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Adrenocortical and psychosocial responses of families in Jordan to the COVID-19 pandemic

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Abstract

This study of 52 predominantly lower income Jordanian and Syrian families with young children (31 girls; $M_{\text{age}} = 53.37$ months, $SD = 3.53$) in Jordan began in 2019, before the pandemic. Families were followed to explore stress physiology, family functioning, and mental health over the first 9 months of the pandemic. Mothers reported less adaptive coping and more negative changes to family life in June 2020 when their children had poorer behavioral self-regulation and more behavior problems, and when families had lower income, in 2019. More negative changes to family life predicted greater hair cortisol concentrations in children in June 2020, and more negative changes and less adaptive coping predicted worse child and mother psychosocial adjustment in December 2020.

Approximately 16 months since cases of COVID-19 were first identified in China, more than 3 million individuals have died from the virus, and more than 141 million cases of infection have been confirmed (<https://coronavirus.jhu.edu>, April 19, 2021). Yet, no one has been untouched. Across the planet, governments have issued voluntary or mandatory restrictions on activities in their efforts to reduce COVID-19 transmission, which, in addition to fears of infection itself, have upended the daily lives of billions of people. Families have had their

social networks and support systems disrupted; schools and child-care centers have been closed, putting new demands on parents for coordination of remote education and constant at-home care; many parents have had their paid work hours reduced or have lost their jobs entirely, resulting in severe financial distress; and many parents have been required to work from home, alongside their children. These changes have placed considerable burdens on parents and families. Public health regulations have changed frequently, with restrictions being

Abbreviations: HCC, hair cortisol concentration; HPA, hypothalamic–pituitary–adrenal; HTKS, Head-Toes-Knees-Shoulders task; LMIC, low- and middle-income countries; SDQ, Strength and Difficulties Questionnaire; WLR, We Love Reading.

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imposed then lifted then imposed again, compounding families' experiences of unpredictability and instability. Over and above the threats to physical health and well-being from the COVID-19 virus itself, the cumulative impacts of these chronic social and economic stressors pose serious threats to the mental health and well-being of children and parents around the world (Brooks et al., 2020; Masten & Motti-Stefanidi, 2020).

Although families with young children in low- and middle-income countries (LMIC) are expected to be most adversely affected by the COVID-19 pandemic (Yoshikawa et al., 2020), most empirical studies have been conducted in Europe and North America (e.g., Paulauskaite et al., 2021; Thorell et al., 2021) or China (e.g., Duan et al., 2020). Most of these have been cross-sectional snapshots or brief longitudinal studies conducted after the onset of COVID-19 (e.g., Neubauer et al., 2021; Waller et al., 2021). Although these studies have provided important information on child and family functioning, the scarcity of studies with pre-pandemic information on children or families precludes our ability to disentangle pre-existing individual differences that contribute to functioning within the pandemic context from aspects of adjustment that are more likely attributable to experiencing the pandemic conditions themselves. Furthermore, almost all psychological studies have been motivated by concern for the stressful changes to daily life incurred by governmental efforts to curb the pandemic, yet to our knowledge, there have been no studies that included indices of children's or parents' stress physiology before and after the onset of COVID-19.

We conducted this prospective, multi-method, biopsychosocial study of families in Jordan with kindergarten-aged children in order to address these gaps and to inform intervention strategies that might be effective in supporting child development and family well-being in LMIC contexts during and after the COVID-19 pandemic, as well as in preparation for future public health crises. Specifically, we sought to examine (a) how family socioeconomic and child behavioral factors contributed to maternal and familial responses to the pandemic conditions, and (b) the implications of these responses for physiological and psychological well-being of children, mothers, and families in Jordan.

The COVID-19 pandemic in the national context of Jordan

Since Jordan's first recorded case of COVID-19 infection on March 2, 2020 (Ministry of Health, 2020), the added stresses of the COVID-19 pandemic and associated public health regulations have severely taxed a country that was already struggling. A stable country within the widely conflict-afflicted Middle East, Jordan hosts the second highest share of refugees per capita in the world; since 2011, most have been Syrian families.

Within Jordan's population of approximately 10 million, around 13% are Syrian refugees, 48% of whom are children age 15 and younger (UNHCR, 2019), further straining already-existing national challenges and raising public discontent and tensions (Francis, 2015). The education system has been overwhelmed by the task of providing education for all children and youth since the onset of the Syrian crisis. Split-day classrooms have decreased the number of hours of instruction for children, the quality of education has declined, and demands on in-home caregivers have increased. In this situation, the impact of the COVID-19 pandemic has been devastating (UNICEF Jordan, 2020).

Amongst many other measures, the government suspended day care, kindergartens and schools on March 15, 2020 (Alqutob et al., 2020). Two days later, a strict nationwide lockdown was imposed for 4 days. This was followed by several weeks of 6 p.m. to 10 a.m. curfew, and daylight travel only for food and essential services. From April 30 until June 6, public health restrictions were slowly eased and businesses re-opened (Ministry of Health, 2020), but all kindergartens and schools remained closed until the end of the academic year. With reported new cases of COVID-19 averaging 15.76 per day in early June, and a total of nine fatalities since the pandemic's onset, a majority of Jordanians approved of the government measures to protect them from COVID-19 (Center for Strategic Studies, 2020). Nevertheless, the mobility restrictions and social isolation are major concerns for families' psychological well-being because strong bonds and regular visits with extended family are central to the Jordanian culture (Shoup, 2007). Based on recent studies in other national contexts (e.g., Thorell et al., 2021), the prolonged closure of schools likely has impeded children's academic development and added stressors to the daily lives of families. The economic challenges of work restrictions also threaten families' health and well-being. According to large national surveys conducted in spring (United Nations Development Programme, 2020) and summer (UNICEF Jordan, 2020), 70%–90% of adults in Jordan experienced employment changes relative to before the pandemic, with the majority indicating that the changes had adversely affected their incomes and threatened their financial ability to meet basic subsistence needs (Brookings Doha Center, 2020).

From June through September 2020, public health regulations and restrictions were relaxed; however, as cases continued to climb through autumn, more restrictive regulations were reinstated. Just a couple of weeks after re-opening (The Jordan Times, September 2, 2020), most schools were closed again on September 17. October saw the beginning of weekly lockdowns on Fridays again, the traditional day for visiting family, and severe limits on activities were imposed in November (e.g., a 5-day period of 24-h lockdown; Garda World, 2020a, 2020b, October 22, 2020, November 2, 2020). Yet, by mid-December, new COVID-19 cases were averaging 2199 per day, with

cumulative fatalities rising to 3604 rates (Ministry of Health; <https://corona.moh.gov.jo/en/MediaCenter>). There were double the number of confirmed COVID-19 cases and triple the number of COVID-19 related deaths in December compared to November (OCHA Relief Wed December 11, 2020).

Thus, as is true across the world, all families in Jordan were affected to some degree by COVID-19 and its resulting public health regulations. Our research team was able to study these effects by leveraging a small but intensive study of families with 4- to 5-year-old children that began in 2019. With follow-up assessments in June and December 2020, we were able to examine both predictors of how families responded to the pandemic, and sequelae of their responses for child, mother and family well-being.

Child, parent, and family responses to the COVID-19 pandemic

In accord with the family stress model (Conger et al., 2010), chronic stressors of the pandemic, including quarantine, social isolation, financial stress, and balancing child care with work responsibilities, are likely to erode parents' self-regulatory capacities, mental health, and quality of parenting (Brown et al., 2020; Shorer & Leibovich, 2020). Large prospective studies with data before and after the onset of the pandemic indicate that adverse effects on adult mental health have been most pronounced in parents with young children at home, those already socioeconomically disadvantaged before the pandemic, and women (Kwong et al., 2020; Pierce et al., 2020; van der Velden et al., 2020). As with child care prior to the pandemic, care for children during the pandemic has fallen disproportionately on the shoulders of mothers (Collins et al., 2021; Rhubart, 2020). This is likely to come at the expense of mothers' mental health, which does not bode well for their children. The extent to which the pandemic conditions affect children's mental health and well-being is likely to depend upon their parents' abilities to maintain the children's sense of safety, support, and predictability in the home (Masten & Motti-Stefanidi, 2020; Prime et al., 2020).

Studies within the first few months of the pandemic support the validity of these concerns. Distress symptoms more than doubled in elementary school-aged children in China followed from October 2019 to March 2020 (Chen et al., 2020). Similarly, compared to 2019, Australian adolescents reported more anxiety and depression in May 2020, especially if they had experienced increased conflict with their parents (Magson et al., 2021). Many parents have reported marked tensions and conflicts in the home, and high levels of anxiety and depression symptoms (Brown et al., 2020). Parents of younger children have been particularly taxed by the demands of home-schooling (Thorell et al., 2021). In an

Israeli study, parents reported that their young children who experienced more COVID-related stressful events (e.g., close acquaintance losing job; media exposure to disturbing coronavirus information) had more emotional and behavioral problems (Shorer & Leibovich, 2020).

With a focus on documenting challenges and problems, few studies have examined how parents adaptively and effectively cope with the pandemic conditions, and whether this conveys benefits for parent and child well-being. Yet, anecdotal reports that some families are thriving through the pandemic have some empirical support. As indirect evidence of thriving, in those studies that have documented parental distress, family conflict, or child problems, some proportion of parents do not report such difficulties. More directly, across seven European countries, a sizable minority of parents reported that homeschooling was a positive experience for themselves and their children (Thorell et al., 2021), and a brief longitudinal study in Germany showed that the extent to which parents felt that their own and their children's needs were being met predicted subsequent parent well-being and family cohesion (Neubauer et al., 2021).

To further understanding the effects of the pandemic on families, in June 2020, we interviewed mothers in Jordan about the changes to family life, financial impacts, and adaptive coping responses they experienced over the first 3 months of school closures, lockdowns, curfews, and other pandemic-related disruptions. The pandemic did not end in June 2020; hence, we examined whether mothers' negative and positive reactions to the pandemic predicted subsequent family, mother, and child well-being in December 2020, during another period of strict restrictions in Jordan.

Predictors of responses to the COVID-19 pandemic

Parents already experiencing financial hardship or chronic trauma were likely to have had few economic, personal, and social resources that they could draw upon to buffer the adverse psychosocial effects of the pandemic's persistent disruptions (Masten & Motti-Stefanidi, 2020). The most economically vulnerable have been hardest hit by the pandemic conditions, presenting with more psychiatric symptoms (Kwong et al., 2020), and having a greater likelihood of experiencing extreme poverty (Yoshikawa et al., 2020). In this pandemic, parents on financial assistance have reported more parenting stress (Brown et al., 2020), and changes to employment and financial security due to the pandemic have undermined child and parent well-being (Neubauer et al., 2021; Waller et al., 2021). Many families in Jordan, including most of those in our sample, were experiencing financial hardship before the pandemic began, and families of Syrian origin were likely to have experienced trauma due to conflict and displacement.

Evocative child effects on parents have long been recognized (Bell, 1968; Lerner, 2002), with children who are difficult, defiant, or poorly self-regulated eliciting greater parental distress and punitive control (Hastings & Rubin, 1999; Patterson et al., 1992; Williford et al., 2007). To date, few empirical studies have examined how children's functioning may have contributed to parents' abilities to cope with the changes to family activities incurred by the pandemic. Parents reported more negative experiences of home-schooling when their children had pre-existing mental health problems (Thorell et al., 2021), and Paulauskaite et al. (2021) reported that most parents of young children with developmental delays and other challenging behaviors reported a wide range of parenting difficulties dealing with the pandemic. Conversely, from following families over 3 weeks in April 2020, Neubauer et al. (2021) found that having children who expressed more positive affect predicted parents' feelings of vitality and well-being.

In this investigation, we examined whether Jordanian mothers' negative and positive reactions to the conditions imposed upon their families by the COVID-19 pandemic in 2020 could be predicted by their families' income level and their children's behavioral self-regulation and behavioral problems in 2019.

Effects of the COVID-19 pandemic on stress physiology

The restrictions on activities, the curtailing of employment, the closing of schools, and the pandemic itself are events beyond the personal control of families. According to the allostatic load model, experiencing such pervasive and enduring stressors could carry a biological toll on the normative and healthy functioning of stress physiology systems (McEwen & Seeman, 1999; McEwen & Stellar, 1993). The hypothalamic–pituitary–adrenal (HPA) axis system is one of the body's primary stress reactivity and regulation systems (Gunnar & Adam, 2012), and its primary agent of activity, cortisol, can be detected in numerous tissues, including hair. The cumulative activity of the HPA axis over periods up to 3 months can be determined by assaying cortisol from hair samples (Stalder & Kirschbaum, 2012). Experiencing more financial hardship has been associated with higher hair cortisol concentrations (HCC) in adults (Stalder et al., 2017) and children (Gray et al., 2018). Parents experiencing symptoms of “parental burnout” evince greater HCC (Brianda et al., 2020), and children's HCC has been found to be positively associated with maternal depression (Liu et al., 2020), although findings have been inconsistent across studies (Bryson et al., 2021; Gray et al., 2018). A prior study documented the feasibility of collecting hair samples for assaying cortisol in a Jordanian sample (Dajani et al., 2018), and showed that adolescents with greater concern about personal, familial, and financial security had greater HCC.

In this investigation, we examined whether the effects of the pandemic on family functioning were associated with mothers' and children's HCC in June 2020, after the first 3 months of the pandemic, and accounting for their pre-pandemic HCC in 2019.

Goal and hypotheses

We had access to a sample of predominately lower-income families with young children in Jordan from whom we had collected pre-pandemic data as part of a study that aimed to explore joint attention processes during play and book reading activities of Jordanian and Syrian mothers and their preschoolers, and whether joint attention processes and play/book-sharing styles changed in response to the child participating in the NGO's We Love Reading (WLR) program. The conditions of the pandemic did not allow us to complete the original study as planned. However, we were able to re-contact participants to collect data during the pandemic, enabling us to conduct an exploratory study of how pre-existing child and family characteristics predicted familial responses to the COVID-19 pandemic conditions, and the implications of these responses for physiological and psychological functioning.

We hypothesized (H1) that mothers with fewer economic resources and with more challenging children in 2019 would report experiencing more negative impacts and less adaptive coping in June 2020, after the first 3 months of the COVID-19 pandemic. (H2) We predicted that more negative impacts and less adaptive coping would predict mothers' and children's elevated HCC in June 2020, reflecting the cumulative activity of their HPA axes over the first 3 months of COVID-19 public health regulations and restrictions, relative to their HCC prior to the pandemic. (H3) We predicted that more negative impacts and less adaptive coping would predict worse psychosocial adjustment of children over the course of the pandemic, relative to their adjustment prior to the pandemic. (H4) We predicted that more negative impacts and less adaptive coping would predict worse psychosocial adjustment of mothers and children 6 months later, in December 2020.

METHOD

Participants

Participants in the present investigation were mothers and their preschool-aged children recruited by a local NGO, in the greater Amman region in Jordan. In 2019, families were recruited by letters distributed through early childhood education centers and public community spaces, inviting parents to provide their phone number to be contacted for study participation. The recruitment

targeted both Jordanian and Syrian families (urban Syrian refugees). In total, 76 mothers (of which 15 identified as Syrian) and their 4- to 5-year-old children participated in the initial data collection in 2019 (baseline; Time 1, T1). Of that original sample, 52 mothers agreed to participate in procedures conducted in June 2020 (follow-up 1; Time 2, T2), approximately 10 months after the first assessment, and/or in December 2020 (follow-up 2; Time 3, T3), with 49 mothers participating at each of T2 and T3 (3 mothers who participated at T3 had not participated at T2). Reasons for attrition were refusal ($n = 3$), did not answer calls ($n = 11$), or contact number was permanently disconnected ($n = 10$). The latter was the primary reason for dropout of Syrian families ($n = 7$) because they often cannot access or afford longer-term mobile plans (GSMA, 2017a, 2017b).

All subsequent details pertain to the 52 families with data in 2020. Demographic information on the families across the three waves is in Table 1. The primary language spoken at home was Arabic for all families. At T1, most children ($n = 40$) were enrolled in day care or kindergarten; children attended classes on 3–5 days per week for, on average, 4.38 h per day ($SD = 1.87$, range between 2–8 h per day). At T3, 14 mothers reported there had been COVID-19 infections in their family, including four hospitalizations and four deaths.

Procedure

Only procedures pertinent to the current analyses are described. All procedures and materials were approved by the Institutional Review Board. In 2019 (T1), prior to the COVID-19 pandemic, families were visited at their homes by two trained local researchers. After providing consent, the mother was administered questionnaires by one researcher, while the child completed the Head-Toes-Knees-Shoulders task (HTKS) with the second researcher in a separate room. Then, hair samples were taken from mothers and children, contingent on separate consent, as recommended by local partners in recognition of the cultural appropriateness of the collection of biological samples. Mothers received monetary compensation and children received sweets for their participation.

At T2, the same two researchers conducted in-depth semi-structured interviews via telephone with 49 mothers, asking about economic and psychosocial aspects of their lives since the onset of the pandemic and public health restrictions. Using a video call feature, the researcher guided the mother on collecting hair samples from herself and her child, contingent on consent. Mothers were asked to complete an online questionnaire (using Google Forms) that included the same questions on their child's behavioral functioning as in 2019 (T1). Due to technical problems and/or internet connectivity problems, the responses of five mothers to the online

questionnaire were not saved and thus missing. Mothers received monetary compensation for their time.

At T3, mothers were re-contacted and invited to complete another online questionnaire (using Google Forms) that included the same questions about their child's behavioral functioning and new questions about their own health, perceived parenting stress, and COVID-19 related impacts on their family. Mothers were compensated for their time.

Measures

Child's behavioral regulation

The HTKS was used as a measure of children's behavioral regulation at T1 (Cameron Ponitz et al., 2008, 2009). The task includes 20 items. The first 10 items use two commands that are paired (e.g., “touch your head” and “touch your toes”). The following 10 items add two new paired commands (e.g., “touch your shoulders” and “touch your knees”). For each item, the child is asked to do the opposite of what the examiner says. The items were scored with 0 for an incorrect response, 1 for a self-corrected response, or a 2 for a correct response. Thus, scores range between 0 and 40, with higher scores reflecting higher levels of behavioral regulation (Cronbach's $\alpha = .81$).

Child's psychosocial adjustment

The parent report version of the Strength and Difficulties Questionnaire (SDQ; Goodman, 1997; Arabic version available from <https://www.sdqinfo.org/a0.html>) for children ages 4–17 years, which has been used effectively with this population (Alyahri & Goodman, 2006), was used to assess child's behavior problems at all three measurement points. We used the total difficulties score, the sum of 20 items assessing emotional problems (5 items), conduct problems (5 items), hyperactivity problems (5 items), and peer problems (5 items), each rated on a 3-point scale (1 = *not true*, 2 = *somewhat true*, 3 = *certainly true*; Cronbach's α ranged .65–.77). The total difficulties score of the SDQ is a robust predictor of children's concurrent and prospective mental health problems (Goodman & Goodman, 2009; <https://sdqinfo.org/>); thus, we used it as a multidimensional indicator of children's psychosocial adjustment.

Hair cortisol concentration

Hair samples were obtained from mothers and children at T1 and T2. The researcher (T1) or mother (T2) cut hair strands from as close to the scalp as possible, at the back of the head. The hair sample was then secured to a paper

TABLE 1 Means, standard deviations, and frequencies for sample demographics across three assessments

Variables	Baseline (2019)			Follow-up 1 (June 2020)			Follow-up 2 (December 2020)					
	N	%	M	SD	N	%	M	SD	N	%	M	SD
Participating families	52				49				49			
Jordanian	44	84.62	—	—	41	83.67	—	—	41	83.67	—	—
Syrian	8	15.38	—	—	8	16.33	—	—	8	16.33	—	—
Girls	31	59.62	—	—	30	38.78	—	—	29	59.18	—	—
Boys	21	40.38	—	—	19	61.22	—	—	20	40.82	—	—
Child age (months)	—	—	53.37	3.53	—	—	61.43	4.39	—	—	69.45	5.81
Number of children in the home ^a	—	—	2.53	1.25	—	—	3.35	1.15	—	—	3.13	1.15
Number of adults in the home	—	—	3.22	1.35	—	—	2.34	1.24	—	—	2.28	0.76
Socioeconomic status												
Poverty (<350 JOD ^b)	19	36.54	—	—	18	36.73	—	—	26	53.06	—	—
Low income (350–850 JOD)	20	38.46	—	—	19	38.77	—	—	18	36.73	—	—
Middle-high income (>850 JOD)	8	15.38	—	—	8	16.33	—	—	4	8.16	—	—
Declined to state income	6	11.54	—	—	4	8.16	—	—	4	8.16	—	—
Fathers employed	44	84.62	—	—	37	84.09	—	—	39	79.59	—	—
Mothers employed	18	34.62	—	—	12	27.27	—	—	16	32.65	—	—
Maternal education level												
Primary education	10	19.23	—	—	9	18.37	—	—	10	20.40	—	—
Secondary education	13	25.00	—	—	13	26.53	—	—	11	22.45	—	—
2-year college degree or higher	25	48.08	—	—	24	48.98	—	—	24	48.98	—	—
Declined to state	4	7.69	—	—	3	18.37	—	—	4	8.16	—	—
Paternal education level												
Primary education	14	26.92	—	—	13	26.53	—	—	14	28.57	—	—
Secondary education	14	26.92	—	—	13	26.53	—	—	12	24.49	—	—
2-year college degree or higher	20	38.46	—	—	20	40.82	—	—	19	38.78	—	—
Declined to state	4	7.69	—	—	3	6.12	—	—	4	8.16	—	—

^aRefers to children under the age of 18 living at home.

^bJOD = Jordanian dollars, with 350 JOD corresponding to the poverty line in Jordan and translating to less than 500 USD per month (UNICEF Jordan, 2019).

drawing an arrow pointing to the root end of the hair and placed in an envelope. At T2, the researcher collected the envelopes after the procedures were completed. One or more hair samples were collected from 46 families, with hair samples of 40 mothers and 37 children at T1, and 42 mothers and 35 children at T2.

Hair cortisol is an easily obtainable, non-invasive measure of cortisol secretion. A 3-cm hair segment is enough to analyze cortisol secretion (Stalder & Kirschbaum, 2012). The hair samples were shipped to the laboratory of the Biopsychological Department at the Technical University Dresden/Germany for assaying and determining HCC, followed the protocol of Davenport et al. (2006), and HCC was determined with a commercially available immunoassay with chemiluminescence detection (CLIA, IBL; see Supporting Information for additional details). Duplicate assays for a randomly selected 20% of the samples were performed to ensure reliability (all $r \geq .940$, $p < .001$, for mothers and children across assessments).

Impacts of COVID-19

At T2, mothers were engaged in semi-structured interviews that took 15–30 min. The interview questions tapped into economic and social aspects of families' lives and changes in their daily routines since the lockdown, how they coped with the stress and worry resulting from COVID-19, and the impacts of the lockdown on their child, their family, and themselves (Rafla et al., 2021; see Supporting Information). Responses were audio-recorded and transcribed by two local research assistants trained in transcribing procedures. One research assistant created the initial transcript which was then reviewed by the second research assistant, with 93% agreement; all disagreements were resolved by consensus.

Due to the novelty of the COVID-19 situation, a novel coding scheme was developed for this study by the two research assistants and the last author (see Supporting Information). The coding categories were defined through a data-driven, iterative extraction process to identify themes that were frequent enough in the transcripts to provide variability for analyses. The transcripts were read by research assistants and common themes were identified. Based on the common themes, mutually exclusive coding categories and sub-codes were created. The coding scheme was tested using a few transcripts. Definitions of categories and sub-codes were refined if needed. The final coding scheme was then applied to all transcripts.

The first category focused on COVID-19 related adverse or challenging impacts on families' lives. Sub-codes included impacts on the family's social interactions (e.g., not being able to visit family), on daily activities and routines (e.g., disruptions in family routine, children not being able to play outside), the psychological state of

family members (e.g., increased worries, boredom, negative changes in behaviors), and on the child's education (e.g., difficulties with homeschooling). The second category focused on adverse or challenging changes to the family's financial situation because of the COVID-19 pandemic (e.g., running out of money, not being able to buy essential goods and supplies, job loss). The last category focused on adaptive coping strategies and responses to COVID-19 related changes. Sub-codes included the mother's and family's general adaptation to the situation (e.g., "we're getting used to it"), adaptation in the family's daily activities (e.g., trying to adapt routines to the specific situation during the lockdown), psychological and behavioral adaptation (e.g., trying to create an atmosphere at home by which family members feel safe), strengthening family bonds (e.g., spending time with each other, playing with each other), being mindful about technology use (e.g., controlling the time that family members spent on the internet/using devices), and turning to religion (e.g., mentioning getting closer and resorting to Allah).

The coding proceeded as follows: One local research assistant coded all transcripts. Once a transcript was coded, the codes were reviewed with the second local research assistant and inconsistencies in the application of codes to the transcript were resolved if needed. The coders were blind to the study's hypotheses. Additional questions, in particular when the research assistants did not find agreement, were solved during regular coding meetings with the last author. The consensus codes for each transcript were then compared with the initial codes to check for how consistent the coding scheme was applied. The agreement was acceptable, on average, 86%.

For the analyses, three variables were created; Financial Impact (aggregating the sub-codes for COVID-19 related changes to family financial situation), Negative Changes to Family Life (aggregating the sub-codes for COVID-19 related impacts on family lives), and Adaptive Coping Responses (aggregating the sub-codes of adaptive coping strategies and responses to COVID-19 related changes). The scores for the three variables were weighted by the total number of codes per transcript using standardized residual change scores to account for variability in the length of the interviews.

Maternal parenting stress

Four parenting stress items from the Fragile Families and Child Wellbeing Study were used at T3 (Cooper et al., 2009): "Being a parent is harder than I thought it would be," "I feel trapped by my responsibilities as a parent," "I find that taking care of my child(ren) is much more work than pleasure," and "I often feel tired, worn out, or exhausted from raising a family." Items were rated on a 4-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), and a mean score was created (Cronbach's $\alpha = .66$).

Maternal depressive symptoms

At T3, mothers completed the Arabic version of the Patient Health Questionnaire, short version (Al-Amer et al., 2020; AlHadi et al., 2017). Mothers rated their experience of nine depressive symptoms in the past 2 weeks (i.e., “feeling down, depressed, hopeless,” “feeling tired or having very little energy”), on a 4-point scale (0 = *not at all*; 1 = *several days*; 2 = *more than half the days*; and 3 = *nearly every day*). A tenth item asked about symptom severity (“how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people”), on a 4-point scale (0 = *not difficult at all*; 1 = *somewhat difficult*; 2 = *very difficult*; and 3 = *extremely difficult*). A mean score was created for maternal depressive symptoms (Cronbach's $\alpha = .89$).

COVID-affected families

At T3, mothers reported on infections, hospitalizations, and deaths in the family (e.g., “Have any of the following happened: fallen ill?”). Mothers responded whether or not the event happened to themselves or to a family member and reported if the event was related to COVID-19 or a different reason. A categorical variable was created to capture families who had been medically affected by a COVID-19 diagnosis (1 = medically affected by COVID-19, 32.65%) and those who had not been affected (0 = not medically affected by COVID-19, 67.35%).

Analytic plan

Data pre-processing

In data pre-processing, raw scores for HCC and children's HTKS were log-transformed, and one score for children's T1 SDQ total difficulties was winsorized to be within 3 SD of the mean. Multivariate normality was assessed by calculating Mardia's Multivariate Kurtosis using the *semTools* package in R, finding significant multivariate kurtosis ($z = -2.022$, $p < .043$), indicating a violation of multivariate normality. No multivariate outliers were identified. Little's missing completely at random test supported interpreting the data as missing completely at random, $\chi^2(330) = 337.541$, $p = .376$.

Hypothesis testing

We fit path analyses using the *lavaan* package in R to model the proposed associations in the hypotheses. Given the small sample size and violation of multivariate normality, we used maximum likelihood with robust corrections to fit the models and obtain parameter

estimates (Lai, 2018). To retain the sample of 52 dyads, full information maximum likelihood was used to estimate missing data values (Kline, 2011). Effects significant at $p < .05$ are presented and interpreted.

For H1, we fit three models testing T1 family income, child behavioral regulation (HTKS) and child behavior problems (SDQ total difficulties) as predictors of mother-reported adaptive coping responses (Model 1a), negative changes to family life (Model 1b), and financial impact (Model 1c) in the June 2020 interviews (T2). For H2, we fit two models testing the associations between mother-reported adaptive coping responses, negative changes to family life, and financial impact and children's HCC (Model 2a) and mothers' HCC (Model 2b) at T2, controlling for T1 HCC. For H3, we fit two models testing mother-reported adaptive coping responses, negative changes to family life, and financial impact at T2 as predictors of child psychosocial adjustment (SDQ total difficulties) at T2 and T3 (Model 3), controlling for child psychosocial adjustment at T1. For H4, we fit two models testing mother-reported adaptive coping responses, negative changes to family life, and financial impact at T2 as predictors of maternal depressive symptoms (Model 4a), and parenting stress (Model 4b) at T3. In total, we fit nine path models to address our research questions.

Covariates

Because of limited statistical power, demographic variables were only included as covariates in the final path models if preliminary analyses revealed significant correlations or associations between a demographic variable and any dependent measure. Preliminary analyses included zero-order correlations, *t*-tests, and ANCOVAs. Child age, child gender, mother nationality, and family income were related to one or more dependent measures; to facilitate comparability across models, significant associations involving these four covariates were included in all analyses (income was treated as a predictor in models testing H1). Whether families had been medically affected by COVID-19 by December 2020 was related to some T3 dependent measures; therefore, being medically affected by COVID-19 was included as a covariate in all analyses for T3 measures.

RESULTS

Preliminary analyses

Descriptive statistics and zero-order correlations are presented in Table 2. Child age was positively correlated with negative changes to family life, $r = .288$, $p = .044$, and negatively correlated with financial impacts, $r = -.281$, $p = .050$, due to the pandemic at T2. Family income at T1 was negatively correlated with child SDQ

TABLE 2 Descriptive statistics and zero-order correlations for key study variables

Variables	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12
1. Child HTKS _{T1}	11.89	13.02	—											
2. SDQ Difficulties _{T1}	33.64	4.74	-.29*	—										
3. SDQ Difficulties _{T2}	33.37	5.98	-.23	.65**	—									
4. SDQ Difficulties _{T3}	33.02	6.21	-.27 [†]	.63**	.63**	—								
5. ACR _{T2}	0.00	0.98	.42**	-.27 [†]	-.24	-.32*	—							
6. NCFI _{T2}	-0.02	0.58	.42**	.38**	.24	.21	-.47**	—						
7. FI _{T2}	-0.06	0.77	-.16	.20	.20	.22	-.27 [†]	-.04	—					
8. MDS _{T3}	1.23	1.10	-.13	.40**	.56**	.54**	-.35*	.09	.28 [†]	—				
9. PS _{T3}	2.80	0.60	-.38*	.24	.34*	.34*	-.15	.20	.30*	.35*	—			
10. Mother HCC _{T1} ^a	0.75	0.29	.01	.15	.15	.16	-.19	.23	.11	.12	.09	—		
11. Mother HCC _{T2} ^a	0.58	0.31	.05	.05	-.10	.06	.01	.10	-.32*	.01	-.16	.29 [†]	—	
12. Child HCC _{T1} ^a	0.48	0.44	-.03	.10	.27	.19	-.17	.07	.44**	.11	.19	.11	-.41*	—
13. Child HCC _{T2} ^a	0.43	0.34	-.01	-.02	-.07	.03	-.19	.39*	.17	.13	.13	.32 [†]	-.06	.55**

Abbreviations: ACR_{T2}, adaptive coping responses at Time 2; FI_{T2}, financial impact at Time 2; HCC, hair cortisol concentrations; HTKS_{T1}, head-toes-knees-shoulders at Time 1; MDS_{T3}, maternal depressive symptoms at Time 3; NCFI_{T2}, negative changes to family life at Time 2; PS_{T3}, parenting stress at Time 3; SDQ, strength & difficulties questionnaire.

[†] $p < .10$, * $p < .05$, ** $p < .01$ (all tests were two-tailed).

^aLog-transformed value.

total difficulties at T1, $r = -.430$, $p = .003$, child HCC at T1, $r = -.385$, $p = .027$, and financial impacts due to the pandemic at T2, $r = -.333$, $p = .025$.

One-way repeated-measures ANCOVAs, controlling for child age and gender, mother nationality, and family income, with multiple imputation to account for missingness, were used to examine potential changes in measures collected both before and during the pandemic. Children's SDQ total difficulties scores did not differ significantly across time, $F(2, 94) = 0.038$, $p = .963$. Similarly, mother's HCC, $F(1, 38) = 0.037$, $p = .849$, and children's HCC, $F(1, 34) = 3.058$, $p = .078$, did not differ significantly between T1 and T2.

Results of *t*-tests revealed significant differences on key variables as a function of child gender, mother nationality, and COVID-19 medical impacts. Girls had significantly higher HTKS scores, $t(46) = 2.533$, $p = .015$, and higher T1 HCC, $t(35) = 2.800$, $p = .008$, compared to boys. Mothers with Syrian nationality reported higher SDQ total difficulties at T1, $t(49) = -2.679$, $p = .01$, at T2, $t(41) = -2.196$, $p = .034$, and at T3, $t(47) = -2.329$, $p = .024$, greater financial impacts due to the pandemic at T2, $t(47) = -2.820$, $p = .007$, and more depressive symptoms, $t(47) = -2.857$, $p = .006$, and parenting stress, $t(47) = -2.211$, $p = .032$, at T3, compared to mothers with Jordanian nationality. Mothers who reported in December 2020 that their families had been medically affected by COVID-19 had higher parenting stress at T3, $t(45) = -2.339$, $p = .024$.

Including child age, child gender, mother nationality, and family income as covariates in all analyses (income was treated as a predictor in models testing H1) generally led to poor model fit, whereas model trimming to remove non-significant parameters resulted in good model fit with no loss of significant paths (see Supporting Information for tables presenting all full models and all trimmed models, with model fit statistics). Full models are presented in the main manuscript for ease of comparability across analyses.

Path analyses

H1: Child and family characteristics predicting mothers' reactions to the pandemic-induced life changes

The three path models predicting mother-reported adaptive coping responses (1a), negative impacts on family life (1b), and financial impacts due to the pandemic at T2 are displayed in Figure 1 (see Supporting Information for tables with full and trimmed models). For model 1a, as hypothesized, children's behavioral regulation (HTKS) at T1 positively predicted adaptive coping responses; no other predictive associations were significant. For model 1b, as hypothesized, mothers reported more

negative changes to family life when children had poorer behavioral regulation (HTKS) and worse psychosocial adjustment (SDQ total difficulties) at T1. Additionally, mothers with older children and in families with lower income reported more negative changes to family life. Finally, there were no significant predictors of adverse financial impacts of the pandemic.

H2: Mother-reported impacts of the pandemic predicting child and mother HCC

The two path models predicting child and mother HCC at T2 are depicted in Figure 2a,b, respectively (see Supporting Information for tables with full and trimmed models). For model 2a, as hypothesized, more negative changes to family life were positively associated with child HCC at T2, over and above the stability of child HCC from T1. For model 2b, mother HCC was not significantly associated with any of the hypothesized predictors; unexpectedly, greater family income at T1 predicted higher mother HCC at T2.

H3: Mother-reported impacts of the pandemic predicting child psychosocial adjustment

Unexpectedly, there were no significant predictors of SDQ total difficulties scores at T2 except for SDQ total difficulties at T1; to conserve space, no model is presented (see Supporting Information for tables with full and trimmed models for SDQ total difficulties scores at T2 and T3). The path model predicting child psychosocial adjustment at T3 is depicted in Figure 3. As hypothesized, mothers' reports of more adaptive coping responses at T2 predicted fewer child SDQ Total Difficulties at T3, over and above the stability of problems from T1.

H4: Mother-reported impacts of the pandemic predicting mother adjustment

The two path models predicting maternal depression (4a) and maternal parenting stress (4b) at T3 are displayed in Figure 4 (see Supporting Information for tables with full and trimmed models). For model 4a, as hypothesized, adaptive coping responses at T2 negatively predicted maternal depressive symptoms at T3; in addition, mothers with Syrian nationality and mothers in families that had experienced COVID-19 infection reported more depression. For model 4b, as hypothesized, negative impacts to family life at T2 positively predicted maternal parenting stress at T3; in addition, having a younger child, having a female child, and being in a family affected by COVID-19 infection predicted more parenting stress.

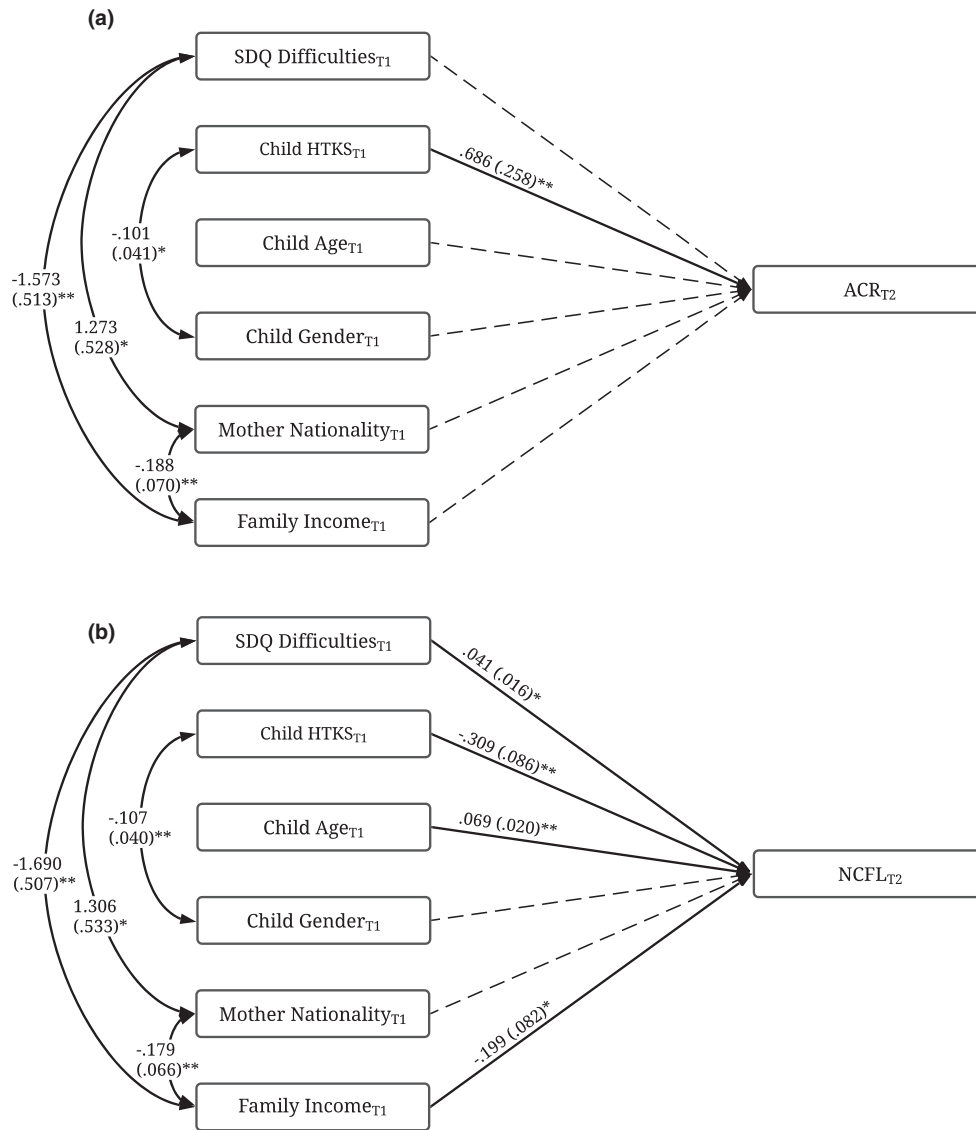


FIGURE 1 Models predicting mother-reported adaptive coping responses (ACR; a) and negative changes to family life (NCFL; b) of the COVID-19 pandemic in June 2020 from family and child characteristics in 2019. Values are unstandardized regression estimates with standard errors in parentheses. HTKS, child's head-toes-knees-shoulders score; SDQ, Strength and Difficulties Questionnaire; T1, Time 1; T2, Time 2. Solid lines represent significant paths. * $p < .05$, ** $p < .01$

DISCUSSION

In accord with life course theory (Elder, 1998), the COVID-19 pandemic of 2020–2021 is a sociohistorical event that will be both defining and disruptive for the generations experiencing it, and may have the profoundest and longest-lasting psychosocial effects on young children (Benner & Mistry, 2020). Children's lives were disrupted by loss of the structure and support of day care or kindergarten, fears about possible infection, social isolation from extended family, financial pressures on families due to effects of the pandemic on working conditions, and parents trying to manage multiple role changes amid all these stressors; these disruptions were

likely to have been particularly acute for financially and sociopolitically vulnerable families around the world (Yoshikawa et al., 2020). We utilized an existing sample to conduct an exploratory, prospective study examining the psychosocial and physiological impacts of these myriad stressors in young children and their families in Jordan. How mothers managed in the first few months of the pandemic was predicted by their children's behavioral characteristics and their families' economic resources. In turn, negative impacts of the pandemic on family functioning and mothers' coping responses predicted children's chronic adrenocortical activity during that time, and children's and mothers' and psychosocial adjustment over the ensuing 6 months of the pandemic.

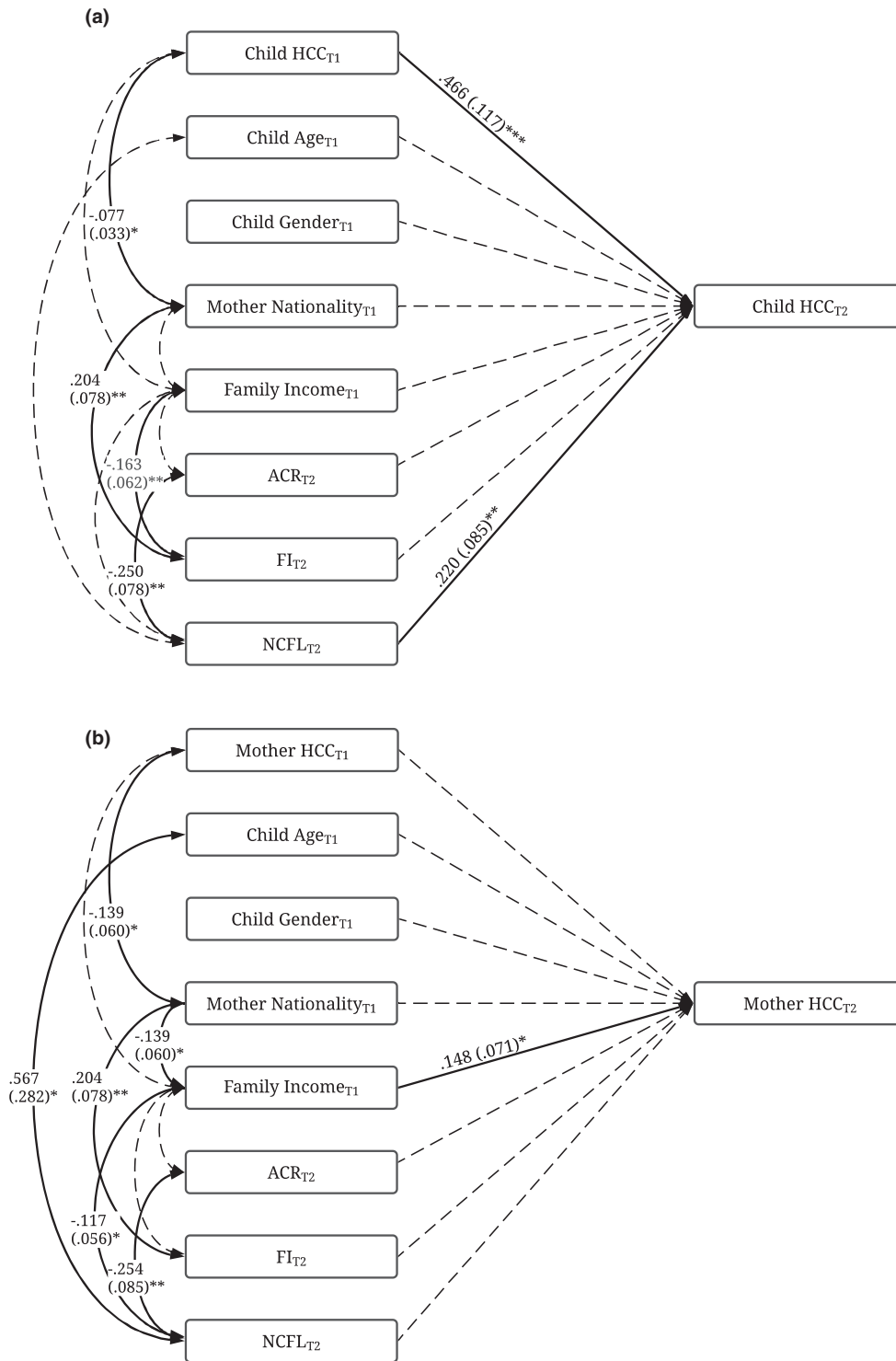


FIGURE 2 Models predicting changes in child hair cortisol concentration (HCC; a) and mother HCC (b) in June 2020 from mother-reported adaptive copings responses (ACR), negative changes to family life (NCFL), and financial impact (FI) of the COVID-19 pandemic in June 2020, accounting for HCC in 2019 and family characteristics. Values are unstandardized regression estimates and standard errors in parentheses. T1, Time 1; T2, Time 2. Solid lines represent significant paths. * $p < .05$, ** $p < .01$, *** $p < .001$

Predicting the impacts of the COVID-19 pandemic on families in Jordan

As expected from child effects models (Bell, 1968; Lerner, 2002), children with better behavioral regulation

abilities and psychosocial adjustment (fewer difficulties) at T1 had mothers who described family life in the first 3 months of the pandemic as being more manageable. Strikingly, children's objectively assessed behavioral regulation on the HTKS task was a more robust predictor

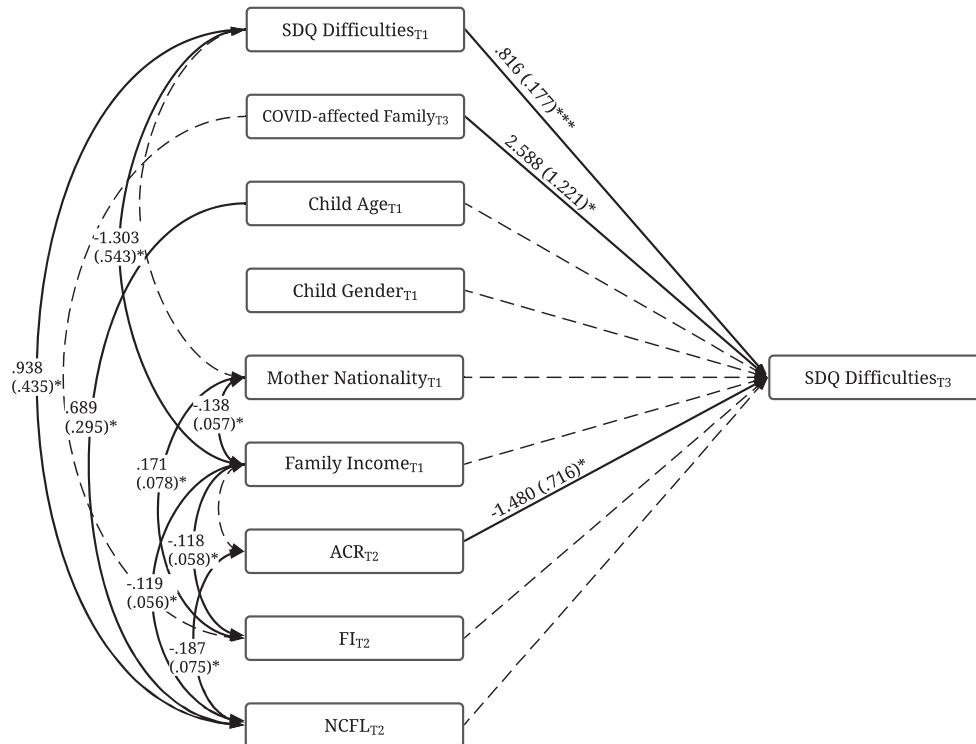


FIGURE 3 Model predicting changes in child psychosocial adjustment (SDQ total difficulties) in December 2020 from mother-reported adaptive copings responses (ACR), negative changes to family life (NCFL), and financial impact (FI) of the COVID-19 pandemic in June 2020, as well as child and family characteristics. Values are unstandardized regression estimates and standard errors in parentheses. HCC, hair cortisol concentration; SDQ, Strength and Difficulties Questionnaire; T1, Time 1; T2, Time 2; T3, Time 3. Solid lines represent significant paths. * $p < .05$, *** $p < .001$

of mother-reported negative changes to family life and adaptive coping responses than were mothers' original reports of children's behavior problems on the SDQ. More well-regulated children and children with fewer behavior problems are likely to have been less dependent on their mothers for external regulation and monitoring of activities; for example, they may have been more capable of cooperating with such new rules as wearing face masks and remaining indoors. This could reduce mothers' parenting stress (e.g., Williford et al., 2007) and allow them to focus their cognitive and emotional resources on managing the day-to-day effects of the public health restrictions imposed due to the COVID-19 pandemic. Thus, children's better self-regulation and psychosocial adjustment may have contributed to mothers being able to more successfully navigate the confinement-related changes to their family's daily lives.

These findings also may suggest that interventions to foster young children's self-regulation capacities may be one way to bolster family functioning under pervasive and chronic stressors like this pandemic. As one example, children's self-regulation can be scaffolded within the family through structured play activities, but such parent-child games are not common within many Arabic cultures; it is only relatively recently that parents in Middle-Eastern countries are becoming more involved in play (Ihmeideh, 2019). Currently, efforts are

being made to develop programming for Middle-Eastern cultures and contexts that fosters young children's positive socioemotional development through play at home and in child-care centers (e.g., <https://www.rescue.org/sesame>). Recognizing that parent-based interventions should be tailored and scaffolded to not over-burden parents, particularly during crises like the COVID-19 pandemic, our findings suggest that programming of this type might benefit mothers and families in Jordan, as well as the children themselves.

We had not predicted that mothers with older children would be more challenged by the COVID-19 pandemic. In an effort to understand this unexpected finding, we reviewed the T1 (pre-pandemic) information we had collected from mothers; that included information on children's amount of child care and kindergarten. In our sample, older children were more likely to attend kindergarten for more days per week ($r = .32, p < .05$) and for more hours per day ($r = .43, p < .01$) prior to the COVID-19 pandemic. As such, families with older children experienced more interruptions in access to child care and early education programs. In addition, family routines might have been more affected as children now had to stay at home and adjust to remote instruction, if available, and mothers had to take on an additional role, that of being a teacher for their child, which has been identified as burdensome (Lee et al., 2021; Thorell et al., 2021).

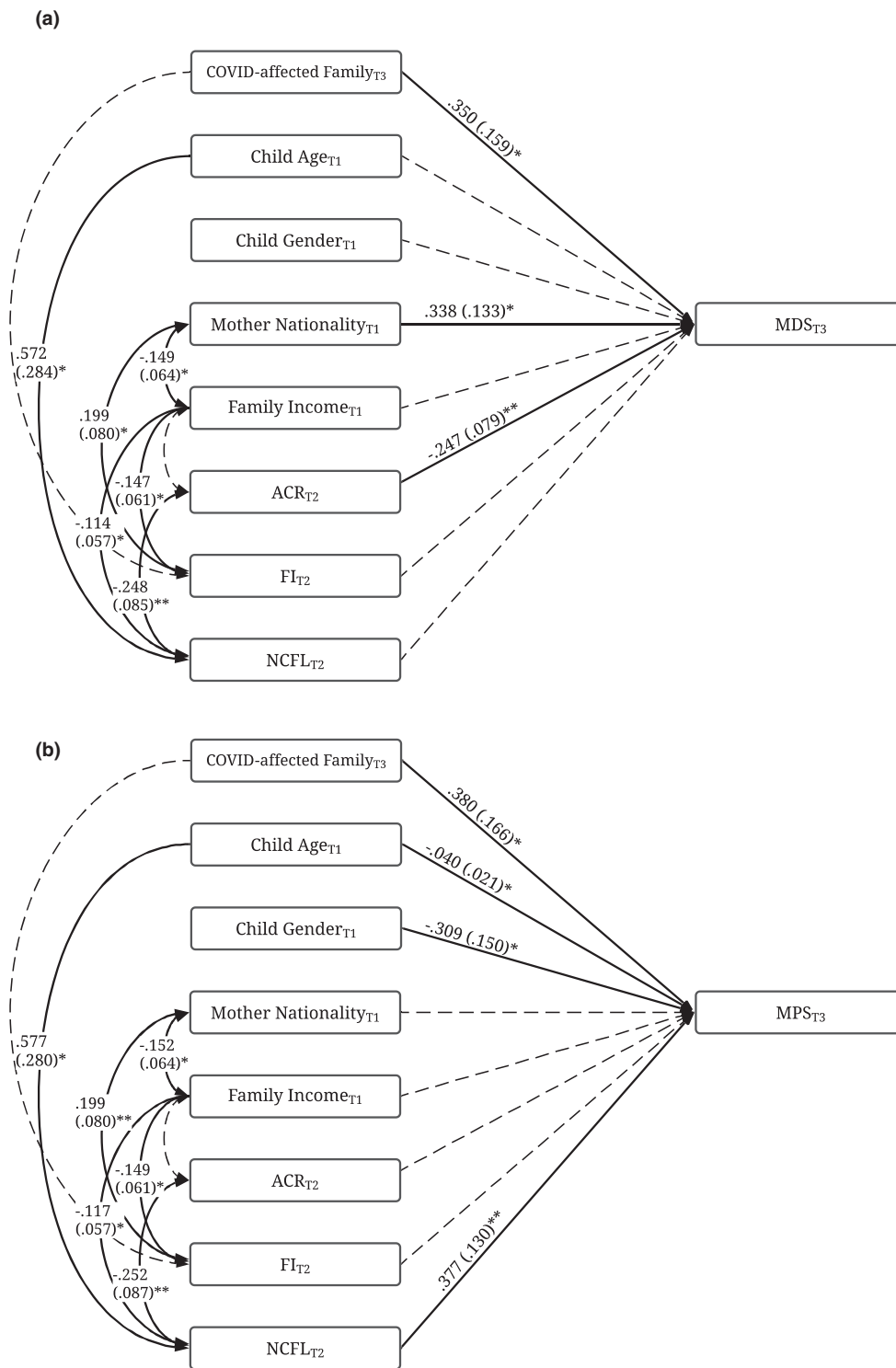


FIGURE 4 Models predicting maternal depressive symptoms (MDS; a) and maternal parenting stress (MPS; b) in December 2020 from mother-reported adaptive copings responses (ACR), negative changes to family life (NCFL), and financial impact (FI) of the COVID-19 pandemic in June 2020, as well as family characteristics. Values are unstandardized regression estimates and standard errors in parentheses. T1, Time 1; T2, Time 2; T3, Time 3. Solid lines represent significant paths. **p* < .05, ***p* < .01

In addition, research from prior pandemics (e.g., Severe Acute Respiratory Syndrome) has documented that children who are more directly affected by a pandemic show less optimal adjustment (Benner & Mistry, 2020). The measure of negative changes to family life included

mothers' perception of negative impacts on their child's psychological and behavioral state during the pandemic. These may have been greater for older children who were used to spending more time outside the home and with same-aged peers; missing those positive experiences due

to the closure of schools and social distancing measures may have been distressing for the children.

Consistent with the family stress model (Conger et al., 2010) and other studies of families during the COVID-19 pandemic (Neubauer et al., 2021; Waller et al., 2021), mothers in families with lower income prior to the pandemic reported that the pandemic brought on more negative changes to family life, and tended to report fewer adaptive coping responses. In this predominantly low income sample, many families were already living in poverty and would have had few if any financial reserves that they could draw upon to meet their acute needs during lockdown and employment instability. Combined with the loss of social interaction and support from extended family, an important aspect of Jordanian culture (Shoup, 2007), unstable economic conditions may have increased mothers' daily strains, hassles and psychological distress, and undermined their abilities to be resilient within the unprecedented conditions of unfamiliarity, unpredictability, and adversity (Masten & Motti-Stefanidi, 2020).

Although the zero-order correlations showed that mothers in lower-income families experienced more financial impacts due to the pandemic, this was not robust in the structural equation model. This may have been due to limited statistical power (sample size) or limited variability in income (predominance of lower-income families), or the scale of the economic consequences of the pandemic. The impacts have been widespread across families of varying financial and material well-being (Karpman et al., 2020). Many families have had to cope with new financial challenges, though those from already low-income backgrounds have been hit hardest (Karpman et al., 2020; Yoshikawa et al., 2020). As such, it will be important to reach families that experience loss of jobs and income and provide support needed to cover their essential expenses. This could include non-income, financial or material transfers to compensate for the loss of jobs and income to reduce the economic burden on families (Blair & Raver, 2016).

Together, the stressful changes to daily life may have set "into motion accumulating ... disadvantages that can deflect long-term trajectories of well-being" (Benner & Mistry, 2020, p. 238). Our findings suggest that it will be important to identify individual and family factors (ideally assessed prior to shocks to development) that may shape the immediate (and lasting) repercussions that a global health crisis such as the current COVID-19 pandemic might have on child, parent, and family adjustment.

Stress physiology in the context of the COVID-19 pandemic

Among the most novel of our findings was that, although the average HCC of children and mothers did not increase

from T1 to T2 for the sample as a whole, more negative changes to family life during the pandemic predicted greater HCC for children in June 2020. The adverse social consequences of the COVID-19 pandemic on families seemed to show an immediate effect on children's tonic stress physiology, in line with evidence suggesting that the "shaping of children's biology and behavior by experience starts early and happens rapidly" (Blair & Raver, 2016, p. S31). Although young children may have had limited understanding of the broader conditions and implications of the pandemic, they directly experienced how it affected the daily lives of their families. Young children are heavily reliant on their parents and families to buffer them from stressors and promote their sense of safety and security (Masten & Motti-Stefanidi, 2020); hence, it was in those families experiencing more disruption than children showed evidence of "stress getting under the skin."

Increased stress responses can be adaptive in the short term (i.e., increased glucocorticoid responses to stimulation enable more reactive and faster responses to threats), but prolonged alteration to stress physiology can convey devastating consequences for children's development (Blair & Raver, 2012, 2016). As such, to protect children's biobehavioral health, it will be critical to mitigate the negative consequences of the COVID-19 pandemic on families' lives. Policy implications include supporting families in restoring high levels of human capital. This could include immediate support for parents to strengthen their capacity to maintain a peaceful and happy family environment during the pandemic (UNICEF, 2020). Although financial impacts due to the pandemic were not associated with children's HCC in June 2020, family income in 2019 was inversely associated with children's HCC at T1. This replicates in this Jordanian sample a pattern that has been observed repeatedly in prior studies (Gray et al., 2018).

Interestingly, and contrary to our hypothesis, neither adaptive coping responses, negative changes to family life, nor financial impact predicted mothers' HCC at T2. Although the COVID-19 pandemic placed major threats and challenges on mothers and their families, we did not find evidence of increased HPA axis activity in mothers. In fact, mothers in more economically advantaged households at T1 evinced greater HCC during the pandemic. Tentatively, this could suggest that mothers in higher income families were experiencing less stress before the pandemic began, but felt greater relative deprivation when faced with the unfamiliar demands and adversities of the pandemic conditions. Perhaps more plausibly, many of the families in this sample were already living in chronically stressful conditions before the pandemic began, and it might take longer for additional pandemic-related stressors to be detected in the tonic stress physiology of adults than was true for young children.

Children's and mothers' psychosocial adjustment in the context of the COVID-19 pandemic

Several studies of anxiety, depression and other mental health problems during the COVID-19 pandemic showed that while symptoms were elevated compared to pre-pandemic levels, the substantial majority of people did not evince clinically diagnosable levels of symptoms (Kwong et al., 2020; Pierce et al., 2020). Some studies did not show any significant elevations in symptoms (van der Velden et al., 2020), and a study with a juvenile population suggested that younger children experienced less increase in problems than older children and youths (Chen et al., 2020). This was paralleled in our finding that children's SDQ total problems scores in June and December 2020 were not higher than their pre-pandemic scores in 2019.

Yet, similarly to other studies of family processes within the pandemic (Shorer & Leibovich, 2020), and consistent with family systems theories like the family stress model (Conger et al., 2010), children's positive psychosocial adjustment (fewer SDQ total difficulties) at T3, December 2020, was predicted by the extent to which mothers felt that they had been able to cope adaptively to the first 3 months of the pandemic, at T2. Similarly, mothers who reported more adaptive coping responses in June 2020 were less depressed in December 2020. Mothers' abilities to maintain their sense of efficacy and competence and to establish effective new family routines in the early months of the pandemic may have persisted over the subsequent half-year as public health restrictions loosened and tightened, thereby promoting the continued well-being of themselves and their children.

Our interview-based adaptive coping measure was broad and encompassed the maintenance of routines and schedules, managing technology use, fostering family connection, and utilizing religion as a source of comfort and assurance. Our findings suggest that adaptive coping responses are a robust and beneficial set of personal resources during a global health crisis that may prevent or dampen maladjustment from continued pandemic conditions and, further, that there are numerous adaptive responses to a crisis that can be effective for maintaining the well-being of families. Notably, many of the coping mechanisms identified by mothers are amenable to intervention. Specifically, pandemic-specific public health campaigns can incorporate information and resources regarding the importance of routine and consistency in children's development and family functioning as well as provide guidelines on age-appropriate technology use to help mothers and caregivers navigate child activities during these new and unusual circumstances. The importance of these behavioral, emotional, and cognitive adaptations as sources of resilience is underscored by the fact that, again, economic factors were not robustly associated with child

or mother psychosocial adjustment. This implies that efforts to support the adaptive functioning of mothers could be beneficial even for economically disadvantaged and acutely impacted families.

Experiencing more negative changes to family life at T2 predicted greater parenting stress at T3, suggesting that disruptions to daily life in the first 3 months of the pandemic continued over the ensuing months of 2020. As Masten and Motti-Stefanidi (2020) contended, the demands of quarantining, social distancing and other public health regulations carried the risk of over-burdening care-givers and undermining their well-being. This may have been felt even more acutely by parents in Jordan who were cut off from regular contact with, and assistance from, extended family members, which are core features of Jordanian culture (Shoup, 2007). Consistent with this, mothers reported both greater parenting stress and more depression when members of their family had contracted the COVID-19 virus. Depression also was elevated in the small number of Syrian mothers, all of whom were refugees who had settled in Jordan. They likely were even more isolated from their extended families and support networks throughout the pandemic, in addition to continuing to experience the effects of war-related traumas.

Strengths, limitations, and future directions

This study had many strengths, including (a) a multi-method approach with behavioral, physiological, interview, and survey data; (b) pre-pandemic measures of child and mother HCC, child regulation and problems, and family sociodemographic circumstances; (c) examination of responses to and adjustment during the COVID-19 pandemic in predominantly lower-income families in Jordan, a population that has received little empirical attention previously; and (d) a repeated-measures longitudinal design with two assessments over the first 9 months of pandemic conditions in Jordan. It also had important limitations. Although the sample size was comparable to some other studies of children's HCC (Gray et al., 2018; Ling et al., 2020), it was nonetheless a small sample that afforded limited power. We may have failed to identify small effects, we were precluded from testing multivariate interaction effects, and we were not able to formally test for mediation effects that may be implicated by our analyses from T1 to T2 and from T2 to T3; we recommend tests of moderation and mediation effects in future studies with adequately powered samples. The original study was not focused on mothers' mental health or family functioning; hence, we did not have pre-pandemic T1 measures of these important outcomes. Additionally, mothers provided all information on reactions to the pandemic and psychosocial functioning of themselves, their children and their families. Shared-method variance may have contributed

to some of the associations that were documented, and future research would be advantaged by incorporating reports from other caregivers and teachers. As the interview was focused mainly on challenges imposed by the first 3 months of public health restrictions, mothers may not have described the full range of potentially positive aspects of their experiences.

Finally, one of the most important contributions of this study may be in its generation of testable new hypotheses for future studies of globally diverse communities in conditions of acute and persistent crises. Our findings have provided unique, exploratory insights into Jordanian family functioning—an underrepresented population in research—during the COVID-19 pandemic, and they point toward biopsychosocial processes that could be relevant for understanding the experiences of other populations during this pandemic, as well as comparable future adverse events. Furthermore, as we have attempted to highlight, our study identified potentially tractable aspects of child, mother, and family functioning that could serve as multiple levers for prevention and intervention efforts to promote well-being in vulnerable communities. As the global community grapples with the uncertain time-course of this pandemic's resolution, and the likelihood of future regional or international pandemics incurring similar disruptions to families, the development and implementation of such programming may be fundamental to promoting the developmental health of this and subsequent generations.

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CONFLICT OF INTEREST

Rana Dajani is the founder and director of WLR, an independent non-profit, non-government organization in Jordan. Rana Dajani was not involved in the collection and analyses of the presented data.

AUTHOR CONTRIBUTIONS

Paul D. Hastings: Conceptualization, Methodology, Data curation, Formal analysis, Writing—original draft, Writing—review & editing. Lindsey C. Partington: Methodology, Data curation, Formal analysis, Visualization, Writing—original draft, Writing—review & editing. Rana Dajani: Conceptualization, Writing—review & editing, Supervision, Project Administration, Fundings Acquisition. Antje von Suchodoletz: Conceptualization, Methodology, Investigation, Resources, Data curation, Formal analysis, Writing—original draft, writing—review & editing, Supervision, Project administration, Funding acquisition.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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