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Economic stress and cortisol among postpartum low-income Mexican American women: buffering influence of family support

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Abstract

Low-income Mexican American women experience significant health disparities during the postpartum period. Contextual stressors, such as economic stress, are theorized to affect health via dysregulated cortisol output. However, cultural protective factors including strong family support may buffer the impact of stress. In a sample of 322 low-income Mexican American women (mother age 18–42; 84% Spanish-speaking; modal family income \$10,000–\$15,000), we examined the interactive influence of economic stress and family support at 6 weeks postpartum on maternal cortisol output (AUCg) during a mildly challenging mother-infant interaction task at 12 weeks postpartum, controlling for 6 week maternal cortisol and depressive symptoms. The interaction significantly predicted cortisol output such that higher economic stress predicted higher cortisol only among women reporting low family support. These results suggest that family support is an important protective resource for postpartum Mexican American women experiencing elevated economic stress.

Keywords

Cortisol; social support; Mexican American; economic stress; perinatal

INTRODUCTION

As members of the largest and most rapidly expanding ethnic minority group in the United States,^{1,2} the postpartum health of Mexican American women is a public health issue deserving attention. During the perinatal period, Mexican American women experience significant socioeconomic and health disparities, scoring lower on a myriad of socioeconomic indices (e.g. income, education, health insurance, material deprivation)³, and higher on prenatal and postpartum depression⁴ than non-Hispanic white women. Perinatal health disparities are partly accounted for by lower socioeconomic status and higher exposure to related stressors.^{4,5} Approximately 25% of Mexican Americans live below the

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An additional seven women were flagged as potentially problematic due to low AUCg (n=1), single time point cortisol values > 3SD from the mean (n=3), thyroid or high blood pressure medication (n=2), and cervical cancer (n=1). When primary analyses were repeated excluding these cases, the results showed a small increase in statistical significance. Therefore all data were retained in analyses.

federal poverty level, compared to 12% of White Americans.⁶ Among pregnant women, economic hardship is associated with worse health status across the perinatal period,³ and poorer postpartum health among Latinas,⁷ making it imperative to understand the mechanisms through which economic hardship affects women's perinatal health.

The current study evaluated regulation of the hypothalamic-pituitary-adrenal (HPA) axis, a component of the body's stress response system commonly indexed by cortisol output, as a potential mechanism linking economic stress to perinatal health disparities in low-income Mexican American women. A well-regulated cortisol stress response is critical for adaptive cognitive, emotional, and behavioral responses to stress, as well as long-term bodily health.⁸ However, under conditions of chronic stress, the magnitude and patterning of the cortisol stress response can become dysregulated, resulting in cortisol output that is either too high or too low to meet environmental demands. Such dysregulation of the HPA axis has been implicated in a wide range of poor mental and physical health outcomes,^{9–11} and may be a pathway through which contextual stressors such as economic hardship and ethnic minority status contribute to perinatal health disparities.

The impact of chronic stress on hormonal stress response systems is uniquely salient for pregnant and postpartum women. The HPA undergoes significant changes and adjustments during the perinatal period.^{12,13} Maternal HPA dysregulation can increase the risk for poor maternal postpartum adjustment, which can negatively impact infant health and development.^{12,14–18} The connection between cortisol dysregulation and depressive symptoms has been found among low-income, non-pregnant Mexican American women^{19,20} and non-Hispanic white mothers in the postpartum period.¹⁷ A recent study including an ethnically diverse sample of pregnant women found that low socioeconomic status was associated with both elevated perceived stress and elevated levels of cortisol across the day.²¹

Despite elevated stress faced by low-income Mexican American mothers, most women navigate the transitions of pregnancy and childbirth successfully. The examination of culturally salient protective factors is essential for advancing research, as it may provide insight into how stress differentially affects health among ethnic minority women, and identify targets to promote resilience in this high risk population. Family-derived social support is theorized to be a primary protective factor for Hispanic women. The Mexican cultural value of *familism* emphasizes the importance of close and supportive immediate and extended family relationships, which are highly valued in Mexican American culture.²² Across minority and majority groups, higher endorsement of familism predicts higher available social support, which in turn predicts lower perceived stress. This relation, however, is strongest for Hispanic women,²³ suggesting that family support is a crucial protective resource for Mexican American women. Higher social support has been linked to better emotional well-being among low-income Hispanic women during the postpartum period.^{7,24} Positive perceived support from family members in particular is associated with better postpartum emotional health among Latina mothers.²⁵ Taken together, these findings highlight the family's unique protective role in promoting postpartum health in low-income Mexican American mothers.

The benefits of social support may extend to cortisol regulation as well. Studies in general population samples have found that high social support buffers against HPA-axis dysregulation.²⁶ Social support may buffer health by changing an individual's cognitive appraisal and response to stress, promoting health-protective behaviors, or through some combination of the two. It remains to be determined whether support buffers the impact of stress on postpartum maternal HPA activity. In a multi-ethnic sample of pregnant women, prenatal psychological distress was associated with elevated pregnancy cortisol among women with low support; however distress had little impact on cortisol for women with high support.²⁷ Support may have similar effects on postpartum maternal cortisol for low-income Mexican American women experiencing economic hardship.

The current study examined the interactive influence of economic stress and postpartum family support on cortisol response to a mildly challenging mother-infant interaction task in a sample of low-income Mexican American women. We hypothesized that for women reporting elevated economic stress, higher family support at six weeks postpartum would be associated with lower cortisol output at three months postpartum relative to women experiencing high economic stress and low family support. For women reporting low economic stress, family support was not expected to affect cortisol output at three months postpartum.

METHODS

Participants

Participants included 322 Mexican American women (mean age = 27.8, SD = 6.5, range 18–42). Data for the analyses were collected at three time points: prenatal (26–38 weeks gestation; mean 35.4 weeks, SD = 2.8), six weeks postpartum, and 12 weeks postpartum. Women were recruited from a prenatal clinic that serves low-income, uninsured, and/or undocumented women. Eligibility criteria included: 1) self-identification as Mexican or Mexican American, (2) fluency in English or Spanish, (3) age 18 or older, (4) low-income status (family income below \$25,000 or eligibility for Medicaid or Federal Emergency Services coverage for the birth), (5) no prenatal evidence of an infant health or developmental problem, and (6) delivery of a singlet baby. Demographic characteristics are displayed in Table 1.

Recruitment and retention

Female, bilingual interviewers approached women during prenatal care appointments and conducted a preliminary assessment of eligibility. Of women who were approached, 56% agreed to schedule a prenatal home visit, during which informed consent was obtained. To minimize participant burden, the study followed a “planned missingness” design in which all women were assigned to the six week visit, but a random 2/3 of the sample were assigned to the 12 week visit. Random assignment to planned missingness groups was determined by a computer algorithm prior to the first data collection. Of the 322 women who consented to the study, 312 (97%) completed the six week visit, and 205 (95%) completed the 12-week visit.

Procedure

The study was approved by the Internal Review Board and carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki). Interviews were conducted at participants' homes in their choice of Spanish (82%) or English (18%). Survey questions were read aloud, and women were given written and graphic descriptions of item response formats to compensate for differences in literacy. At the 12-week interview, saliva samples were collected from mothers before and after video-recorded mother-infant interaction tasks that began approximately 30 minutes after arrival in the home. Interviews lasted approximately two hours and were scheduled between 8:00 AM and 4:30 PM (median 11:30 AM). Women were compensated with \$75 and small gifts (e.g., bath oils) at the prenatal interview, and \$50 and small gifts (e.g., bath toys) at the six and 12 week interviews.

Measures

Economic Stress—At the prenatal visit, mothers were administered the 20-item Economic Hardship Scale (EHS; Cronbach's $\alpha = .72$),²⁸ developed for low-income families as a subjective measure of hardship. It is advantageous over objective measures such as family income due to difficulties accurately quantifying income in populations with unpredictable income (e.g., day laborers, irregular work hours), as well as problems interpreting the adequacy of a given income level based on unique life circumstances. Subscales include: Financial Strain, Inability to Make Ends Meet, Not Enough Money, and Economic Adjustments. Subscale scores were converted to z-scores and summed. Higher scores indicate more economic stress.

Family Support—At six weeks postpartum, women completed the family support subscale of the Prenatal Expectations Scale for Mexican Americans (PES-MA)²⁹, a six item measure of family support after childbirth (Cronbach's $\alpha = .93$). Developed specifically for low-aculturated Mexican American women, the PES-MA is a culturally-relevant measure of women's prenatal expectations and postpartum experiences. Sample items include "After your baby was born, family members stayed with you and helped take care of your baby", and "You received special help from family and friends". Responses were rated from "1" (Not at all) to "5" (Completely) and summed. Higher scores represent higher postpartum family support.

Depressive Symptoms—The 10-item Edinburgh Postnatal Depression Scale³⁰ was given at six weeks postpartum. A sample item includes, "You have blamed yourself unnecessarily when things went wrong". Two of the items were dropped because they were found to be inconsistent between English and Spanish versions. The remaining 8-items were summed to create a measure of maternal postpartum depressive symptoms ($\alpha = .82$). Higher scores represent higher depressive symptomatology. The EPDS has been validated in English³⁰ and Spanish.³¹

Control variables—Cortisol levels can be influenced by factors such as age, time of day, time of waking, and recent meals or exercise. These variables are not expected to explain relations between maternal stress, family support, and maternal cortisol, but adjusting for

variables that affect cortisol may increase efficiency in estimation.³² Covariates were included if prior research confirms their relation to cortisol and they were significant influences on cortisol in the current analyses. We treated postpartum depressive (PPD) symptoms at 6 weeks as a potential confound because prior research supports the association of PPD with maternal stress, social support, and cortisol.^{17,19,33–35} Therefore, we adjusted for six week depressive symptoms in the prediction of maternal cortisol at 12 weeks.

Cortisol Sampling—Structured, video-recorded mother-infant observational episodes were conducted at the 12 week visit to elicit mild frustration for mothers and infants and provide a context for cortisol sampling. The episodes included 1) Free play (5 mins), 2) Arm Restraint (2 mins),³⁶ 3) Soothing (3 mins), 4) Teaching task (5 mins; mothers are asked to “teach” her child a task from the Bayley Scales of Infant Development II³⁷ that reflects a skill 1–2 months beyond the infant’s capabilities), and 5) Peek-a-boo (3 mins). Saliva samples were obtained from mothers immediately before the first task (T0), and at 0 (T1), 20 (T2), and 40 (T3) minutes after the final task. Samples were obtained using Salivette devices (Sarstedt, Rommelsdorf, Germany), a small cotton swab that is held inside the mouth for 2 minutes. Saliva samples were frozen and mailed to Salimetrics where they were assayed for free cortisol. Cortisol levels at each of the four time points were used to calculate area under the curve with respect to ground (AUCg). We calculated AUCg for participants with at least three of four viable cortisol samples. AUCg was log-transformed to correct for deviations from normality. Although no cortisol values were outside normal physiological levels, (i.e., 45 nmol/L³⁸) analyses of outliers identified 3 women with cortisol AUCg values >3 SD from the sample mean who were removed from analyses¹.

Data Analyses

Analyses were conducted using the general analysis program MPlus³⁹ because of its capability for full information maximum likelihood estimation for the planned missing data design of the study, considered a superior method for handling missing data.⁴⁰ Economic stress, family support, and their interaction were entered into a single regression model to predict cortisol AUCg at 12 weeks, along with relevant covariates.

RESULTS

Preliminary Results

Zero-order correlations between study variables are shown in Table 2. Economic stress was positively correlated with six week depressive symptoms. Family support was negatively correlated with mother’s age and breastfeeding status, and positively correlated with education. Time of day, time of waking, and six week AUCg were the only variables significantly correlated with cortisol AUCg at 12 weeks. Therefore, time of day, time of waking, six week maternal cortisol AUCg, and six week depressive symptoms were included as covariates in the regression model.

Primary Results

The primary model predicted maternal cortisol AUCg at 12 weeks postpartum from economic stress, family support, and the economic stress by family support interaction,

adjusting for six week maternal cortisol AUCg and depressive symptoms, and time of day and time of waking at 12 weeks postpartum. The interaction term was significant, estimate = $-.001$, $SE = .001$, $p = .027$ (see Figure 1). The covariates time of waking (estimate = $.046$, $p = .003$), time of day (estimate = $-.088$, $p < .001$), 6-week depressive symptoms (estimate = $.008$, $p = .027$), and 6 week maternal cortisol AUCg (estimate = $.339$, $p < .001$) were also predictive of maternal cortisol at 12 weeks. As shown in Figure 1, cortisol levels were higher in women who reported higher economic stress and lower family support.

Post-hoc probing was conducted by evaluating the simple slopes at $\pm 1SD$ from the mean of social support (Aiken & West, 1991). For women with lower family support, the simple slope was significant ($p = .021$): higher economic stress predicted higher cortisol. For women with higher family support, the simple slope was not statistically significant ($p = .48$): economic stress did not predict cortisol.

DISCUSSION

Family and kinship networks assume an expanded role in child-rearing in Mexican culture, and may serve to protect new mothers from social and economic hardship.⁴¹ The current study examined the interactive influence of economic stress and family support on maternal cortisol output at 12 weeks postpartum during a mildly challenging mother-infant interaction task in a sample of low-income Mexican American mothers. As predicted, mothers who reported higher economic stress and lower postpartum family support had higher cortisol output at 12 weeks postpartum than mothers reporting higher family support. The precise risk associated with higher cortisol in this context is difficult to specify because the definition of a “normal” cortisol response is dependent on demographic, situational, historical, and other factors.⁴² However, high cortisol output is a potential form of physiological dysregulation⁸ that has been shown to be predictive of poor outcomes among general samples.^{9–11} Thus, these findings suggest that family support may serve as a critical protective resource for low-income Mexican American women experiencing economic stress during the perinatal period.

Uchino²⁶ reviews several mechanisms by which social support may protect health. One mechanism may operate through an individual’s cognitive appraisal and response to stress; received social support may increase confidence in one’s ability to cope with stressors. In turn, this confidence allows an individual to appraise and respond to stress in an emotionally and biologically well-regulated manner, avoiding the long-term health effects that can result from chronic stress and dysregulated emotional and biological responses. Social support may also protect health through improving health behaviors; for example, a new mother might receive help from family members to watch over her child after childbirth, giving her time to recover and take care of herself (e.g. sleep, eat a healthy snack). These cognitive and behavioral mechanisms may positively affect biological processes (e.g. cortisol release) associated with postpartum health. A recent study reported that social support buffered the impact of psychological distress on maternal cortisol during pregnancy.²⁷ The current study builds on these findings by demonstrating that family support may buffer the impact of economic stress on cortisol output in Mexican American mothers in the postpartum period.

Family support is an essential culturally-salient factor to investigate as a buffering agent for Mexican American mothers for several reasons. The cultural value of *familism*, which promotes the family as a central source of emotional and physical support, can be a core concept in Mexican Americans' conceptualization of their identities and social roles.^{22,43} A large proportion of women who immigrate from Mexico to the U.S. either live with family members or have family that reside within ten miles of their homes, making family a readily accessible source of support.⁴⁴ However, women who emigrate from Mexico without their families may be at higher risk for poor postpartum outcomes. A woman's mother has been specifically identified as an important family resource in aiding recovery and transition from childbirth,⁴⁵ and multiple studies find family support to be a protective factor against poor postpartum mental health outcomes.²⁵ Few studies, however, have considered the central role of family support as a protective mechanism against physiological regulation in the postpartum period.

Economic hardship during the perinatal period can set forth a trajectory of negative consequences for mother and infant that may be lessened with family support in low-income Mexican American women. Understanding the process through which family support buffers economic stress is essential for developing effective interventions aimed at reducing the health disparities experienced by low-income Mexican American women during the perinatal period. It has been suggested that interventions that target low-income ethnic women should focus on aspects such as building social support, as opposed to individual interventions.⁴⁵ Social support-enhancing interventions have shown promise for a wide range of patient populations.⁴⁶ The current results raise the intriguing possibility that interventions capable of enhancing family support may improve biological regulation in the postpartum period, which may have attendant benefits for mothers as well as infants. Future research can build on these findings by evaluating whether family support not only promotes well-regulated stress responses, but also protects women from stress-related perinatal health problems.

There are several limitations of the study. First, although economic stress likely exerts a considerable impact on the lives of the low-income women in the current sample, other stressors (e.g. interpersonal stress, pregnancy-related stress) may also influence cortisol output and health disparities during the perinatal period. Similarly, although family support has been shown in previous research to be uniquely beneficial for Mexican American women during the perinatal period,²³ other resources and forms of support such as a sense of mastery, paternal support, and community support are associated with improved postpartum health outcomes^{25,47-49} and warrant exploration in relation to cortisol regulation among Mexican American mothers. Second, we did not assess maternal cortisol during pregnancy, and are unable to examine changes in cortisol across the perinatal period or how stress and family support affect prenatal HPA activity. Finally, our sample only included low-income Mexican American women, the majority of whom primarily spoke Spanish and were born outside of the U.S. The results should not be generalized beyond this unique, high risk group.

CONCLUSIONS

Low-income Mexican American women are understudied in the health literature, despite having the highest rate of new births in the U.S.,² high rates of poverty and associated economic stress, and significant health disparities during the perinatal period relative to ethnic majority women.^{4,5} However, family support may serve a critical protective function for Mexican American women in a high stress context. The current study demonstrated that family support buffered the impact of high economic stress during the perinatal period such that among women who reported low family support, higher economic stress predicted higher cortisol output. For women reporting higher family support, economic stress did not predict cortisol. The study is strengthened by the use of a longitudinal design and an objective physiological outcome measure. The results provide insight into the process by which economic stress may affect perinatal health, identifying family support as culturally-salient protective resource for this high risk ethnic minority population.

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References

1. Martin JA, Hamilton BE, Ventura SJ, Osterman MJ, Wilson EC, Mathews TJ. Births: final data for 2010. *Natl Vital Stat Rep.* 2012; 61(1):1–72.
2. US Census Bureau. The Hispanic Population: 2010. Washington, DC: U.S. Department of Commerce Economics and Statistics Administration; 2011.
3. Stewart AL, Dean ML, Gregorich SE, Brawarsky P, Haas JS. Race/ethnicity, socioeconomic status and the health of pregnant women. *J Health Psychol.* 2007; 12(2):285–300. [PubMed: 17284493]
4. Liu CH, Tronick E. Rates and predictors of postpartum depression by race and ethnicity: results from the 2004 to 2007 New York City PRAMS survey (Pregnancy Risk Assessment Monitoring System). *Matern Child Health J.* 2013; 17(9):1599–1610. [PubMed: 23095945]
5. Goyal D, Gay C, Lee KA. How much does low socioeconomic status increase the risk of prenatal and postpartum depressive symptoms in first-time mothers? *Womens Health Issues.* 2010; 20(2): 96–104. [PubMed: 20133153]
6. US Census Bureau. Poverty rates for selected detailed race and Hispanic groups by state and place: 2007–2011. Washington, DC: U.S. Department of Commerce Economics and Statistics Administration; 2013.
7. Sumner LA, Valentine J, Eisenman D, et al. The influence of prenatal trauma, stress, social support, and years of residency in the US on postpartum maternal health status among low-income Latinas. *Matern Child Health J.* 2011; 15(7):1046–1054. [PubMed: 20652383]
8. McEwen BS, Gianaros PJ. Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. *Ann N Y Acad Sci.* 2010; 1186:190–222. [PubMed: 20201874]
9. Manenschijn L, Schaap L, van Schoor NM, et al. High long-term cortisol levels, measured in scalp hair, are associated with a history of cardiovascular disease. *J Clin Endocrinol Metab.* 2013; 98(5): 2078–2083. [PubMed: 23596141]
10. McEwen BS. The neurobiology of stress: from serendipity to clinical relevance. *Brain Res.* 2000; 886(1–2):172–189. [PubMed: 11119695]
11. Bjorntorp P, Rosmond R. Hypothalamic origin of the metabolic syndrome X. *Ann N Y Acad Sci.* 1999; 892:297–307. [PubMed: 10842670]

12. Glynn LM, Davis EP, Sandman CA. New insights into the role of perinatal HPA-axis dysregulation in postpartum depression. *Neuropeptides*. 2013; 47(6):363–370. [PubMed: 24210135]
13. Mastorakos G, Ilias I. Maternal and fetal hypothalamic-pituitary-adrenal axes during pregnancy and postpartum. *Ann N Y Acad Sci*. 2003; 997:136–149. [PubMed: 14644820]
14. Bloch M, Daly RC, Rubinow DR. Endocrine factors in the etiology of postpartum depression. *Compr Psychiatry*. 2003; 44(3):234–246. [PubMed: 12764712]
15. Ehlert U, Patalla U, Kirschbaum C, Piedmont E, Hellhammer DH. Postpartum blues: salivary cortisol and psychological factors. *J Psychosom Res*. 1990; 34(3):319–325. [PubMed: 2342000]
16. Grace SL, Evindar A, Stewart DE. The effect of postpartum depression on child cognitive development and behavior: a review and critical analysis of the literature. *Arch Womens Ment Health*. 2003; 6(4):263–274. [PubMed: 14628179]
17. Jolley SN, Elmore S, Barnard KE, Carr DB. Dysregulation of the hypothalamic-pituitary-adrenal axis in postpartum depression. *Biol Res Nurs*. 2007; 8(3):210–222. [PubMed: 17172320]
18. Sandman CA, Davis EP, Buss C, Glynn LM. Prenatal programming of human neurological function. *Int J Pept*. 2011; 2011:837596. [PubMed: 21760821]
19. Burke HM, Fernald LC, Gertler PJ, Adler NE. Depressive symptoms are associated with blunted cortisol stress responses in very low-income women. *Psychosom Med*. 2005; 67(2):211–216. [PubMed: 15784785]
20. Mangold D, Marino E, Javors M. The cortisol awakening response predicts subclinical depressive symptomatology in Mexican American adults. *J Psychiatr Res*. 2011; 45(7):902–909. [PubMed: 21300376]
21. Corwin EJ, Guo Y, Pajer K, et al. Immune dysregulation and glucocorticoid resistance in minority and low income pregnant women. *Psychoneuroendocrinology*. 2013; 38(9):1786–1796. [PubMed: 23541234]
22. Sagrestano LM, Feldman P, Rini CK, Woo G, Dunkel-Schetter C. Ethnicity and social support during pregnancy. *Am J Community Psychol*. 1999; 27(6):869–898. [PubMed: 10723538]
23. Campos B, Schetter CD, Abdou CM, Hobel CJ, Glynn LM, Sandman CA. Familialism, social support, and stress: positive implications for pregnant Latinas. *Cultur Divers Ethnic Minor Psychol*. 2008; 14(2):155–162. [PubMed: 18426288]
24. Martinez-Schallmoser L, Telleen S, MacMullen NJ. The effect of social support and acculturation on postpartum depression in Mexican American women. *J Transcult Nurs* Oct. 2003; 14(4):329–338.
25. Sheng X, Le HN, Perry D. Perceived satisfaction with social support and depressive symptoms in perinatal Latinas. *J Transcult Nurs*. 2010; 21(1):35–44. [PubMed: 19820171]
26. Uchino BN. Social support and health: a review of physiological processes potentially underlying links to disease outcomes. *J Behav Med*. 2006; 29(4):377–387. [PubMed: 16758315]
27. Giesbrecht GF, Poole JC, Letourneau N, Campbell T, Kaplan BJ. The buffering effect of social support on hypothalamic-pituitary-adrenal axis function during pregnancy. *Psychosom Med*. 2013; 75(9):856–862. [PubMed: 24163383]
28. Barrera M Jr, Caples H, Tein JY. The psychological sense of economic hardship: measurement models, validity, and cross-ethnic equivalence for urban families. *Am J Community Psychol*. 2001; 29(3):493–517. [PubMed: 11469118]
29. Gress-Smith JL, Roubinov DS, Tanaka R, et al. Prenatal expectations in Mexican American women: development of a culturally sensitive measure. *Arch Womens Ment Health*. 2013; 16(4):303–314. [PubMed: 23592028]
30. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry*. 1987; 150:782–786. [PubMed: 3651732]
31. Garcia-Esteve L, Ascaso C, Ojuel J, Navarro P. Validation of the Edinburgh Postnatal Depression Scale (EPDS) in Spanish mothers. *J Affect Disord*. 2003; 75(1):71–76. [PubMed: 12781353]
32. Sauer, B.; Brookhart, MA.; Roy, JA.; Vanderweele, TJ. Covariate selection. In: Venentgas, P.; Dreyer, NA.; Nourjah, P.; Smith, SR.; Torchia, MM., editors. *Developing a Protocol for Observational Comparative Effectiveness Research: A User's Guide*. Rockville, MD: Agency for Healthcare Research and Quality; 2013.

33. Gress-Smith JL, Luecken LJ, Lemery-Chalfant K, Howe R. Postpartum depression prevalence and impact on infant health, weight, and sleep in low-income and ethnic minority women and infants. *Matern Child Health J.* 2012; 16(4):887–893. [PubMed: 21559774]
34. Laurent HK, Ablow JC, Measelle J. Risky shifts: how the timing and course of mothers' depressive symptoms across the perinatal period shape their own and infant's stress response profiles. *Dev Psychopathol.* 2011; 23(2):521–538. [PubMed: 23786693]
35. Luecken, LJ.; MacKinnon, DP. Prenatal distress, temperament, and infant cortisol regulation in low-income Mexican American families. *World Congress for Infant Mental Health*; Edinburgh, Scotland. 2014.
36. Goldsmith, HH.; Rothbart, MK. The laboratory temperament assessment battery (LAB-TAB). University of Wisconsin; 1993.
37. Bayley, N. Bayley Scales of Infant Development- Second Edition (BSID-II). 1993.
38. Nicolson, NA. Measurement of cortisol. In: Luecken, LJ.; Gallo, LC., editors. *Handbook of Physiological Research Methods in Health Psychology*. Thousand Oaks, CA: Sage Publications, Inc; 2008. p. 461-474.
39. Muthén, LK.; Muthén, BO. *Mplus User's Guide*. 6. Los Angeles, CA: Muthén & Muthén; 2012.
40. Enders C, Bandalos DL. The relative performance of full information maximum likelihood estimation for missing data in structural equation models. *Struct Equ Modeling.* 2001; 8:430–457.
41. Garcia Coll C, Magnuson K. Cultural differences in beliefs and practices about pregnancy and childbearing. *Med Health R I.* 1996; 79(7):257–260. [PubMed: 8797327]
42. Shirtcliff EA, Peres JC, Dismukes AR, Lee Y, Phan JM. Riding the physiological roller coaster: Adaptive significance of cortisol stress reactivity to social contexts. *J Pers Disord.* 2014; 28(1):40–51. [PubMed: 24344886]
43. Knight GP, Gonzales NA, Saenz DS, et al. The Mexican American Cultural Values scales for Adolescents and Adults. *J Early Adolesc.* 2010; 30(3):444–481. [PubMed: 20644653]
44. Sherraden MS, Barrera RE. Prenatal care experiences and birth weight among Mexican immigrant women. *J Med Syst.* 1996; 20(5):329–350. [PubMed: 9001998]
45. Cunningham M, Zayas LH. Reducing depression in pregnancy: designing multimodal interventions. *Soc Work.* 2002; 47(2):114–123. [PubMed: 12019798]
46. Hogan BE, Linden W, Najarian B. Social support interventions do they work? *Clin Psychol Rev.* 2002; 22(3):381–440.
47. Collins NL, Dunkel-Schetter C, Lobel M, Scrimshaw SC. Social support in pregnancy: psychosocial correlates of birth outcomes and postpartum depression. *J Pers Soc Psychol.* 1993; 65(6):1243–1258. [PubMed: 8295121]
48. Heilemann M, Frutos L, Lee K, Kury FS. Protective strength factors, resources, and risks in relation to depressive symptoms among childbearing women of Mexican descent. *Health Care Women Int.* 2004; 25(1):88–106. [PubMed: 14742112]
49. Martinez-Schallmoser L, MacMullen NJ, Telleen S. Social support in Mexican American childbearing women. *J Obstet Gynecol Neonatal Nurs.* 2005; 34(6):755–760.

Figure 1. Economic stress, family support, and 12 week postpartum cortisol

Note: Interaction effects are graphically displayed at ± 1 SD from the means of economic stress and family support.

*Simple slope is statistically significant at 1 SD below the mean (Low Family Support), $p = .021$. The simple slope for High Family Support (1 SD above the mean) is not statistically significant, $p = .48$.

Table 1**Sample demographics**

Prenatal marital status – N (%)	
Married or living w/partner	249 (77%)
Not married or living w/partner	73 (23%)
Education – N (%)	
0 through 8 years of school	87 (27%)
Some high school completed	103 (32%)
High school graduate	86 (27%)
Some college, vocational or technical school	26 (8%)
College degree (BS/BA) or above	20 (6%)
Number of children – Range; M (SD)	
1–10; 2 (1.7)	
Country of birth – N (%)	
U.S.	44 (14%)
Mexico	277 (86%)
Family Income N (%)	
\$5,000	44 (14%)
\$5,001 – \$10,000	61 (19%)
\$10,001 – \$15,000	87 (28%)
\$15,001 – \$20,000	37 (12%)
\$20,001 – \$25,000	40 (13%)
\$25,001 – \$30,000	16 (5%)
\$30,001 – \$40,000	17 (5%)
\$40,000	12 (4%)
Language spoken in the home- N (%)	
English	58 (18%)
Spanish	264 (82%)
6 wk depressive symptoms M(SD)	
4.5 (5.0)	
Economic stress (z-score) M(SD)	
-.04 (3.0)	
Family support M(SD)	
18.2 (6.6)	

Table 2

Zero-order correlations

	1	2	3	4	5	6	7	8	9	10
1. Economic stress	1.0									
2. Family support	-.21*	1.0								
3. 12 wk Cortisol AUC _g ^a	-.02	.06	1.0							
4. Mother's Age	.15*	-.17*	-.05	1.0						
5. Education (yrs)	-.20*	.27*	.11	.29*	1.0					
6. Household income	-.25*	.19*	.00	.06	.24*	1.0				
7. Depressive symptoms (6 wk)	.22*	-.09	-.08	.10	-.04	.13*	1.0			
8. 6 wk Cortisol AUC _g ^a	-.003	.08	.42*	.00	.09	.00	.03	1.0		
9. Breastfeeding ^b	-.02	-.17*	.00	.16*	-.08	.06	.07	.03	1.0	
10. Time of day ^c	.07	-.10	-.55*	.05	-.07	.09	.00	.08	-.16*	1.0
11. Time of waking ^c	-.07	.05	.17*	-.32*	.04	-.03	-.07	-.02	-.01	.02

^a Log-transformed^b Coded 0 = bottle-feed only, 1 = partial or exclusive breastfeeding^c In minutes past midnight