Differential Effects of Objective and Subjective Economic Hardship and Daily Stress in Diurnal Cortisol Regulation in Low-income, Mexican-origin Dyads

Questions? Suggestions? Email me at eugarte@ucdavis.edu and follow the Hibel lab updates at https://hibellab.weebly.com/.

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Methods

Participants

The current study includes 72 Mexican origin mothers (Mage = 22.54 years, SD = 3.51) and their infants (Mage = 11.75 months, SD = 6.13, 40.28% female) participating in the California Babies Project, an ongoing NICHD-funded longitudinal study examining the development of self-regulation from infancy to early childhood. Mothers were recruited from the California Families Project database, an NIH study following 674 Mexican origin families. The second generation from California Families

Project were asked to participate in the California Babies Project if they were expecting or were new parents, and mothers were assessed as the primary caregiver. Data for this study were collected from February 2016 to January 2021. All mothers lived in a rural and urban area of Northern California and all of them identified themselves as Mexican or Mexican-American. Most mothers had completed high school (64%) and reported a modal income between $35,000-$40,000 annually.

Procedure

The study was approved by the Institutional Review Board of the University of California, Davis. Bilingual English-Spanish home visitors visited the families' homes when infants were six and eighteen months of age. After consent was provided, mothers completed questionnaires about their demographics, life experiences, parenting behaviors and their experiences of economic hardship. In addition, mothers were trained on saliva collection and how to respond to their EMAs administered through a free phone application called Metricwire® which has been previously used in behavioral studies. All mothers received a saliva collection kit for three days of participation and the option to use a project cell phone or their own phone to answer EMA questions and communicate with project staff.

During the visit, mothers and the home visitors agreed on a schedule for six days of participation during the following two weeks. Mothers practiced EMA questions with the interviewer during the home visit and were asked to answer emotion-related questionnaires three times a day: at wake, in the evening (preferably with their child present, before eating dinner), and during bedtime. The timing of each questionnaire was determined based on families' schedules. After this home visit, parents received $100 compensation.

As depicted in Figure 1, mothers reported their emotions during the first three days of participation (days 1 – 3) of the first week and added saliva collection (as well as emotions) from days 4 – 6 during the second week, resulting in a maximum of 18 occasions for emotion and 9 cortisol samples. Project staff monitored families' compliance with protocols during their participation via Metricwire®. Due to lack of compliance, which was defined as completing less than 75% of data collection, parents were asked to restart their participation. After two weeks of data collection, parents

were compensated with another $100. The most complete data from three consecutive days in the first week and three consecutive days in the second week were included in the study.

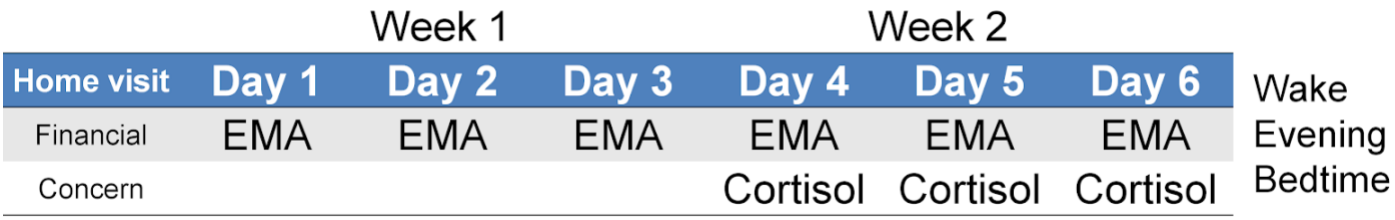

Figure 1. Study design.

Measures

Income to needs. Mothers reported on the family's annual total household income to the nearest $5,000 increment. Each increment corresponded to a number between 1 ("less than $5,000") and 20 ("$95,001 or more"). Mothers also reported the number of people living in the household. Annual income-to-needs ratios were calculated by dividing the family's reported income by the income value corresponding with the poverty line for a family of that size that year, as indicated by the U. S. Census Bureau (https://www.census.gov/data/ tables/time-series/demo/income-poverty/historical-poverty-thresholds.html). Income-to-needs ratios ranged from 0.10 to 4.1 with ratios of 1 or less indicating poverty.

Financial adjustments. 9-item subscale of the Economic Hardship Questionnaire probing for financial cutbacks made in the past three months (Conger et al., 1992). Includes items such as changing food shopping habits or shutting down air conditioning. The scale had acceptable reliability, Cronbach's a = 0.73.

Unmet material needs. Two subscales of the Economic Hardship Questionnaire (8 items, Conger et al., 1992) assessing lack of affordability of day-to-day needs. The scale had good reliability, Cronbach's a = 0.90.

Financial concern and strain. Two subscales of the Economic Hardship Questionnaire (7 items, Conger et al., 1992). Includes items such as "You have trouble sleeping because of your

financial problems" and "You are concerned because you cannot afford health insurance." The scale had good reliability, Cronbach's a = 0.86.

Maternal stress. Maternal stress was measured using the momentary collections of the Positive and Negative Affect Scale (Hajal et al., 2017) administered to mothers three times a day for six days through Metricwire®, during the morning, evening and at bedtime. Mothers answered how stress they were feeling in the last 30 minutes using a 0 to 100 sliding scale (0=Not at all, 100=Extremely).

Salivary Cortisol. During the home visit, mothers received saliva collection kits. Collection kits included pre-labeled sample tubes and saliva collection swabs for the children (SalivaBio, LLC). Mothers were instructed to collect saliva via swab for their infants and place it in the pre-labeled tube. Immediately after saliva collection, mothers were asked to submit a photo of the tube using the Metricwire® application, answering the corresponding EMA survey to have an objective measure of their collection times. Project staff observed the mother collect one practice sample from her and her child during the home visit, and provided feedback to ensure comprehension and compliance of the saliva procedure.

Participants provided three salivary samples per day: immediately upon waking, during the evening after the mother has spent time together with her child, and right before the child's bedtime. During each collection, they were instructed to refrain from eating, drinking, or brushing their teeth 20 minutes before collection. Text-based reminders were sent through the Metricwire® application. Parents were instructed to keep saliva tubes in provided storage bottles in their freezers until project staff would pick them up at the end of the second week of participation. After pick up, samples were stored in an ultralow freezer (-80° C) with a backup generator before all analyses (Granger et al., 2007).

Samples were analyzed using standard assays with a highly sensitive, commercially available enzyme immunoassay (Salimetrics, LLC) conducted by the Interdisciplinary Salivary Bioscience Research at the University of California, Irvine. After assay, cortisol values were inspected for

biological outliers. Cortisol values above 4.00 ug/dl were excluded and values between 3.00-4.00 were recorded as 3.00 ug/dl. After removing biological outliers, infants' raw cortisol values were log transformed to correct for positive skewness and screened for statistical outliers within 3 *SD* above or below the mean.

Analytic strategy

Control variables.

Associations between cortisol values and variables known to influence cortisol were explored before including them as covariates in the models. For mother's cortisol, there were significant associations with medication, maternal age, pregnancy, and whether the participant was tested after March 2020. There were no significant associations with children's age and sex, maternal education, protocol compliance, and wake time. Similarly, children's cortisol levels were associated with sex, age, medication, and study participation after March 2020 only.

Modeling caregiver and children's salivary cortisol across three days. To estimate dyadic diurnal rhythm, we fitted a linear two-level dual growth curve model with random intercepts and slopes for time of day, allowing the variance associated with specific evening and bedtime sample times to be accounted in the model while also including each member's intercept and slope as covariates. On average, mothers had 6.19 cortisol samples (*SD* =2.40), and infants had 5.67 cortisol samples (*SD* =2.34). The model with best fit did not include random effects of days. Therefore, our model represents the dyad's average cortisol across three days. Covariates and predictors were centered before the analysis. The proposed multilevel growth curve model was fitted using Mplus 8.3 (Muthen & Muthen, 1998-2019) using full maximum likelihood estimation with robust standard errors.