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Family Income and Appraisals of Parental Conflict as Predictors of Psychological Adjustment and Diurnal Cortisol in Emerging Adulthood

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The goal of the current study was to provide the first investigation of whether appraisals of parental marital conflict mediate associations of family income with emerging adult psychological adjustment and diurnal cortisol production. Participants were 178 college students who provided 3 saliva samples across the day and reported their family income, adjustment (depressive symptoms, perceived daily stress, internalizing problems, and externalizing problems), and appraisals of their parents' conflict (including perceptions of frequency, intensity, resolution, stability, as well as perceived threat and self-blame for conflict). Results indicated that emerging adults from low-income families reported more-negative conflict appraisals, which in turn predicted lower levels of adjustment; there was no association between income and patterns of cortisol production across the day. However, emerging adults who felt responsible for their parents' conflict displayed cortisol levels that were lower early in the day, with a tendency toward blunted cortisol slopes across the day; those who appraised their parents' conflict less negatively displayed a more normative pattern of cortisol production. These results suggest that effects of family income on psychological adjustment are explained, in part, by appraisals of parental conflict, particularly of appraisals of conflict as threatening, whereas self-blame conflict appraisals have main effects on cortisol, and predict a dysregulated and potentially maladaptive pattern of cortisol production across the day for emerging adults.

Keywords: family income, mental health, adjustment, diurnal cortisol, emerging adulthood, parental conflict, structural equation modeling

Growing up in a family experiencing low income or poverty has ramifications for physical and mental health, achievement, and socioemotional functioning (Evans, 2004) that persist from infancy into adulthood (Bradley & Corwyn, 2002). Family process models (e.g., Conger et al., 1991; Elder, 1974) highlight the importance of family relationships, which are disrupted by economic stress, as potent mediators of these effects. Past research has focused on disruptions in parenting as a mediator, despite arguments that marital conflict is an important mediator (e.g., Conger et al., 1991; Elder, 1974), and that children's appraisals of their parents' marital conflict are an important mechanism by which conflict operates (Grych & Fincham, 1990). In addition, a family process model has not been applied to understand whether family relationships mediate the consistently noted associations between income and stress physiology (e.g., circulating levels of the stress hormone cortisol) (Cohen, Doyle, & Baum, 2006; Evans & English, 2002; Li, Power, Kelly, Kirschbaum, & Hertzman, 2007; Lupien, King, Meaney, & McEwen, 2000). Rooted in family process models, the goals of the current study were to examine whether appraisals of parental marital conflict mediate associations between family income, adjustment, and stress physiology. These associations were examined in a neglected age period, "emerging adulthood" (Arnett, 2000), a period when family relationships are changing but are still important for offspring functioning (e.g., Larose & Boivin, 1998).

Family Income as a Predictor of Negative Developmental Outcomes

Across the life span and in many different racial/ethnic groups, individuals experiencing poverty or economic stress report more mental health and adjustment problems, including internalizing (e.g., Evans & English, 2002; Hammack, Robinson, Crawford, & Li, 2004) and externalizing problems (e.g., Conger et al., 1991). Low income individuals also report experiencing many more and often multiple stressors compared to other individuals (Evans & English, 2002; Hammack et al., 2004). Because individuals from low-income families report more stressors, researchers have examined whether income predicts stress physiology. Varied and multiple stressors can activate the hypothalamic-pituitary-adrenocortical (HPA) axis, an important arm of the human stress response system (e.g., Hostinar & Gunnar, 2013). Cortisol is the end-product of the HPA axis, and basal cortisol levels have been linked to numerous psychological and physical health outcomes (Chrousos, 2009).

A well-documented diurnal cortisol pattern has been observed, with healthy individuals showing a peak shortly after waking and then steady declines for the rest of the day (e.g., Stone et al., 2001).

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Deviations from this diurnal pattern are considered indicators of HPA axis dysregulation (e.g., Gunnar & Vazquez, 2001). Studies of children and adults investigating links between low income and basal cortisol levels have sometimes revealed blunted patterns of cortisol declines across the day (Agbedia et al., 2011), but other studies suggest increased levels of cortisol in the morning or at some points across the day in poverty samples (Brandtstädter, Baltes-Gotz, Kirschbaum, & Hellhammer, 1991; Kristenson, Kucinskiene, Bergdahl, & Orth-Gomer, 2001; Lupien et al., 2000; Steptoe et al., 2003; Wright & Steptoe, 2005). In other adult samples, low income predicts higher levels of evening cortisol (Cohen et al., 2006).

These discrepancies reflect larger inconsistencies in the chronic stress literature, as chronic stress can be associated with both elevated and low/blunted basal levels of cortisol, depending on the time of measurement in relation to stressor onset and duration, as well as on individual characteristics. Stressors typically lead to acute elevations in basal cortisol levels soon after stressor onset, but with time and chronicity, hormonal output is reduced; in particular, traumatic, uncontrollable, or life-threatening stressors that are chronic tend to elicit a flat pattern of cortisol production across the day, with lower morning and greater evening levels, sometimes leading to higher levels of total cortisol output across the day (Miller, Chen, & Zhou, 2007). These patterns are likely attributable to the self-rectifying feedback mechanisms of the HPA axis, which can shut down its own production and change set points in response to periods of prolonged activation (Hostinar & Gunnar, 2013). This down-regulation in HPA axis activity in response to chronic stress has been referred to as "hypocortisolism" (Gunnar & Vazquez, 2001) or the "attenuation hypothesis" (e.g., Susman, 2006). These atypical patterns of diurnal production have drawn much attention because of the fact that they are associated with a plethora of mental (e.g., Lauc, Zvonar, Vuksic-Mihaljevic, & Flogel, 2004) and physical health problems (Chrousos, 2009).

Family Process Mediators of the Effects of Family Income

Family process models (e.g., Conger et al., 1991; Elder, 1974) emphasize that the effects of low income on offspring are rarely direct but are instead mediated by the negative effects that economic stress has on family processes. When parents are experiencing economic pressure, they typically suffer as partners to each other and as parents to their children; this intense stress stems from situations that typically accompany economic stress including lacking resources, living in poor housing and neighborhood conditions, and facing reduced educational and employment opportunities (Evans & English, 2002). The marital and parenting difficulties that result from being low income or in poverty are considered reasonable responses to these stressors. Indeed, economic stress predicts increased hostility and decreased warmth and support in the marital relationship, thereby decreasing marital satisfaction (Conger et al., 1990).

The majority of research on family process models has focused on disruptions in parenting as mediators of the effects of income on youth outcomes (e.g., Conger et al., 1992; Conger et al., 1991; Hammack et al., 2004). Although parenting disruptions are clearly important in understanding negative effects of economic stress, marital conflict as a mediator separate from parenting has been understudied. However, marital conflict is a chronic stressor for the children who witness it and conflict exposure predicts poorer adjustment in childhood and adolescence, including both externalizing and internalizing problems (see Buehler et al., 1997 for a review).

As a potent stressor, marital conflict also interferes with children's abilities to regulate stress physiology (Repetti, Taylor, & Seeman, 2002). Cortisol produced across the day is sensitive to stressful experiences, particularly in close relationships (e.g., Gunnar & Donzella, 2002). Studies that have focused on basal or average daily cortisol levels indicate that family functioning and marital discord are important, although studies differ in whether they suggest that low family relationship functioning predicts elevated (Flinn & England, 1995; Pendry & Adam, 2007) or depressed (e.g., Granger et al., 1998) cortisol levels; inconsistencies may be attributable to child age (Lucas-Thompson, 2012) or differences in length of exposure (Kudielka, Hellhammer, & Wüst, 2009). Marital conflict may also predict deviations from the normal diurnal cortisol rhythm, an argument rooted in the attenuation hypothesis (Susman, 2006). Consistent with that hypothesis, Pendry and Adam (2007) found that children whose parents reported high marital functioning had steeper declines in cortisol across the day than children whose parents had low marital functioning; the same differences were not apparent in the adolescent group.

However, the effects of marital conflict are believed to be both direct and indirect (mediated by parenting; Fauber & Long, 1991). The two primary theoretical positions that explain the direct effects are (a) the cognitive-contextual model (Grych & Fincham, 1990) and (b) the emotional security hypothesis (Davies & Cummings, 1994). Both positions emphasize that observing marital conflict elicits emotional, behavioral, and cognitive responses in children, as well as attempts on the child's part to understand and cope with the conflict. These models differ in terms of whether emphasis is given to cognitive or affective responses to the conflict; however, both have provided compelling evidence that the effects of marital conflict are mediated by the negative cognitive and emotional responses that conflict elicits in children (e.g., Davies & Cummings, 1994; Grych, Seid, & Fincham, 1992). A goal of the current study was to provide the first investigation of whether perceptions of marital conflict mediate associations between family income and emerging adult adjustment and diurnal cortisol production.

Family Income and Perceptions of Marital Conflict

To our knowledge, there is no evidence that family income predicts conflict appraisals. However, conflict appraisals are shaped by characteristics of the conflict itself (Grych & Fincham, 1990), and are strongly related to parents' reports of marital conflict (Grych, Seid, & Fincham, 1992); because low income predicts greater marital problems (Conger et al., 1990), conflict property appraisals are likely more negative in youth from low-income families. Marital conflict may be more threatening to low-income youth because of concerns about how divorce may impact family finances; for instance, family income often drops dramatically after a divorce (Weiss, 1984). In terms of self-blame, parents from low-income families may argue more often about their children, because of links of low income with child academic and behavior problems (Linver, Brooks-Gunn, & Kohen, 2002); if

the marital conflict centers around finances, youth from low-conflict families may also be more likely to blame themselves because of their impact on family finances. Therefore, we examined whether low income is associated with more negative perceptions of parental marital conflict, and whether those perceptions mediated the effects of family conflict and emerging adult outcomes.

Appraisals of Marital Conflict, Adjustment, and Cortisol

Conflict appraisals are related to adjustment in childhood and adolescence (e.g., Fosco & Grych, 2008), even above and beyond effects of parent-reported conflict (Grych, Seid, & Fincham, 1992). There is limited evidence for associations between conflict appraisals and diurnal cortisol production, but how conflict is perceived and appraised by an observer may be especially important in terms of that individual's cortisol production, particularly as children age and there is increased separation from the family as well as increased cognitive sophistication. To our knowledge, no studies have investigated the role of offspring perceptions of conflict in diurnal cortisol production. Outside of the conflict literature, evidence suggests that physiological responses differ in large part because of the different ways individuals appraise stressful experiences (Kemeny, 2003), and that threat and challenge appraisals cause physiological stress responses (Tomaka, Blascovich, Kibler, & Ernst, 1997). Within the conflict literature, there is compelling evidence that the effects of marital conflict on adjustment are mediated by the cognitive and emotional responses that conflict elicits in children (e.g., Grych, Seid, & Fincham, 1992).

The types of appraisals that are considered most important are those about the nature of the conflict and of threat, self-blame, and coping ability (Grych, Seid, & Fincham, 1992). These three types of appraisals are sometimes found to have unique and independent effects on adjustment, at least in children (Fosco & Grych, 2008), thus we aimed to examine their separate effects on adjustment. It is currently unknown whether the HPA axis would be sensitive to each of these dimensions or would be more likely to react to global conflict appraisals. The only study to examine cortisol and two of these dimensions described 6- to 7-year-old children and found that perceived threat and self-blame were related to cortisol reactivity to a marital dispute (Koss et al., 2013), but diurnal cortisol was not examined. Given this major gap in the literature, we aimed to examine both a global conflict measure and the separate conflict dimensions in relation to diurnal cortisol to be able to test whether the diurnal HPA rhythm is sensitive to both. This study aimed to provide new and important information about how perceptions of marital conflict are associated with diurnal cortisol production in a sample of emerging adults from intact families.

Why Emerging Adulthood?

The period of roughly 18–25 years of age is increasingly being recognized as a unique developmental period (Arnett, 2000). These "emerging adults" experience many important transitions, and negotiating family relationships is key (Arnett, 2000). The quality of family relationships remains critical for the functioning of emerging adults (Larose & Boivin, 1998), and predicts psychological adjustment (e.g., Holahan, Valentiner, & Moos, 1994) as well as cortisol reactivity to a laboratory task (Luecken, Kraft, & Hagan, 2009). However, there is limited evidence for the effects of family-of-origin income on adjustment and physiology in this developmental period. Most past studies have focused on these effects in childhood or adulthood. However, effects of family income are theorized to be long-lasting (Bradley & Corwyn, 2002; McLeod, 1992). Furthermore, diurnal cortisol and measures of reactivity are often not measured in the same studies, making inferences challenging and requiring more empirical investigation of the diurnal rhythm itself. Lastly, the transitional (and therefore potentially stressful) nature of emerging adulthood often results in increased risk of stress-related and mental health problems (Arnett, 2007; Masten et al., 2004), and the mental and physical health trajectories that are established in emerging adulthood are theorized to have long-lasting consequences. As there is increased separation from the family and increased cognitive sophistication during emerging adulthood, how individuals think about and mentally represent their family relationships may be particularly important during this period. For these reasons, it is important to understand how family income predicts adjustment and cortisol in emerging adulthood, and whether conflict appraisals mediate these effects in this age group.

Hypotheses

We hypothesized that (1) family income predicts lower levels of adjustment as well as flattened diurnal cortisol patterns, and (2) conflict appraisals mediate associations between family income and negative outcomes, such that lower income predicts more negative appraisals which, in turn, predict adjustment problems as well as a flatter pattern of diurnal cortisol production. As indicators of adjustment, we considered self-reports of depressive symptoms, perceived daily stress, internalizing problems, and externalizing behaviors. Given our goal of testing whether the HPA axis is sensitive to each separate conflict dimension or global appraisals, we tested these associations in two separate structural equation models, one including a latent Perceived Conflict factor and the other examining each appraisal dimension separately but simultaneously.

Method

Participants

Participants were 178 college students (M age = 20.28 years, SD = 1.89) at a large university in California who were part of a larger study (n = 203) about family relationships and health; the subset of 178 included participants who agreed to provide saliva samples. Participants who declined did not differ from those who provided these samples in age, income, family conflict variables or mental health variables ($ps > .25$) and did not differ in gender distribution, $\chi^2(1) = 2.48$, $p = .12$. Participants whose biological parents were still married were recruited; participants were predominately (90%, n = 161) female, and were 44% (n = 77) Asian American, 19.43% (n = 34) Caucasian, 15.43% (n = 27) Hispanic American, and 21.14% (n = 37) other or mixed ethnicities; 3 participants did not report ethnicity. Participants reported a range of family income (from < $35,000 for 15.7% of them to > $150,000 for 15.7%) and parental education (from eighth grade

or less to graduate school), with a median yearly income of $80,000–94,000 and a median of 16 years of parental education. Six participants did not report family income.

Procedure

The research protocol was approved by the Institutional Review Board. Participants were recruited through a social science participant pool, and were given course credit for participation. At the laboratory, after providing informed consent, students completed questionnaires and were given instructions about taking saliva samples at home the next day. They were instructed that it was essential that they take samples at different but specific times of day: 1, 4, and 8 hours after waking. On average, participants woke at 8:15 a.m. (SD = 132 minutes), and took saliva samples at 9:43 a.m. (SD = 166), 12:41 (SD = 170), and 4:37 p.m. (SD = 201). Samples were taken using Salivettes (Sarstedt, Germany), and frozen until they were returned. Compliance was encouraged by sending reminders via text (94%) or email (6%) 15 minutes before each sample should have been provided (based on participant reports of their schedule). On collection days, participants completed a brief questionnaire about health behaviors relevant to the measurement of cortisol (e.g., MacArthur Research Network on SES and Health, 2000) as well as the time of waking and collection of each saliva sample, which was used to check compliance.

Measures

Family income. Students reported their family's approximate total gross income, selecting from one of 9 income brackets representing roughly $15,000 a year (e.g., $35,000–$49,999; range: 1–9, M = 4.79, SD = 2.83).

Marital conflict appraisals. Conflict appraisals were assessed using the Children's Perceptions of Interparental Conflict Scale (CPIC; Grych, Seid, & Fincham, 1992), an internally consistent, reliable, and valid measure of conflict appraisals (Grych, Seid, & Fincham, 1992) that has been validated for use through late adolescence (Bickham & Fiese, 1997). The CPIC is a 49-item questionnaire that assesses nine dimensions of interparental conflict: frequency, intensity, resolution, threat, coping efficacy, content (child or nonchild related), stability, self-blame, and triangulation, or the likelihood of the conflict involving the child. Answer choices are "true," "sort of true," and "false"; after reverse scoring, higher scores reflect more negative conflict appraisals.

In previous work with late adolescents, Bickham and Fiese (1997) found factor analytic evidence for three factors: *Conflict Properties* (frequency, intensity, stability, triangulation, and resolution), *Threat* (threat and coping efficacy), and *Self-blame* (content and self-blame). In this study, mean scores were calculated for each of these three dimensions. High scores on *Conflict Properties* (28 items, M = 1.74, SD = 0.50, Cronbach's alpha = .95) represent marital conflict that is perceived to occur often, be hostile and poorly resolved, have stable causes, and make the student feel caught in the middle. High scores on *Threat* (12 items, M = 1.59, SD = 0.42, Cronbach's alpha = .82) represent threatening conflict that the student feels unable to cope with. High scores on *Self-blame* (9 items, M = 1.25, SD = 0.26, Cronbach's alpha = .73) represent conflict that is often about the student and about which the student feels responsible. We examined model fit when the subscales were examined separately (as recommended by Bickham & Fiese, 1997), as well as when these three subscales were used to create a single latent variable.

Adjustment

Depressive symptoms. Participants completed the Center for Epidemiological Studies Depression Scale (Radloff, 1977), a widely used, reliable, and valid measure. The scale consists of 20 questions that assess symptoms from the last week. All 20 items were summed (after appropriate reverse scoring) so that higher scores represent more depressive symptoms (Cronbach's alpha = .86, M = 11.44, SD = 7.95; range = 0 to 43). Scores of 16 or above are considered to be clinically significant depression. This criterion was met by 50 participants.

Externalizing and internalizing behaviors. The Youth Self Report was used, which is a well-validated, reliable, internally consistent and widely used measure of adjustment (Achenbach & Edelbrock, 1987). The YSR was chosen over the Adult Self-Report (ages 18–59) version (a) because approximately 20% of our sample were between the ages of 17–18, which is within the age range of the YSR (11–18), and (b) to avoid using two instruments on the same sample. In addition to the great overlap between the two measures, any measurement error would be parsed out of the construct when Internalizing and Externalizing were combined with the other adjustment measures. Participants rated a series of statements in terms of how well they describe themselves ("not true," "somewhat/sometimes true," or "very/often true"). An externalizing score was created by summing responses to attention problems, delinquency, and aggressive subscales (M = 12.78, SD = 7.67; Cronbach's alpha = .84). The internalizing score was created by summing responses to anxiety/depression, withdrawal/depression, and somatic complaints subscales (M = 15.43, SD = 8.00; Cronbach's alpha = .87).

Perceived daily stress. Participants reported on daily hassles over the last month (Kanner, Coyne, Schaefer, & Lazarus, 1981). Daily hassles (e.g., regrets about past decisions, problems juggling multiple commitments) are strongly correlated with psychological symptoms (Kanner et al., 1981) and better capture aspects of psychological adjustment than scales which only document a small number of life events that can be due to chance (e.g., injury or death of close ones). A total hassle score was created by summing the endorsed hassles from the list of 60 possible (M = 21.6, SD = 10.56, range = 0 – 52; Cronbach's alpha = .93).

Diurnal cortisol. Cortisol was assessed via saliva because sampling in this way is simple and nonaversive. Cortisol concentrations in saliva are independent of flow rate, and reflect "free" levels in plasma (Riad-Fahmy, Read, Walker, & Griffiths, 1982). Samples were kept at −20°C until analysis. Thawed samples were centrifuged at 3000 rpm for 15 minutes before assay. Salivary cortisol levels were determined by a solid phase enzyme-linked immunosorbent assay (ELISA; IBL-America, Minneapolis, MN) with reported detection limits of 0.012 μg/dl. The cross reactivity was <1.25% with cortisone, progesterone, and corticosterone and <0.001% with other naturally occurring steroids. The intra- and interassay coefficients of variance were 3.46% and 3.48%, respectively. All samples were assayed in duplicate and averaged.

Analytic Plan

Data preparation. All variables were tested for normality before statistical analyses; the cortisol distribution was skewed and therefore log-transformed. Outliers were Winsorized (values more than 3 *SDs* from the mean were replaced with the value for the 99.7th percentile).

Missing data. To test whether data were missing completely at random (MCAR), Little's MCAR test was used on the larger sample of $n = 203$ participants. Data on variables used in any analysis reported in the present manuscript were missing completely at random (Little's MCAR test was not significant, $\chi^2 = 171.6$, $df = 165$, $p = .35$). Given that some participants had more than 5–10% missing cortisol data (12.3% refused all samples, 13.5% missing 2 samples, and 32.6% had 1 missing sample), we also tested whether cortisol samples were missing completely at random and indeed they seemed to be (Little's MCAR test: $\chi^2 = 13.2$, $df = 9$, $p = .15$).

Potential confounding variables. We tested whether each of the health behaviors and demographic variables were a significant predictor of the cortisol intercept or slope if the predictor was fixed (sex, age, amount of sleep during the previous night, physical health index, time of wake-up, exercise in the previous 8 hours) or by adding paths to individual cortisol values if the predictors were time-varying and had a different value at each sampling time (dairy or caffeine intake in the hour prior to sample collection). Each predictor was tested by itself. The only significant paths were the effect of total sleep during the previous night on the cortisol intercept, $\beta = -.05$, $SE = .02$, $p = .045$, and of dairy consumption on the midday cortisol sample, $\beta = .20$, $SE = .09$, $p = .02$, thus these covariates were the only ones included in subsequent analyses. We also controlled for whether participants were living at home, because family income was significantly lower among students living at home (mean approximately \$50–65,000 per year), compared to those moving away for college (mean approximately \$80–94,000 per year), which was a significant difference, $t(86.8) = 2.97$, $p = .004$ (similar effects were found using a variable representing how often students saw their parents).

Statistical analyses. Correlations and *t* tests were used to examine bivariate associations. Using Mplus (version 6.12, Muthén & Muthén, 2011), we then used a latent growth model to model the drop in cortisol across the day and structural equation modeling (SEM) to examine relations between constructs. SEM was used to allow for estimation of simultaneous paths for the use of latent factors to capture common variance, thus parsing out some measurement error of individual variables. We adopted a bottom-up approach to model testing by (1) testing the fit of the cortisol latent growth model, (2) using confirmatory factor analysis (CFA) to build Adjustment and Perceived Conflict factors, (3) examining the mediating role of a global Perceived Conflict latent factor and, subsequently, of each appraisal dimension separately. Both models were necessary given a gap in the literature regarding the sensitivity of the HPA axis to separate versus global appraisals of conflict (captured by the common variance in the three dimensions). A nonlinear latent growth model was fit to capture change in cortisol, with the slope parameters being 0, free, and 2 (given the nonlinear nature of diurnal cortisol production, an approach consistent with prior literature, McArdle & Epstein, 1987). Means of the intercepts/slopes and variances of cortisol were also freed to vary. Maximum likelihood estimation was used throughout. Model fit was assessed by examining the chi-square test (ideally, it should be nonsignificant), whether the root mean square error of approximation (RMSEA) is under .08, the comparative fit index (CFI) is greater than .95 and the standardized root-mean-square residual (SRMR) is under .08 (Hu & Bentler, 1998).

Results

Correlations, means, and *SD*s are presented in Table 1. All three conflict dimensions were significantly and positively related to each psychological adjustment outcome, which also were positively related to each other. Single cortisol samples were not correlated with any psychological measure. Family income was negatively correlated with Conflict Properties and Threat. However, there was no relation between total income and Self-blame.

Testing the Cortisol Growth Model

We began by testing the latent growth model for cortisol using Mplus, as previously described. Dairy consumption before the

Table 1
Descriptive Statistics for and Correlations Between Main Variables of Interest

	1	2	3	4	5	6	7	8	9	10	11
1. Conflict property	1										
2. Threat	.51**	1									
3. Self-blame	.40**	.43**	1								
4. Log cortisol 1	.06	.06	−.11	1							
5. Log cortisol 2	.11	.03	.09	.34**	1						
6. Log cortisol 3	−.02	−.01	.02	.28**	.40**	1					
7. Daily stress	.30**	.51**	.31**	.10	.05	−.01	1				
8. CESD depression	.30**	.53**	.37**	−.07	.01	−.01	.61**	1			
9. YSR internalizing	.34**	.50**	.25**	.02	.09	−.05	.41**	.66**	1		
10. YSR externalizing	.25**	.28**	.16*	.12	.06	−.03	.39**	.45**	.54**	1	
11. Family income	−.19*	−.17*	−.03	−.02	−.03	−.08	−.09	−.09	−.10	−.05	1
M	1.75	1.58	1.27	0.62	0.12	−0.06	21.6	11.41	12.56	15.30	4.76[a]
SD	0.50	0.40	0.28	0.48	0.63	0.67	10.56	7.90	7.68	8.21	2.8

[a] Corresponds to an income bracket of \$65–79,000 per year.
* $p < .05$. ** $p < .01$. *** $p < .001$.

second cortisol sample and total amount of sleep were kept as covariates in the model. Slope parameters were 0, free, and 2 (see Data Analysis plan). The covariance between the intercept and the slope was not significant, $\beta = -.04$, $SE = .06$, $p = .57$, thus it was set to zero. Latent growth model fit was excellent, $\chi^2 = .12$, $p = .73$, RMSEA $< .001$, CFI = 1, SRMR = .009, thus this model specification was kept in subsequent analyses.

Results of the Confirmatory Factor Analysis

Two latent factors were created to allow testing of our proposed questions: Adjustment and Perceived Conflict. The CFA showed good model fit for the measurement model, such that the latent Adjustment factor was well defined by CESD depression, YSR Internalizing, YSR Externalizing, and perceived Daily Stress as the four indicators (the standardized paths, i.e., factor loadings, were all significant and high: .77, .83, .65, and .82, respectively), and the Perceived Conflict factor was well-defined and paths were significant to the three conflict dimensions (Conflict Properties, Threat and Self-blame, loadings of .62, .84, and .53, respectively), with overall fit for this measurement model being adequate: $\chi^2(13) = 32.95$, $p = .002$, RMSEA = .09, CFI = .96, SRMR = .04.

Testing the Mediation Model

Given that the growth model and latent constructs were well-specified, we proceeded to test our two models, testing the mediating role of global and then separate conflict appraisals.

Global conflict perceptions model. We simultaneously tested the mediating role of global conflict perceptions for paths between (a) family income and adjustment and (b) family income and cortisol growth curve parameters. The model (see Figure 1) had good fit: $\chi^2(63) = 99.4$, $p = .002$, RMSEA = .057, CFI = .93, SRMR = .049. Family income had a significant path to perceived conflict, but no relation to the cortisol slope or intercept (see Table 2 for estimates). Similarly, Perceived Conflict was strongly related to Adjustment, but not to cortisol intercepts or slopes. Adjustment and cortisol factors were allowed to covary in this model, thus their potentially shared variance is accounted for in the model. There was evidence of mediation such that the indirect path from Income to Adjustment via Perceived Conflict was still significant after controlling for the direct path which was included in the model, $\beta = -.14$, $SE = .06$, $p = .03$.

Parallel conflict dimensions model. A model examining the three separate conflict dimensions as mediators was then tested. The three dimensions were allowed to covary with each other, effectively testing the unique contribution of each measure independent of others in the mediation model. The model had adequate fit that was comparable to that of the global conflict model, χ^2 (53) = 87.3, $p = .002$, RMSEA = .06, CFI = .94, SRMR = .045 (see Table 3 for estimates and Figure 2 for the structural model). Although low income predicted greater appraisals of both Threat and Conflict Properties, Threat was the only conflict dimension with a significant path to Adjustment. In addition, Threat was the only significant mediator of the association between income and Adjustment, because the indirect effect estimated in Mplus was significant, $\beta = -.09$, $SE = .04$, $p = .035$, even with the direct effect in the model. Similar to the global conflict model, cortisol parameters were not related to income or Adjustment. However, Self-blame was

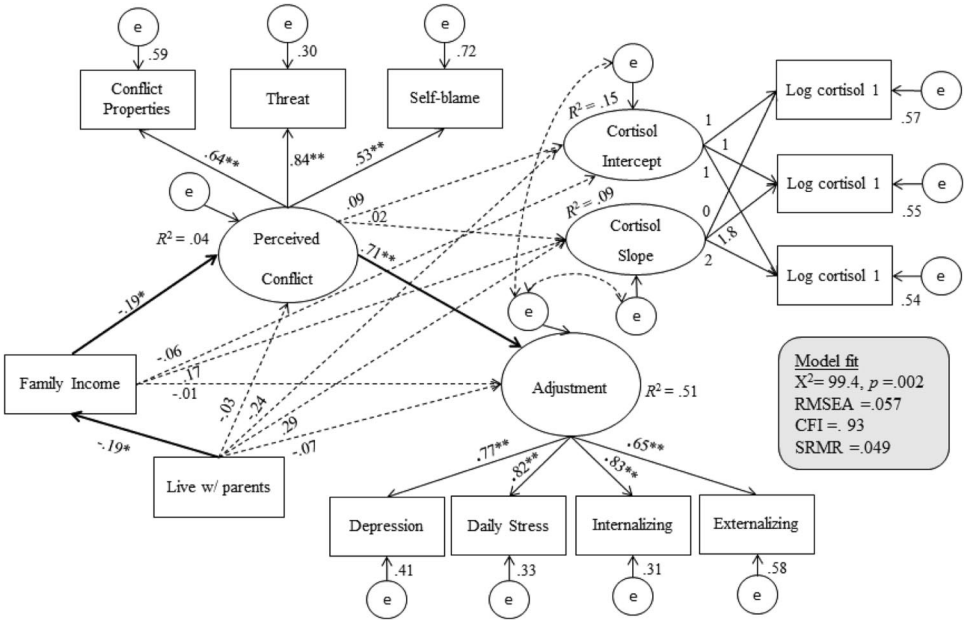

Figure 1. Results for the structural equation model testing the mediating role of global Perceived Conflict on the association of family income with Adjustment and cortisol. Standardized estimates for paths are displayed on arrows, 'e's are errors. Solid arrows are significant paths (structural paths in bold), nonsignificant associations are displayed as hashed arrows. Note: Paths from sleep to the cortisol intercept and from dairy consumption to log cortisol 2 were in the model (significant) but not displayed here for simplicity.

Table 2
Unstandardized (B) and Standardized (β) Estimates, Standard Errors (SE) and Significance Tests for SEM Model With Global Perceived Conflict Latent Variable and All Other Variables of Interest

	B	β	*SE*	*p* value
Intercept				
Log-cortisol 1	1	0.66		
Log-cortisol 2	1	0.49		
Log-cortisol 3	1	0.49		
Slope				
Log-cortisol 1	0	0.00		
Log-cortisol 2	1.8	0.46	0.19	<0.001***
Log-cortisol 3	2	0.51		
Log-cortisol 2 on				
Dairy	0.24	0.19	0.09	<0.01**
Adjustment by				
Depression	1.00	0.77		
Internalizing	1.06	0.83	0.10	<0.001***
Externalizing	0.85	0.65	0.10	<0.001***
Daily stress	1.42	0.82	0.14	<0.001***
Conflict by				
Threat	1.00	0.84		
Self-blame	0.45	0.53	0.07	<0.001***
Conflict properties	0.95	0.64	0.13	<0.001***
Intercept on				
Sleep	−0.04	−0.26	0.02	0.02*
Conflict	0.08	0.09	0.16	0.61
Income	−0.01	−0.06	0.02	0.67
Live w/parents	−0.17	−0.24	0.10	0.07
Slope on				
Conflict	0.01	0.02	0.10	0.94
Income	0.01	0.17	0.01	0.33
Live w/parents	0.11	0.29	0.06	0.07
Conflict on				
Income	−0.02	−0.19	0.01	0.03*
Live w/parents	−0.02	−0.03	0.07	0.74
Adjustment on				
Conflict	12.78	0.71	1.89	<0.001***
Income	−0.02	−0.01	0.16	0.89
Live w/parents	−0.99	−0.07	0.98	0.32
Income on				
Live w/parents	−1.21	−0.19	0.49	0.01*
Adjustment with				
Intercept	−0.06	−0.05	0.22	0.77
Slope	0.00	0.00	0.14	0.99

* $p < .05$. ** $p < .01$. *** $p < .001$.

significantly related to the cortisol intercept (and also marginally related to the cortisol slope); the nature of this association is represented in Figure 3. Emerging adults who reported more self-blame for their parents' conflict had significantly lower cortisol intercepts (and marginally less negative—i.e., flattened—slopes across the day). In addition, living with parents during college was also significantly associated with a lower intercept and a more flattened slope. This was independent of the effects of self-blame, threat, and conflict properties that were also included in the model.

Discussion

The goal of this study was to provide the first investigation of whether appraisals of marital conflict mediate associations of low income with emerging adult adjustment and diurnal cortisol production. Past research examining family processes as mediators of the effects of low income have focused on parenting; in addition, to our knowledge, no studies have examined whether family processes mediate associations between family income and diurnal cortisol production. This developmental period has often been

Table 3
Unstandardized (B) and Standardized (β) Estimates, Standard Errors (SE), and Significance Tests for SEM Model With Parallel Perceived Conflict Dimensions Tested as Separate Mediators

	B	β	*SE*	*p* value
Intercept by				
Log-cortisol 1	1	0.70		
Log-cortisol 2	1	0.52		
Log-cortisol 3	1	0.52		
Slope by				
Log-cortisol 1	0	0.00		
Log-cortisol 2	1.80	0.48	0.18	<0.001***
Log-cortisol 3	2	0.54		
Log-cortisol 2 on				
Dairy	0.24	0.18	0.09	0.01*
Adjustment by				
Depression	1	0.77		
Internalizing	1.06	0.83	0.10	<0.001***
Externalizing	0.85	0.65	0.10	<0.001***
Daily stress	1.42	0.82	0.14	<0.001***
Intercept on				
Sleep	−0.05	−0.27	0.02	<0.01**
Threat	0.06	0.07	0.13	0.67
Self-blame	−0.33	−0.28	0.16	0.03*
Conflict Properties	0.17	0.26	0.10	0.09
Income	−0.01	−0.04	0.02	0.77
Live w/parents	−0.19	−0.24	0.10	0.047*
Slope on				
Threat	−0.01	−0.02	0.08	0.92
Self-blame	0.17	0.29	0.10	0.08
Conflict Properties	−0.07	−0.21	0.07	0.26
Income	0.01	0.14	0.01	0.39
Live w/parents	0.12	0.29	0.06	0.047*
Adjustment on				
Threat	7.60	0.51	1.33	<0.001***
Self-blame	2.20	0.10	1.66	0.18
Conflict Properties	1.30	0.11	0.99	0.19
Income	−0.09	−0.04	0.15	0.54
Live w/parents	−1.00	−0.07	0.96	0.30
Threat on				
Income	−0.02	−0.17	0.01	0.03*
Live w/parents	−0.04	−0.04	0.07	0.56
Self-blame on				
Income	0.00	−0.02	0.01	0.79
Live w/parents	0.01	0.01	0.05	0.91
Conflict Properties on				
Income	−0.03	−0.16	0.01	0.04*
Live w/parents	0.02	0.02	0.09	0.83
Income on				
Live w/parents	−1.21	−0.19	0.49	0.01*
Adjustment with				
Intercept	−0.03	−0.02	0.21	0.91
Slope	0.00	0.00	0.14	0.99
Self-blame with				
Threat	0.05	0.43	0.01	<0.001***
Conflict properties	0.06	0.42	0.01	<0.001***
Threat with				
Conflict properties	0.10	0.52	0.02	<0.001***

* $p < .05$. ** $p < .01$. *** $p < .001$.

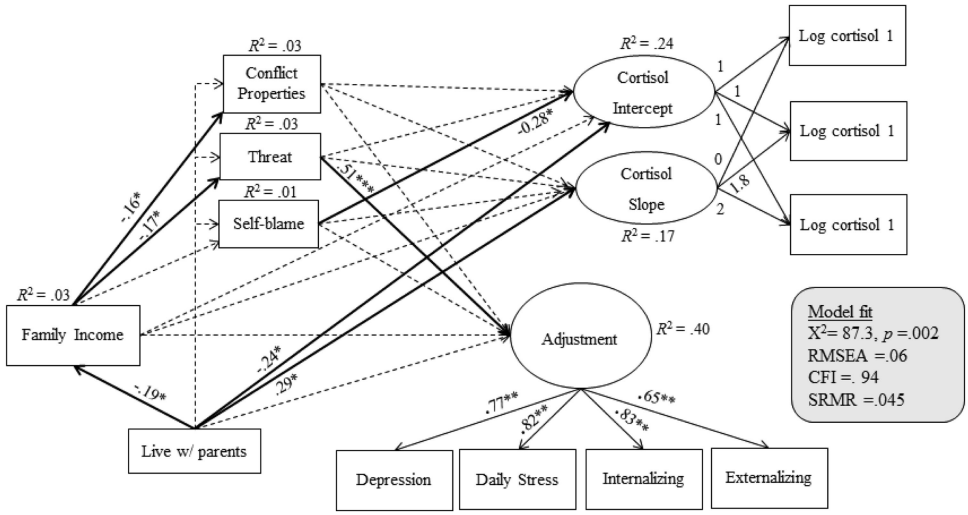

Figure 2. Results for the structural equation model testing the parallel mediating roles of the three conflict dimensions. Standardized estimates for significant paths are displayed next to solid arrows (see Table 3 for βs of nonsignificant paths, which are displayed as hashed arrows). Note: The following were included in the statistical model but not displayed here for simplicity: paths from sleep to the cortisol intercept and from dairy consumption to log cortisol 2 (significant); correlations between errors of cortisol intercept and cortisol slope, between Adjustment and cortisol intercept and slope, and between each pairwise combination of Conflict Properties, Threat, and Self-blame (see Table 3 for the nature of these associations).

neglected with respect to the study of how family processes continue to affect adjustment and stress physiology, despite the importance of better understanding this transitional period that is ridden with life changes and stress-related mental health problems (Arnett, 2007; Masten et al., 2004). As hypothesized, low family income predicted more-negative conflict perceptions, which in turn predicted poorer adjustment. However, results suggested that family income was not related to diurnal cortisol; instead, there were main effects of reports of self-blame for parental conflict on cortisol intercept (significant) and slope (marginally significant), which indicated that self-blame was related to lower cortisol levels early in the day and marginally flattened slopes across the day.

Past research has consistently provided evidence that experiencing economic stress predicts poorer mental health and greater life stress for children and adults (Evans & English, 2002; Hammack et al., 2004; Kahn, Wise, Kennedy, & Kawachi, 2000); our results are consistent with this evidence, but also extend family process models by indicating that these income effects are mediated by negative appraisals of marital conflict, particularly by appraisals of marital conflict as threatening to the emerging adult and beyond his or her coping abilities. In keeping with propositions of family process models (e.g., Conger et al., 1991; Elder, 1974), this study provides new evidence that the stressors associated with low family income may lead offspring, even emerging adults who may no longer be living at home, to perceive conflict more negatively. These appraisals, which may be accurate reflections of increased conflict and decreased marital satisfaction in low-income families (Conger et al., 1990), then likely lead to adjustment difficulties; however, it is also possible that emerging adults with greater psychological and adjustment problems interpret interpersonal conflict more negatively. Essentially, associations of family income with adjustment appear largely mediated by perceptions of family relationships that become disrupted in the presence of economic stress. Research has consistently supported this perspective (Conger et al., 1992; Conger et al., 1991; Hammack et al., 2004), but has focused on disruptions on parenting as a mediator. To our knowledge, no previous studies have examined whether conflict appraisals mediate associations between family income and offspring outcomes, despite arguments that increased marital conflict is a likely mediator of low income (e.g., Conger et al., 1991; Elder, 1974) and evidence that responses to stressful experiences are largely shaped by appraisals of those experiences (Kemeny, 2003). Our results provide support for family process model predictions that constructs relating to marital conflict are also important to consider; future research should simultaneously examine parenting and conflict appraisals as mediators of the effects of low income in the family of origin to examine their combined and unique effects.

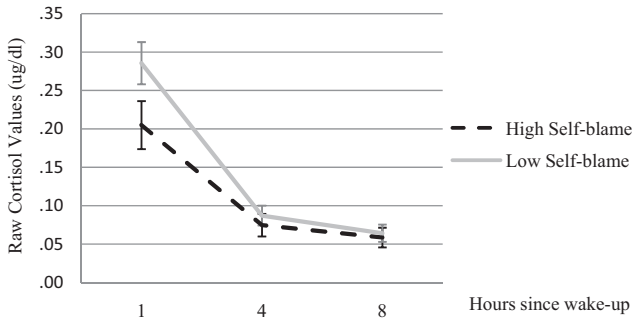

Figure 3. Self-blame (median split used to determine high vs. low groups) and diurnal cortisol production. Error bars represent SEMs.

Although there is robust evidence that family income is related to the total amount of cortisol produced across the day (Cohen et

al., 2006; Evans & English, 2002; Li et al., 2007; Lupien et al., 2000), few studies had examined whether income predicts the pattern of diurnal cortisol production. In this study, family income was not related to patterns of diurnal cortisol. More severe levels of poverty than were represented in this study may be necessary to predict diurnal cortisol patterns, whereas lower levels of income may be sufficient to predict adjustment. It is also possible that attenuation of the HPA axis is less likely to develop as a result of low income once emerging adults begin to leave the home. Most studies have examined parental income in childhood or own income in adulthood; future research should continue to explore how family-of-origin income differences predict mental health and cortisol through emerging adulthood as individuals become more independent from parents (Arnett, 2000).

Although income and cortisol production were not associated in the current study, perceptions of self-blame for parental marital conflict did predict lower cortisol levels produced early in day and, marginally, a flatter pattern of change in cortisol from morning to evening. By examining the dynamic pattern of cortisol production throughout the day, the current study provides support for the attenuation hypothesis (Susman, 2006) and suggests that feelings of blame for parental conflict are a stressor that appear to lead to down-regulation of the HPA axis. Essentially, those with less self-blaming conflict appraisals are displaying a pattern similar to the well-documented circadian rhythm of cortisol, with values that are higher early in the day that then steadily decrease throughout the day (e.g., Stone et al., 2001). In contrast, emerging adults who feel responsible for their parents' conflict display attenuated cortisol production patterns that deviate from this "normal" rhythm. Deviations like these are typically considered indicators of HPA axis dysregulation (Gunnar & Vazquez, 2001). A similar flat pattern has been demonstrated in other individuals who have experienced chronic stress (e.g., veterans with posttraumatic stress disorder; Lauc et al., 2004). In addition, a flat pattern of cortisol production has been linked with cognitive and mental health problems (e.g., Fiocco, Wan, Weekes, Pim, & Lupien, 2006) as well as suppressed immune function and, as a result, earlier mortality among cancer survivors (Sephton, Sapolsky, Kraemer, & Spiegel, 2000). Therefore, the results of this study suggest that emerging adults who feel responsible for their parents' conflict display a dysregulated and potentially maladaptive pattern of cortisol production throughout the day.

Previous research has suggested a similar pattern of a less-steep decline in cortisol levels throughout the day among those exposed to marital conflict, although in children and not adolescents (Pendry & Adam, 2007). Differences in results may be attributable to a focus in the current study on offspring appraisals rather than parental reports of conflict as in past research; appraisals may become increasingly important as offspring age and children increasingly separate from the family and develop in terms of cognitive sophistication.

The global Perceived Conflict factor was a significant mediator of effects of income on a wide array of adjustment and mental health problems; however, when examined individually it was perceptions that the interparental conflict was threatening to the student that seemed to carry the weight of the link between low income and adjustment. The aspect of marital conflict that appears particularly physiologically stressful for young adults is feeling responsible for the conflict and reporting that the conflict is often about the individual. These findings are consistent with evidence that different appraisal dimensions vary in terms of their predictive utility for offspring outcomes (e.g., Bickham & Fiese, 1997). College students often have limited contact with their parents compared with younger individuals; therefore, marital conflict may be easier to deal with, and may be less physiologically stressful, when the individual does not feel any blame or responsibility for causing the conflict, even when the conflict is frequent, intense, or hostile. Along these lines, conflict that feels threatening, and beyond a youth's coping abilities, may be the most likely to lead to adjustment problems; it may also be that youth with adjustment problems feel the most threatened by parental conflict. These explanations cannot be teased apart in this cross-sectional study, but future research should continue to explore these issues. It should also replicate these findings in younger samples to further understand why self-blame and threat seem more important for diurnal cortisol production and adjustment, respectively.

Interestingly, emerging adults living at home with their parents had lower early morning cortisol and flattened patterns of production across the day. During this developmental period in which youth are negotiating increased autonomy from parents (Arnett, 2000), it may be physiologically stressful to be creating those new roles while living with their parents. However, it is also possible that youth who display this potentially dysregulated physiological pattern are more likely than other youth to struggle with the challenges of living independently and may, therefore, choose to live at home. Future research should explore these possibilities.

Although important and novel, the current study is not without limitations. In particular, cortisol was measured on only one day, which makes it difficult to reduce sampling error resulting from day-to-day variations in cortisol production; furthermore, it would be ideal to collect more than three cortisol samples on each day to better capture waking and evening cortisol levels (MacArthur Research Network on SES and Health, 2000). In addition, although there were a range of appraisals evident in this sample, and family income ranged from less than $35,000 a year to more than $150,000 a year, the participants came from predominately well-educated and higher-income families. Future research should examine perceptions of financial security and relative inequality in relation to emerging adult adjustment and diurnal cortisol, as these dimensions may be most important in terms of understanding SES (Wilkinson, 1999). In recent years, roughly 40% of college students are employed (U.S. Department of Education, 2012); therefore, future studies should also consider the income that emerging adults earn themselves.

Participants were also predominately female, and were all attending a four-year college. Although rates of mental health problems are comparable in emerging adults who do and do not attend college (Blanco et al., 2008), future research should replicate these results with more diverse samples of male and female participants and should include young adults who are not enrolled in college to create a more representative sample. Furthermore, the correlational nature of the study precludes causal conclusions. The possibility that unmeasured confounding variables could explain associations between conflict appraisals and diurnal cortisol cannot be ruled out.

Despite these limitations, this study provides new information in emerging adulthood about the role of appraisals of parental conflict as a mediator of the effects of low family income on psycho-

logical adjustment, and as an independent predictor of diurnal cortisol production. This study suggests that emerging adults from low-income families report more-negative perceptions of parental conflict, which in turn predict poorer adjustment. In addition, those who perceive themselves to be to blame for their parents' conflict display an attenuated and potentially dysregulated pattern of diurnal cortisol production. As a result, these emerging adults from low-income families may be at greater risk for problems in multiple domains. Therefore, attempts to improve the long-term health of emerging adults may benefit from considering the ways that marital conflict is appraised, particularly in the context of low family income.

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