23.5	21.8	25.3	

Numbers may not add up to the sample total due to missing values

*P*-values generated from linear regression and one-way ANOVAs.

<sup>a</sup>First generation: born in Puerto Rico/Dominican Republic, Second generation: at least one parent born in Puerto Rico or Dominican Republic, Third generation: Grandparents born in Puerto Rico/Dominican Republic

**Table 3.**

Unadjusted and multivariable linear regression results for effects of acculturation on perceived stress, Proyecto Buena Salud, 2006–2011.

	Perceived Stress Scale																	
	Overall pregnancy				Early pregnancy				Mid/late pregnancy									
	Unadjusted	B	95% CI	Adjusted <sup>a</sup>	Unadjusted	B	95% CI	Adjusted <sup>a</sup>	Unadjusted	B	95% CI	Adjusted <sup>a</sup>						
Psychological Acculturation Scale (PAS) (continuous score)	-0.67	-1.24	-0.10	-0.68	-1.25	-0.12	-0.40	-1.09	0.30	-0.47	-1.16	0.22	-0.91	-1.56	-0.25	-0.90	-1.55	-0.24
PAS - 2 level																		
Low (<3)	Referent			Referent			Referent			Referent			Referent			Referent		
High (3)	-0.92	-1.82	-0.02	-0.94	-1.83	-0.06	-0.01	-1.13	1.11	-0.09	-1.19	1.01	-1.32	-2.37	-0.27	-1.30	-2.34	-0.26
PAS - 3 level																		
Low (<3)	Referent			Referent			Referent			Referent			Referent			Referent		
Bicultural (3)	-2.13	-3.49	-0.76	-2.15	-3.50	-0.81	-1.15	-2.89	0.60	-1.32	-3.04	0.39	-2.46	-4.05	-0.87	-2.35	-3.92	-0.77
High (>3)	-0.19	-1.28	0.90	-0.20	-1.28	0.88	0.62	-0.72	1.96	0.59	-0.73	1.92	-0.63	-1.91	0.65	-0.65	-1.92	0.626
Language preference for speaking/reading																		
Spanish	Referent			Referent			Referent			Referent			Referent			Referent		
English	0.06	-0.78	0.91	-0.19	-1.04	0.66	0.56	-0.49	1.61	0.30	-0.76	1.36	-0.59	-1.56	0.39	-0.79	-1.78	0.195
Generation in the United States <sup>b</sup>																		
First generation	Referent			Referent			Referent			Referent			Referent			Referent		
Second or third generation	0.67	-0.06	1.40	0.50	-0.23	1.23	0.76	-0.15	1.66	0.53	-0.38	1.44	0.40	-0.43	1.24	0.28	-0.56	1.12
Generation in the United States <sup>b</sup>																		
First generation	Referent			Referent			Referent			Referent			Referent			Referent		
Second generation	0.86	0.11	1.61	0.70	-0.05	1.44	0.99	0.06	1.92	0.77	-0.16	1.70	0.51	-0.35	1.37	0.40	-0.46	1.26
Third generation	-0.89	-2.48	0.69	-1.20	-2.78	0.39	-1.18	-3.17	0.81	-1.50	-3.47	0.48	-0.49	-2.32	1.35	-0.79	-2.63	1.05

<sup>a</sup> Adjusted model included age, education, living with a partner, and smoking



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First generation: born in Puerto Rico/Dominican Republic, Second generation: at least one parent born in Puerto Rico or Dominican Republic, Third generation: Grandparents born in Puerto Rico/  
Dominican Republic  $B$  = Beta coefficient; SE = Standard Error

**Table 4.**

Unadjusted and multivariable linear and logistic regression results for the association between acculturation and change in stress from early pregnancy to mid/late pregnancy, Proyecto Buena Salud, 2006-2011.

	Continuous Change in Stress						Increase in Stress					
	Unadjusted			Adjusted <sup>a</sup>			Unadjusted			Adjusted <sup>a</sup>		
	<i>B</i>	95% CI		<i>B</i>	95% CI		OR	95% CI		OR	95% CI	
Psychological Acculturation Scale (PAS) (mean, SD)	-0.33	-1.05	0.39	-0.35	-1.07	0.38	0.92	0.73	1.16	0.92	0.73	1.16
PAS - 2 level												
Low (<3)	Referent						Referent					
High ( 3)	-0.80	-1.98	0.39	-0.81	-2.00	0.38	0.89	0.61	1.29	0.88	0.60	1.29
PAS - 3 level												
Low (<3)	Referent						Referent					
Bicultural (3)	-1.35	-3.21	0.52	-1.35	-3.22	0.52	0.94	0.52	1.70	0.93	0.51	1.70
High (>3)	-0.50	-1.92	0.92	-0.51	-1.94	0.92	0.86	0.54	1.36	0.85	0.53	1.35
Language preference for speaking/reading												
Spanish	Referent						Referent					
English	-0.63	-1.74	0.49	-0.57	-1.71	0.57	0.79	0.56	1.11	0.80	0.56	1.14
Generation in the United States*												
First generation	Referent						Referent					
Second or third generation	-0.21	-1.16	0.74	-0.16	-1.13	0.81	1.21	0.90	1.64	1.20	0.89	1.64
Generation in the United States*												
First generation	Referent						Referent					
Second generation	-0.22	-1.20	0.76	-0.18	-1.17	0.82	1.20	0.88	1.63	1.20	0.87	1.64
Third generation	-0.14	-2.25	1.97	0.00	-2.14	2.13	0.90	0.45	1.79	0.93	0.46	1.85

Numbers may not add up to the sample total due to missing values

<sup>a</sup> Adjusted model included age, education, living with a partner, and smoking

<sup>b</sup> First generation: born in Puerto Rico/Dominican Republic, Second generation: at least one parent born in Puerto Rico or Dominican *B* = Beta coefficient; OR = Odds ratios; CI = Confidence Interval