Effect of daily school and care disruptions during the COVID-19 pandemic on child behavior problems

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Abstract

The COVID-19 pandemic profoundly affected American families and children, including through the closure or change in the nature of their care and school settings. As the pandemic has persisted, many children remain in remote schooling and those attending in-person child care or school have contended with unpredictable closures. This study investigated the frequency and consequences of disruptions to children's child care and school arrangements during fall 2020. The sample is parents who were hourly service-sector workers prior to the pandemic, had a young child between the ages of 2 and 7, and were at least partially responsible for their children's school and/or care in fall 2020 ($N = 679$); half of the sample are non-Hispanic Black, 23% are Hispanic; and 18% are non-Hispanic White. Parents were asked to complete 30 days of daily surveys about whether their care and school arrangements went smoothly and as predicted that day, and about their mood, parenting behaviors, and children's behavior. Results showed that daily disruptions to care and school were common, with families reporting a disruption on 24% of days. Families with children in exclusively remote schooling experienced more frequent disruption than families with children in in-person care or school. For all families, care or school disruptions were related to worse child behavior, more negative parental mood, and increased likelihood of losing temper and punishment. Within-family mediation suggests that parents' difficulties supporting children's learning, and to a lesser degree their mood and parenting behaviors, partially mediate effects of disruptions on child behavior.

The outbreak of the novel coronavirus has profoundly affected American families. Most areas of the country have experienced stay-at-home orders (National Academy for State Health Policy, 2020), unemployment claims have skyrocketed to unprecedented levels (Bureau of Labor Statistics, 2020), and millions of cases of the illness have been confirmed (Center for Systems Science and Engineering at Johns Hopkins University, 2020). Given the size and scope of both the economic and health effects of the current crisis, it likely has strongly affected the psychological well-being of both parents and children (Gassman-Pines et al., 2020), but there continues to be limited evidence about psychological effects.

One substantial change for many children during the COVID-19 crisis has been the closure or change in the nature of their primary care and school settings. At the onset of the crisis, in March 2020, nearly all schools closed, moving education virtual, and remained closed for the rest of the school year. Throughout the 2020-21 school year, the majority of children thus far have remained in remote or partially remote (hybrid) school (USC Center for Economic and Social Research, 2021). While some schools and many child care centers reopened over summer and fall 2020, they were subject to frequent, unpredictable closures as COVID-19 cases occurred in the setting or due to staff shortages when substantial numbers of staff were ill or required to quarantine. Anecdotal evidence suggests that parents and children struggle with these types of instability (Grose, 2021; Hsu, 2020), which compound underlying stressors from the pandemic such as job and income loss, material hardship, social isolation, and grief.

These disruptions to care and schooling mean that the COVID-19 crisis, while affecting all Americans, have hit families with children particularly hard. The impact is even more pronounced for vulnerable populations of families with children (Ananat & Gassman-Pines, 2020), including: hourly worker parents, who face unstable employment and earnings (Kurmann

et al., 2020); families of color, whose communities face high rates of infection, inadequate medical care (Williams & Collins, 2016), and pre-existing health disparities that worsen clinical outcomes (Haynes et al., 2020); and essential workers, who cannot work remotely and therefore cannot earn without childcare. Identifying the psychological effects of this crisis on children in vulnerable families is essential for building both an understanding of how the COVID-19 pandemic has affected children and also developmental psychology theory on instability in microsystem settings and resulting effects on child well-being.

To address this gap in the literature, this is the first study to examine daily variation in disruptions to care and school in the fall 2020 phase of the COVID-19 pandemic and identify disruptions' causal effects on daily child behavior problems. Further, this paper examines differences in the frequency and consequences of care and school disruptions for families using remote vs. in-person care, and for families of different racial and ethnic groups. This research adds to the literature on how low-income children have been affected by the COVID-19 pandemic by focusing on a representative sample of hourly service workers in a major US city with young children, who reflect a group with significant but common vulnerabilities.

Theoretical linkages between disruptions to care and school and children's behavior problems

Ecological Systems Theory posits that microsystems, or settings in which children spend time, have the most direct and immediate influence on development (Bronfenbrenner, 1979, 1989; Bronfenbrenner & Morris, 1998). Outside of their families, schools and child care settings are the primary microsystems in which young children spend time and, thus, among the primary drivers of their development. Within microsystems, the main drivers of child development are

interactions between individuals within those settings, such as between parents and children within families.

For both families with children in in-person care or school, and those with children in remote school, the pandemic has radically altered those settings (Becker et al., 2020). For in-person care and school settings, the pandemic has led to different procedures, policies and experiences for students. For example, early care and education settings and schools serving students in person require students and staff to comply with public health measures, like mask wearing and social distancing (Sharfstein & Morphew, 2020; Simon et al., 2020; The Hunt Institute, 2021). Parents and students have expressed ongoing concerns about these protocols and the need for clear messaging to support compliance (Lorenc et al., 2021). For remote schooling, the pandemic has blurred the lines between settings, with both schooling and family interactions happening in same physical space (Roy et al., 2021). Many parents are juggling work and family responsibilities at the same time, leading to concerns about children's learning outcomes (Garbe et al., 2020).

In addition to causing changes in the nature of children's and parents' experiences in care and school settings, the COVID pandemic has also caused disruptions to school and care. These disruptions include both large-scale changes, like the emergency school closures implemented in spring 2020, and smaller-scale changes, like temporary closures due to school-based COVID clusters. Further, the need for technology to support schooling from home can lead to additional disruptions for children, as many families do not have reliable internet access or devices (Auxier & Anderson, 2020), and as remote school relies on software that is often difficult to manage (Domina et al., 2021).

An Ecological Systems Theory approach posits that effects of these disruptions to care and schooling on children's development will be both direct and indirect, via children's interactions with others, primarily parents. First, unexpected school closures or disruptions to remote schooling can make it more difficult for parents to provide support to their children's learning, a key role during the pandemic (Roy et al., 2021). Further, disruptions to care and school can make it more difficult for parents to balance work and family demands (Garbe et al., 2020), leading to increased parental stress (Ashforth et al., 2000; Pleck, 1995) and altered parent-child interactions (Berger et al., 1994; Williams & Alliger, 1994). Each of these changes to family routines, parental mood, and parent-child interactions are, in turn, related to children's behavior and well-being (Bass et al., 2009; Grzywacz & Marks, 2000; Ilies et al., 2007),

The experiences of families during the pandemic may also vary by family race and ethnicity, for several reasons. First, people of color were more likely to contract and become severely ill with COVID-19 (Mackey et al., 2021), increasing strain on families of color and taxing family resources. Second, even among lower-income families, families of color have faced more pandemic-related hardships, such as such as food insecurity and increased debt, than non-Hispanic white families (Enriquez & Goldstein, 2020). These family hardships likely made balancing work and care/school demands more challenging for parents of color. Finally, wealth disparities by race are well documented (Darity & Nicholson, 2005), meaning families of color, on average, have fewer financial resources with which to buffer the negative effects of the pandemic. In addition, the COVID-19 pandemic has also coincided with renewed attention to racial justice and a national reckoning with racism in the United States, which, while important and long overdue, may also compound stress for families' of color (Neighmond, 2020).

Empirical findings

The research on child well-being during the COVID pandemic is emerging but points to increased behavior problems and psychological distress. Behavior problems and psychological distress among young children have increased since the pandemic began (Ehrler et al., 2021; Gadermann et al., 2021; Steimle et al., 2021), and are correlated with cumulative exposure to pandemic-related stressors, such as income loss and family illness (Gassman-Pines et al., 2020). There is also evidence that parents' psychological distress mediates the effects of pandemic-related stressors on child behavior problems (Koehler-Dauner et al., 2020; Marchetti et al., 2020). Further, the pandemic has had stronger effects on BIPOC children than white children (Clawson et al., 2021).

The growing literature on families' experiences with changes to care and schooling during the pandemic shows that for parents, managing schooling has been challenging. A nationally representative survey found that worry about schooling was a major source of stress for parents during the pandemic (American Psychological Association, 2020). The less prepared parents felt to support children's learning at home, the worse their own self-reported mental health (Lee et al., 2021). When parents had challenges with child care, they also reported higher levels of distress (Patrick et al., 2020). Other findings suggest that in fall 2020, on average, parents with children in in-person schooling reported significantly higher levels of emotional distress than parents of children in remote only or hybrid schooling (Verlenden, 2021). However, given that these results reflect cross-sectional correlations at a point in time, they may reflect pre-existing differences between families that are correlated with both distress and school mode of instruction. Although provision of child care for younger children has also been disrupted by the pandemic (Ali et al., 2021; Jessen-Howard & Workman, 2020), much less of the ongoing research has focused on linking changes in child care to the well-being of children or parents.

Finally, literature has evaluated learning loss during the pandemic. Overall, the evidence to date suggests that the disruption to schooling has led to learning loss for school-aged children, in basic skills like reading fluency (Domingue et al., 2021) and math skills (Kuhfeld, Tarasawa, et al., 2020). Importantly, these changes in learning were not experienced equally across groups, with lower-income students experiencing larger losses than higher-income students (Kuhfeld, Soland, et al., 2020). These differences were likely driven by families' differential abilities to obtain additional educational supports for children, differential technology access, or other challenges in supporting students during virtual learning (Bacher-Hicks et al., 2021; Domina et al., 2021).

Daily diary studies

The emerging literature on the effects of changes to school and care during the COVID-19 pandemic has primarily described children's and parents' experiences in general in different care and school settings, or during the spring 2020 shift from in-person to remote instruction. A novel approach is to examine families' experiences of day-to-day variability in disruptions to care and school arrangements during the fall of 2020, in order to match the time scale of family life and capture daily variation in context and behavior (Bolger et al., 2003). A focus on children's daily experiences and well-being, holding constant aspects of families that do not vary from day to day, allows for an examination of the dynamic interplay of care and school disruptions with daily well-being. Understanding families' daily lives can facilitate culturally grounded inquiries about family life in diverse families (Weisner, 2002).

Using daily surveys has other methodological strengths. First, using daily surveys reduces recall bias. Survey questions that ask people to recall the number of instances of unexpected school or child care closures over a fixed period of time may underreport the extent

of school and care disruptions, as accurately recalling past events is cognitively challenging (Bound et al., 2001). There is substantial evidence, for example, that even spells of unemployment, which are highly salient at the time that they occur, are not accurately captured retrospectively (Akerlof & Yellen, 1985; Jürges, 2007; Levine, 1993). Second, daily surveys reduce the need for individuals to mentally aggregate across instances, which can result in underreporting (Mathiowetz et al., 2002; Winter, 2004). For example, asking people to report about their income in general results in lower reported levels than when people are asked to provide information about income from specific sources (Mathiowetz et al., 2002).

Given the ongoing nature of the pandemic and the nascent literature about its effects, no research following this type of daily diary design has been used to examine daily disruptions to care and school arrangements and their consequences for children's daily well-being. Emerging literature focused on families' daily experiences during the early phase of the pandemic has shown that family psychological well-being decreased markedly when school closures were initially announced (Gassman-Pines et al., 2020). Children's daily behavior problems, including uncooperativeness and feelings of sadness or worry, in particular, increased at the time of school closures and were substantially higher than in the days prior to the closures (Steimle et al., 2021). No research, however, has yet examined daily variability in care and schooling during the pandemic, nor how care and school disruptions are related to daily child behavior and well-being.

Current study

In order to understand how disruptions to care and schooling due to the COVID-19 pandemic have affected children's daily psychological well-being, this study examined four

research questions in a vulnerable sample, hourly service workers with young children, that is majority families of color:

1. How common are disruptions to children's care and school arrangements? Do they vary for those in remote vs. in-person settings?
2. What are the daily effects of school/care disruptions on children's daily behavior problems?
3. Are the daily effects of school/care disruptions on children's daily behavior problems mediated by parents' self-reported difficulty managing children's learning, parents' well-being, or harsh parenting behaviors?
4. How do these effects vary by families' racial and ethnic group?

Method

Sample Recruitment

Individuals were eligible if they worked in an hourly service-industry position in a retail, food service, or hotel business in a given large U.S. city, had a child aged 2 to 7 at the time of enrollment, and had a mobile phone that could send and receive basic SMS text messages. The sample was originally recruited for a study examining parents' work schedule unpredictability and family well-being (for additional detail about this sample, see [Authors]). Recruitment occurred between August and November, 2019 using a venue-based sampling approach, a commonly-used technique for producing generalizable samples of hard-to-reach, un-rostered populations (Semaan, 2010). The key to successfully using this technique is generating a complete list of venues, which in this case were food service, retail and hospitality businesses in the city, provided by the Columbia University Earth Institute. We then constructed a sampling frame of venue (business) day-time units (VDTs), randomly selected VDTs, and systematically

identified and recruited eligible individuals present in those VDTs, thus plausibly identifying a representative sample of the population (Muhib et al., 2001). To do so, at the time that study staff visited each business, they aimed to identify all workers who met sampling criteria who were at work at that time by approaching workers at each business, determining their eligibility, and asking those workers to direct them to any other employee with a young child who was currently at the venue. This strategy differs from snowball sampling in that study staff only recruited and only followed up with potentially eligible workers who were present at that time, to preserve random sampling.

Procedure

Initial Procedure

When first recruited, for the original study purpose of estimating effects of work schedules on family well-being, all participants were asked to complete 30 days of daily surveys and a one-time survey about demographic and household characteristics. All aspects of this study received human subjects approval from the [university] Institutional Review Board.

Current Study Data Collection Procedure

Each participant from the original sample was contacted about participating in an additional 30-day wave of daily data collection, with recruitment and data collection occurring between September 8, 2020 and January 13, 2021. 733 participants enrolled in this wave of data collection (70% response rate). For the present analysis, we excluded parents who reported that they were not involved in their children's schooling or care ($N = 54$). Thus, the analysis sample for the present study was 679, with approximately 17,000 person-days for analysis (daily Ns varied slightly due to missing data).

Respondents were prompted to report on each day's experiences with disruptions of care or school and their own and their child's well-being via SMS text message for 30 consecutive days. All survey materials used for this study were available in both English and Spanish.

The daily text surveys were programmed and automated by a third-party vendor. On the day of enrollment in this wave, participants received a text welcoming them to the start of the wave. The following day, the 30-day data collection period began. During that period, the first survey question was sent out each evening at 7:00PM. As soon as respondents sent back their answer to the first survey question, the second question was sent. This sequence was repeated until all questions and answers had been sent and received. A thank-you text sent at the end of the sequence let individuals know they had completed all that day's survey questions. If a respondent failed to reply to the first survey question, a reminder text was sent at 8:00PM. Additionally, if an individual started the survey but did not complete all questions, a reminder text was sent after two hours of inactivity (with the question on which the individual left off re-sent as part of the reminder) and then again after 14 hours of inactivity. Additional details about the text-message survey protocol are available in [Authors].

Single Point-in-Time Survey Data Collection Procedure

At the end of the 30-day daily data collection all participants were asked to complete a one-time survey that gathered information about children's school and care arrangements. All survey questions and answers were sent and received via SMS text message. Response rate to the one-time survey was very high (N = 666; 99% response rate among analysis sample).

Measures

Daily Survey Measures

Disruptions to school and care. Parents were asked, "Did your child(ren)'s child care/school go smoothly today--happened on schedule, internet worked if needed, etc.?" Answer choices were: *Yes*; *Mostly*; *Somewhat*; and *Not at all*. A dichotomous indicator representing disruption was constructed equal to 1 if the respondent answered *Not at all, Somewhat, or Mostly* and 0 if they answered *Yes*.

Child behavior problems. Daily child uncooperative behavior was measured with a single item asking: "How much was your child uncooperative today?" Answers on a four-point scale included: *Not at all, Just a little*, *Some,* and *A lot.* This question was modified from an item in the Inattention/Overactivity with Aggression Conners Rating Scale (Loney & Milich, 1982), which asks parents to rate how much the adjective describes their child "at this time."

Daily child worry was measured with a single item asking: "How much did your child appear to be sad or worried today?" Answer choices on a four-point scale included: *Not at all, Just a little*, *Some,* and *A lot.* This question was modified from an item in the Preschool Behavior Questionnaire (Behar & Stringfield, 1974), which asks parents to rate how much the child exhibits each behavior.

For both child behaviors, prior research has demonstrated the reliability and validity of multi-item scale versions adapted for measuring daily externalizing and internalizing behavior problems (Gassman-Pines, 2015). In the current study, single items were used to reduce respondent burden and attrition. Dichotomous indicator variables were set equal to 1 if the parent responded *Some* or *A lot* and 0 if the parent responded *Not at all* or *Just a little*.

Parent Psychological Well-Being. Daily parental negative mood was measured with a single item asking: "How much of the time today did you feel fretful, angry, irritable, anxious, or depressed?" Answers on a three-point scale included: *None of the time, Some of the time,* and *All*

of the time. This question was modified from a question with a four-week recall period from the Health Utilities Index (HUI) (Furlong et al., 2001; Horsman et al., 2003) (During the past four weeks how often did you feel fretful, angry, irritable, anxious or depressed?). The single item has been validated as a daily measure of negative mood as it is positively correlated with daily stressors, including daily food insecurity (Gassman-Pines & Schenck-Fontaine, 2019) and daily work schedule disruptions [authors]; it increased substantially once COVID-19 restrictions were put into place [authors]. A dichotomous indicator was created equal to 1 for those who answered *Some of the time* or *All of the time* and 0 for those who answered *None of the time*.

Daily perceived negative sleep quality was measured with a single item also used in other daily survey studies (George et al., 2019), asking: "How well did you sleep last night?" Answers were on a 10-point scale from *really badly* to *really well*. We treat self-reported sleep quality as a measure of daily well-being, as perceived sleep quality is associated with daily affect (Bower et al., 2010). The sleep quality measure was reverse-coded so that higher numbers indicated worse perceived sleep quality. This measure has been validated, as it is correlated in expected directions with negative and positive daily mood, daily self-esteem (George et al., 2019) and daily work schedule disruptions, a daily stressor [authors].

Parenting Behavior. Difficulty supporting children's care or learning was measured with a single item asking, "How hard was it to support your child(ren)'s participation in care/learning today?" Answer choices were: *Not hard at all*; *Somewhat hard*; and *Very hard*. A dichotomous indicator was created equal to 1 for those who answered *Somewhat hard* or *Very hard* and 0 for those who answered *Not hard at all*.

Harsh parenting was measured using two questions: "Did you punish your child today?" and "Did you lose your temper with your child today?" Both questions were answered either *Yes*

or *No*. Dichotomous indicator variables were set equal to 1 if the parent responded *Yes* and 0 if the parent responded *No*.

Single Point-in-Time Survey Measure of School and Care Context

Parents were asked two questions: "Do you have a child/children enrolled in remote school?" and "Do you have a child/children in out-of-home care and/or school?" Both questions were answered either *Yes* or *No.* From those responses, a set of mutually exclusive indicators were created representing having children only in remote school, only in out-of-home care/school, both remote and out-of-home care/school, or neither.

Other Analysis Variables

At the outset of the study, participants were asked two questions about their racial and ethnic group: (1) "What is your race?" And (2) "Are you Hispanic/Latino/Latina?" For the first question, participants could select all that applied from the following list: Black/African-American; White/Caucasian; Asian/Pacific Islander; Native American/American Indian/Alaska Native; and Other. From the responses to the two questions, three indicators were created: non-Hispanic Black, non-Hispanic White; and Hispanic (any race).

An indicator variable for *weekend* was created that equaled 1 when that day was a Saturday or Sunday and 0 otherwise.

Analytic Plan

First, we calculated descriptive statistics overall, by care/school type, and by family race and ethnicity.

Second, we estimated random effects regressions, with the predictor (daily school/care disruptions) and child and parent outcomes at level 1 (daily level) and random effects at level 2 (family level). All models included an indicator for whether the day in question was a weekend

day at level 1. We also estimated subgroup regressions on the subsample that was reported to be in remote school only and the subsample that was reported to be in in-person care/school only. We estimated both the overall regressions and the care-type subsample regressions separately for families in which the respondent identified as Hispanic, Non-Hispanic Black, and Non-Hispanic White. Correlations among all predictor variables are available in Table A1.

Finally, we estimated within-subject, 1-1-1 mediation models, with the predictor and child outcomes as described above, and parental psychological wellbeing and parenting behaviors as level 1 mediators. We ran separate mediation models for each mediator and outcome, following the mediation models described in Bolger and Laurenceau (2013).

Results

Sample Characteristics

Sample characteristics appear in Table 1. Our sample is majority female, consistent with working in the service industry and with having custody of a young child [authors]. About half are African-American and about one-fifth are Hispanic, consistent with being central-city hourly workers (Transportation Research Board and National Research Council, 1999). At the time of study enrollment, mean age was 31, consistent with being the parent of a young child [authors], and the modal education was 12 years, consistent with hourly service employment (Schwartz et al., 2015). About half of focal children are female; focal children were, on average, 4.9 years of age at the time of study enrollment. Mean income prior to the pandemic was $2,239 per month.

Descriptive Results

Table 2 reports the distribution of learning modalities, both overall and by race. Remote-only was the most common modality, reported by 44% of the sample overall; as public schools were entirely remote in the fall in the city of our study, that is not surprising. Next most common

was a combination of in-person and remote learning, at 32% of the sample. Another 13% of families reporting having only in-person care or schooling, while 11% reported that their family was currently using no care or school of either kind. For the most part, patterns of use by race and ethnicity were similar, and there were no race/ethnic differences in learning modality that were significant at conventional levels. However, the difference between the non-Hispanic Black rate (11.7%) and non-Hispanic White rate (18.7%) of using only in-person care/school was marginally statistically significant ($p < .10$).

Table 3 reports the incidence of school and care disruptions overall, and by modality and race/ethnicity. The share of days on which school/care did not go as planned is strikingly high, at nearly a quarter of days (24.4%) overall, as is the share of days when respondents reported it was difficult to support their child's learning (24.9%). Across the month of the daily surveys, 77% of respondents reported at least one day when school/care did not go as planned, and 74% reported at least one day when it was difficult to support their child's learning. While daily disruptions were frequent for all groups, they were more common for families using only remote learning (23.9% of days) than for those using only in-person school/care (17.9%), and share of days on which it was difficult to support learning were similarly elevated for remote (25.3%) versus in-person (19.2%); both differences were statistically significant ($p < .01$).

Overall, Hispanic parents reported the highest incidence and frequency of disruption and of difficulty supporting learning, while non-Hispanic Black parents' reports were lower and non-Hispanic White parents' reports were in between. The difference between Hispanics' and non-Hispanic Blacks' experiences were statistically significant for both measures overall and for all of the measures among remote learners; among families using in-person care, the differences were significant only for disruption frequency.

For all race/ethnic groups, the frequency of daily disruptions to learning was higher in remote than in in-person school/care. The differences were larger for Hispanics (40% more frequent disruptions in remote than in in-person learning, $p < .001$) and non-Hispanic Blacks (60% more frequent, $p < .001$) than for non-Hispanic Whites (29% more frequent, $p < .01$).

Daily Effects

Child behavior

Table 4 shows the effect of daily learning disruptions on child behavior, overall and by race/ethnicity and modality. A learning disruption on a given day increased the share of children who were uncooperative "some or a lot today" by 10.3 percentage points, a striking increase from a base rate of 14.1%. The effect was significantly larger for non-Hispanic Whites (13.6 percentage points) than for non-Hispanic Blacks (8.6 percentage points), but the effects were significantly different from zero and substantial in size for all race/ethnic groups. The pattern was similar for effects on the probability that the child appeared to be sad or worried some or a lot today, with an overall effect of 7.2 percentage points (more than doubling the base rate of 6.7%); the effect was significantly larger for non-Hispanic Whites (9.9 percentage points) than for Hispanics (5.1 percentage points), but again, effects were significantly different from zero and substantial in size for all race/ethnic groups.

Effects of disruption were consistently significant across modalities and outcomes. They were often somewhat smaller for children in remote school, and larger for those in-person, than for children overall; however, the difference in effects for in-person versus remote was statistically significant only for uncooperativeness among non-Hispanic Black respondents (15.3% versus 5.1%).

Parent mood

Learning disruptions also strongly affected daily parent mood, increasing by a statistically significant 14.1 percentage points the share of respondents that day who said they felt fretful, angry, irritable, anxious, or depressed, from a base rate of 41.6%. Effects were large and significant for all race/ethnic groups, with a higher point estimate for non-Hispanic White parents (17.7 percentage points) but no statistically significant differences in estimates between groups. Parent sleep difficulty also rose by a marginally significant .03 *SD* ($p < .10$) the night after a disruption, an effect driven entirely by Non-Hispanic Black respondents, who experienced an .05 *SD* increase in sleep difficulty. The magnitude of this impact appeared larger for parents of children in remote school only (0.08 SD, $p < 0.01$) than for parents of children attending school or care in person only (0.00 SD), but the difference was not statistically significant.

In contrast to effects on child behavior, effects of disruption on parent mood were similar across modalities overall—those using remote only had a 15 percentage point increase in feeling fretful, angry, irritable, anxious, or depressed after a disruption, while those using in-person only had a 15.4 percentage point increase. However, this consistency masked some differences by race. Non-Hispanic White parents experienced much worse effects from disruptions in in-person schooling (24 percentage points) than from disruptions in remote only school (10.8 percentage points); the difference was marginally statistically significant ($p < .10$). The point estimate for the effect on non-Hispanic Black parents from disruptions in remote schooling (18 percentage points) was, by contrast, larger than from disruptions in in-person (10.9 percentage points), although the difference was not statistically significant.

Parenting behaviors

Perhaps not surprisingly given effects on mood, parents were more likely to lose their temper with their child on a day with a disruption. The overall increase was a statistically

significant 5.8 percentage points from a base rate of 7.0%. Effects were large and significant for all race/ethnic groups, but the effect for non-Hispanic White parents (9.1 percentage points) was significantly larger than for non-Hispanic Black parents (4.8 percentage points). Parents were also more likely to punish their child on a day with a disruption, with an increase of 4.8 percentage points from a base rate of 5.8%. These effects were large and significant for all race/ethnic groups, and were statistically indifferent across race/ethnic groups, though the effect was directionally higher for non-Hispanic White parents (8.2 percentage points). Effects on parenting behaviors did not differ significantly by school/care modality.

Mediation

Within-family mediation models showed that effects of disruptions on children's uncooperative and sad/worried behavior were partially mediated by parent mood and parenting behavior (Table 5). Parents' difficulty supporting children's learning accounted for 43% of the total effect of disruptions on children's uncooperative behavior ($p < 0.001$), negative mood accounted for 22% ($p < 0.001$), and losing temper and punishment both accounted for about 20% ($p < 0.001$). Likewise, difficulty supporting children's learning accounted for 46% of the total effect of disruptions on children's sad or worried behavior ($p < 0.001$), negative mood accounted for 20% ($p < 0.001$), losing temper accounted for 13% ($p < 0.001$), and punishment accounted for 10% ($p < 0.001$). Results were generally consistent for in-person and remote care (results not shown but available from authors). Full mediation model results are available in Table A2.

Discussion

The COVID-19 pandemic has altered daily life for most families with young children. In particular, the closure or change in the nature of children's primary care and school settings has been one of the most substantial changes experienced by children themselves. Emergent

evidence has shed light on the disruptions caused by the abrupt shift to remote schooling in the spring of 2020 (Bacher-Hicks et al., 2021; Domina et al., 2021). But there is little evidence about the experiences of disruptions as the pandemic persisted through the fall of 2020, nor about the effects of those disruptions on children's well-being. This study filled that gap by using daily survey data gathered in fall 2020 from a representative sample of hourly service workers with young children—a group with significant but common vulnerabilities—to shed light on the frequency of instances of disruptions to school and care, and the consequences of those disruptions for child behavior. The national public discussion about the relative risks to bringing children back to the classroom versus keeping them at home has had little rigorous evidence on which to rely. We document an aspect of daily mental health burden during the pandemic, unexpected disruptions in care and learning, and show its costs for child wellbeing. Results indicate that disruptions were common overall, occurred regularly for both remote and in-person settings, and were most common in remote learning. Further, children's behavior is negatively affected by disruptions, with evidence that effects are partially mediated by parents' challenges supporting children's learning and by parents' mood and behavior.

Research has shown how radically family life was altered when school abruptly closed in spring 2020 (Gassman-Pines et al., 2020; Gassman-Pines & Gennetian, 2020; Steimle et al., 2021). Our results underscore that although many schools and child care facilities re-opened throughout summer and fall, families continued to experience instability in school and care throughout the fall. On any given day, nearly 25% of parents said that their care or school arrangement had not gone smoothly that day, and the vast majority of families had at least one day during the month of data collection on which care or school was disrupted. Our innovative daily survey design enabled us to reveal how common these disruptions were as they were

occurring in daily life. This approach reduces recall bias and eliminates the need to ask people to mentally aggregate instances of disruptions, both of which can lead to undercounting these experiences (Bound et al., 2001; Mathiowetz et al., 2002).

Further, our results show that keeping children home to attend school remotely did not eliminate disruptions. In fact, although disruptions were common across school/care modality, we found that disruptions in remote learning were *more* common than disruptions in in-person care or school. This is likely due to challenges related to lack of stable and reliable internet access, dependable devices, user-friendly learning software, or other technological problems, which are more common among lower-income families (Auxier & Anderson, 2020). Daily reports of parental difficulty supporting learning were also higher for families using remote than in-person, consistent with the unprecedented demands on parents of implementing remote education.

In terms of effects of these daily school and care disruptions on children's behavior problems, we found striking and consistent evidence that parents reported that their children had more behavior problems on days with a disruption than days without a disruption. Compared to days without disruptions, on days with disruptions parents reported a 71% increase in the share of children who exhibited uncooperativeness (an aspect of externalizing behavior problems) and a 112% increase in the share of children who seemed sad or worried (aspects of internalizing behavior problems). These large increases in child behavior problems are consistent with Ecological Systems Theory, as changes to children's microsystems are posited to have the largest and most direct effects on children's development and well-being. For example, in contrast, prior research has shown that daily changes to the exosystem (parents' workplaces) have large effects on parent mood but do not affect children's daily behavior (Ananat et al., 2020).

Consistent with Ecological Systems Theory and our general conceptual framework, these disruptions to care and schooling appeared to have both direct and indirect effects on children's behavior. In particular, given that the pandemic has blurred the lines between the family and school microsystems, parents' behaviors and mood are key mediating mechanisms. Children, who are embedded in family systems, are influenced by their parents' own mood and behavior.

More broadly beyond the pandemic, these results provide additional evidence of the harmful effects of daily unpredictability and instability in children's everyday lives. Instability in the family setting has been linked to young children's behavior problems (Fomby & Mollborn, 2017). Further, research has shown that daily hassles and stressors in childhood are just as strongly related to later life health as major stressful life events (Odgers & Jaffee, 2013). As developmental scientists seek to understand microsystem influences on child behavior, the disruptions and instability in school and care caused by the pandemic provide additional evidence of how chronic lower-level stressors can lead to child behavior problems.

Finally, in terms of understanding the context of children's care and schooling in fall 2020, we found differences for families from different racial and ethnic groups. Although school/care disruptions were common for all families, Hispanic parents reported the highest rates of disruptions and non-Hispanic Black parents reported the lowest. Non-Hispanic Black families also experienced somewhat milder effects of disruptions on well-being than did other families, while non-Hispanic White families experienced somewhat stronger effects than did other families. A complete understanding of the reasons underlying these differences will require further study but we note that, consistent with prior literature (e.g., Akee et al., 2019), the non-Hispanic white families in our sample had more advantages at the outset of the study, including slightly higher levels of education and being more likely to be living with a spouse or partner. It

is possible that during the pandemic loss of access to some of the supports related to those advantages may have made disruptions experienced during the pandemic more salient.

Nonetheless, across race/ethnicity groups all families experienced severe—large, statistically significant, negative—effects from disruptions on parent mood, child mood, and parenting behaviors. Moreover, across all racial/ethnic groups families were 36% more likely to experience daily disruptions in remote school, with even greater increases for families of color. These findings provide compelling evidence that policymakers should prioritize efforts to make a safe return to in-person school available as an option to families at the same time that they bolster support for remote learners.

Limitations

While our study demonstrates the impact of COVID-related disruptions on a vulnerable population, the sample population was limited and targeted. Families in which parents were hourly workers in other industries or salaried workers, may have had different experiences with school and child care during the fall of 2020. Further, our findings are local to a particular major city. The experience of the pandemic may differ from city to city, based on infection prevalence and governmental and social response. Finally, we used a simplified approach so as to allow us to have a large sample answer this question daily. However, this meant that we were not able to ask detailed follow-up questions, so we are not able to parse out from this data whether a given disruption was due to internet failure, COVID-19 cases, or some other specific source.

Conclusion

Despite these limitations, however, this study provides compelling new evidence of disruptions to important microsystem settings for young children – school and child care – during the ongoing COVID-19 pandemic. There has been little evidence about the experiences of

disruptions to children's care and school arrangements as the pandemic has persisted through the 2020-2021 school year, nor about the effects of those disruptions on child and family well-being. By using innovative daily survey data gathered in the fall of 2020 from a representative sample of hourly service workers with young children, we are able to shed light on the frequency of disruptions to school and care, and the consequences of those disruptions for child and parent mental health, among a group of families with significant but common vulnerabilities. While previous work had documented that universal, short closures (such as snow days) had few effects on children (Goodman, 2014), we document that frequent, unexpected disruptions in care and learning have significantly contributed to the daily burden for families during the pandemic. Policies to increase the safety, accessibility, and predictability of in-person learning hold promise to reduce disruptions. Moreover, as school districts prepare for a new school year in which many plan to continue offering remote options, additional support and resources for families in remote modes may be needed to stabilize their day-to-day experiences. Finally, this research provides further evidence on, as well as identifying additional sources of, emotional distress among children that schools and other child-serving organizations will need to address as they try to repair the damage incurred in the pandemic.

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Table 1. Sample characteristics and descriptive statistics

	Mean	St. Dev.
Demographics at study enrollment (Fall 2019)		
Parent age (years)	30.8	6.9
Parent female	83.8%	
Race/ethnicity		
Hispanic (of any race)	21.8%	
African-American (non-Hispanic)	50.9%	
White (non-Hispanic)	17.7%	
Asian (non-Hispanic)	2.9%	
Multi-racial (non-Hispanic)	2.4%	
Education:		
< high school education	8.8%	
Exactly a high school education	61.9%	
> high school education	29.3%	
Monthly household income	$2,177	$1,639
Child characteristics		
Age (years)	5.0	2.6
Female	51%	
Daily family measures during current study (Fall 2020)		
Daily child behavior measures		
Uncooperative	14.1%	
Sad/worried	6.7%	
Daily parent measures		
Fretful, angry, irritable, anxious, depressed	41.6%	
Difficulty sleeping (1-10 scale)	4.1	2.4
Daily parenting behaviors		
Lost temper with child	7.0%	
Punished child	5.8%	
N (persons) =	679	
N (person-days) =	16,962	

Table 2. Distribution of school/care modalities, overall and by race

	Remote Only	In Person Only	Both	Neither
All families				
share	44.0%	12.9%	32.3%	10.8%
standard error	(1.9%)	(1.3%)	(1.8%)	(1.2%)
N	293	86	215	72
Hispanic families				
share	41.7%	14.4%	30.2%	13.7%
standard error	(4.2%)	(3.0%)	(3.9%)	(2.9%)
N	58	20	42	19
Non-Hispanic Black families				
share	43.3%	11.7%	34.2%	10.8%
standard error	(2.7%)	(1.7%)	(2.6%)	(1.7%)
N	148	40	117	37
Non-Hispanic White families				
share	43.9%	18.7%	30.1%	7.3%
standard error	(4.5%)	(3.5%)	(4.2%)	(2.4%)
N	54	23	37	9

Table 3. Incidence and frequency of school/care disruptions by modality and race/ethnicity

		Race/Ethnicity		
	All families	Hispanic	Non-Hispanic Black	Non-Hispanic White
Across all modalities				
Days with:				
School/care disruption	24.4%	30.8%	21.5%	22.2%
	(.3%)	(.8%)	(.5%)	(.7%)
Difficulty supporting learning	24.9%	28.1%	22.1%	24.7%
	(.3%)	(.7%)	(.5%)	(.8%)
Parents reporting at least 1 instance during the month of:				
School/care disruption	77.3%	81.4%	72.3%	78.8%
	(1.6%)	(3.2%)	(2.5%)	(3.8%)
Difficulty supporting learning	73.9%	81.4%	69.3%	72.0%
	(1.7%)	(3.2%)	(2.5%)	(4.1%)
Remote only				
Days with:				
School/care disruption	24.4%	30.8%	21.5%	22.2%
	(.3%)	(.8%)	(.5%)	(.7%)
Difficulty supporting learning	24.9%	28.1%	22.1%	24.7%
	(.3%)	(.7%)	(.5%)	(.8%)
Parents reporting at least 1 instance during the month of:				
School/care disruption	77.3%	81.4%	72.3%	78.8%
	(1.6%)	(3.2%)	(2.5%)	(3.8%)
Difficulty supporting learning	73.9%	81.4%	69.3%	72.0%
	(1.7%)	(3.2%)	(2.5%)	(4.1%)
In-person only				
Days with:				
School/care disruption	24.4%	30.8%	21.5%	22.2%
	(.3%)	(.8%)	(.5%)	(.7%)
Difficulty supporting learning	24.9%	28.1%	22.1%	24.7%
	(.3%)	(.7%)	(.5%)	(.8%)
Parents reporting at least 1 instance during the month of:				
School/care disruption	77.3%	81.4%	72.3%	78.8%
	(1.6%)	(3.2%)	(2.5%)	(3.8%)
Difficulty supporting learning	73.9%	81.4%	69.3%	72.0%
	(1.7%)	(3.2%)	(2.5%)	(4.1%)
N (person-days)	17077	3644	7981	3262
N (persons)	679	145	332	118

Note. Standard errors in parentheses.

Table 4. Effect of school/care disruption today on daily outcomes, by modality and race/ethnicity

		By Race/Ethnicity		
	All families	Hispanic	Non-Hispanic Black	Non-Hispanic White
All modalities				
Child behavior:				
Child was uncooperative some or a lot today	.103***	.102***	.086***	.136***
	(.010)	(.022)	(.013)	(.021)
Child appeared to be sad or worried some or a lot today	.072***	.051***	.076***	.099***
	(.007)	(.014)	(.011)	(.017)
Parent wellbeing:				
Felt fretful angry irritable anxious or depressed today	.141***	.121***	.138***	.177***
	(.013)	(.028)	(.019)	(.031)
Sleep Difficulty the night following this day - normalized	.033+	0.034	.048+	.013
	(.017)	(.034)	(.028)	(.040)
Parenting behaviors:				
Lost temper today	.058***	.047**	.048***	.091***
	(.008)	(.018)	(.010)	(.018)
Punished child today	.048***	.04**	.037***	.082***
	(.007)	(.013)	(.009)	(.022)
Remote only				
Child behavior:				
Child was uncooperative some or a lot today	.083***	.081*	.051**	.135***
	(.014)	(.035)	(.017)	(.038)
Child appeared to be sad or worried some or a lot today	.065***	.037*	.067***	.077**
	(.010)	(.016)	(.014)	(.025)
Parent wellbeing:				
Felt fretful angry irritable anxious or depressed today	.150***	.158**	.18***	.108**
	(.019)	(.047)	(.027)	(.040)
Sleep Difficulty the night following this day - normalized	.081**	0.086	.116**	0.044
	(.026)	(.059)	(.042)	(.059)
Parenting behaviors:				
Lost temper today	.052***	0.023	.044***	.068*

	(.011)	(.024)	(.012)	(.029)
Punished child today	.043***	0.016	.039**	.085*
	(.010)	(.015)	(.012)	(.039)
In-person only				
Child behavior:				
Child was uncooperative some or a lot today	.123***	.118*	.168**	.122**
	(.027)	(.060)	(.049)	(.044)
Child appeared to be sad or worried some or a lot today	.088***	.124**	.11**	.104*
	(.020)	(.035)	(.041)	(.049)
Parent wellbeing:				
Felt fretful angry irritable anxious or depressed today	.154***	0.136	.125*	.24***
	(.042)	(.098)	(.063)	(.067)
Sleep Difficulty the night following this day - normalized	-0.003	0.107	0.041	-.200***
	(.052)	(.096)	(.123)	(.054)
Parenting behaviors:				
Lost temper today	.046*	0.015	.068*	0.064
	(.020)	(.036)	(.032)	(.041)
Punished child today	.039*	-0.015	-0.053	-0.04
	(.020)	(.036)	(.033)	(.044)
N (person-days)	16,961	3,615	3,253	7,916

Random effects regressions with family and daily variation; all regressions include an indicator for weekend days. Standard errors clustered on family in parentheses.

Table 5. Indirect effect of school/care disruption on child behavior, via parent mood and parenting behavior

Mediator	Child appeared to be sad or worried				Child was uncooperative			
			95% C.I.				95% C.I.	
Parent wellbeing:	Estimate	(SE)	Lower	Upper	Estimate	(SE)	Lower	Upper
Felt fretful angry irritable anxious or depressed today	0.016***	(0.003)	0.012	0.021	0.027***	(.0.004)	0.02	0.034
Proportion of total effect	0.197***	(0.032)	0.144	0.25	0.216***	(0.032)	0.163	0.269
N (persons)	676				676			
N (person-days)	16961				16961			
Parenting behaviors:								
Difficulty supporting child's learning	0.039***	(0.005)	0.031	0.047	0.053***	(0.006)	0.044	0.063
Proportion of total effect	0.46***	(0.051)	0.376	0.545	0.432***	(0.047)	0.355	0.509
N (persons)	678				678			
N (person-days)	17,010				17010			
Lost temper today	0.011***	(0.003)	0.006	0.017	0.025***	(0.005)	0.017	0.034
Proportion of total effect	0.127***	(0.035)	0.071	0.184	0.197***	(0.034)	0.141	0.254
N (persons)	676				676			
N (person-days)	16905				16905			
Punished child today	0.009***	(0.003)	0.005	0.014	0.025***	(0.004)	0.018	0.033
Proportion of total effect	0.104***	(0.030)	0.054	0.154	0.189***	(0.031)	0.139	0.239
N (persons)	676				676			
N (person-days)	16919				16919			

Note: Within-subject mediation of school disruption on child outcomes, mediated by parent wellbeing and parent behavior. Models run separately for each child outcome/mediator pair.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix A

Table A1. Correlation Matrix of Predictor Variables

		1	2	3	4	5	6
1	School disruption	1					
2	Had difficulty supporting learning	0.70	1				
3	Parent negative mood	0.34	0.53	1			
4	Lost temper with child	0.24	0.34	0.46	1		
5	Punished child	0.23	0.33	0.39	0.75	1	
6	Weekend	-0.05	-0.24	-0.11	-0.12	-0.09	1

Note: Tetrachoric correlation coefficients, all are significant at $p < 0.001$

Table A2. Mediated effect of learning disruption on children's outcomes, via parent mood and parenting behavior

Panel A: Child appeared to be sad or worried

Mediator	*Felt fretful angry irritable anxious or depressed*						*Had difficulty suppporting child's learning*						*Did you lose your temper with your child today? Yes or No*						*Did you punish your child today? Yes or No*					
					95% C.I.						95% C.I.						95% C.I.						95% C.I.	
Effect	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper
a (X to M)	0.212	(0.016)	12.996	0.00	0.184	0.239	0.404	(0.016)	25.331	0.00	0.378	0.43	0.067	(0.009)	7.253	0.00	0.051	0.082	0.059	(0.008)	7.105	0.00	0.045	0.072
b (M to Y)	0.055	(0.006)	8.572	0.00	0.011	0.015	0.079	(0.010)	8.231	0.00	0.063	0.094	0.149	(0.020)	7.443	0.00	0.116	0.182	0.152	(0.019)	7.956	0.00	0.12	0.183
c' (X to Y)	0.066	(0.008)	7.984	0.00	0.053	0.08	0.046	(0.007)	6.243	0.00	0.034	0.058	0.078	(0.009)	8.962	0.00	0.064	0.092	0.081	(0.009)	8.903	0.00	0.066	0.095
Cov (ajbj)	0.005	(0.002)	2.081	0.04	0.001	0.008	0.007	(0.004)	2.008	0.05	0.001	0.013	0.001	(0.003)	0.432	0.67	-0.004	0.007	0	(0.003)	0.165	0.87	-0.004	0.005
Mediated Effect	0.016	(0.003)	6.306	0.00	0.012	0.021	0.039	(0.005)	8.174	0.00	0.031	0.047	0.011	(0.003)	3.394	0.00	0.006	0.017	0.009	(0.003)	3.271	0.00	0.005	0.014
Total Effect	0.083	(0.009)	9.537	0.00	0.068	0.097	0.085	(0.008)	9.954	0.00	0.071	0.099	0.089	(0.009)	9.451	0.00	0.074	0.105	0.09	(0.009)	9.491	0.00	0.074	0.105
Proportion mediated	0.197	(0.032)	6.123	0.00	0.144	0.25	0.46	(0.051)	8.95	0.00	0.376	0.545	0.127	(0.035)	3.689	0.00	0.071	0.184	0.104	(0.030)	3.422	0.00	0.054	0.154
N person	676						678						676						676					
N person-days	16961						17010						16905						16919					

Panel B: Child was uncooperative

Mediator (M)	*Felt fretful angry irritable anxious or depressed*						*Had difficulty suppporting child's learning*						*Did you lose your temper with your child today? Yes or No*						*Did you punish your child today? Yes or No*					
					95% C.I.						95% C.I.						95% C.I.						95% C.I.	
Effect	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper	Estimate	(SE)	Est./S.E.	P	Lower	Upper
a (X to M)	0.212	(0.016)	12.968	0.00	0.185	0.239	0.405	(0.016)	25.403	0.00	0.379	0.431	0.065	(0.009)	7.149	0.00	0.05	0.08	0.057	(0.008)	6.931	0.00	0.044	0.071
b (M to Y)	0.09	(0.009)	9.503	0.00	0.074	0.105	0.116	(0.012)	9.716	0.00	0.097	0.136	0.393	(0.023)	16.731	0.00	0.354	0.431	0.363	(0.024)	15.393	0.00	0.316	0.401
c' (X to Y)	0.098	(0.022)	9.256	0.00	0.081	0.115	0.07	(0.010)	6.744	0.00	0.053	0.087	0.103	(0.011)	9.046	0.00	0.085	0.122	0.109	(0.012)	9.368	0.00	0.09	0.128
Cov (ajbj)	0.008	(0.004)	2.144	0.03	0.002	0.014	0.006	(0.005)	1.35	0.18	-0.001	0.014	0.00	(0.004)	-0.027	0.99	-0.006	0.006	0.005	(0.003)	1.315	0.19	-0.001	0.01
Mediated Effect	0.027	(.0.004)	6.47	0.00	0.02	0.034	0.053	(0.006)	8.835	0.00	0.044	0.063	0.025	(0.005)	5.202	0.00	0.017	0.034	0.025	(0.004)	5.735	0.00	0.018	0.033
Total Effect	0.125	(0.011)	11.006	0.00	0.106	0.144	0.124	(0.012)	10.474	0.00	0.104	0.143	0.129	(0.013)	10.166	0.00	0.108	0.15	0.134	(0.013)	10.632	0.00	0.114	0.155
Proportion mediated	0.216	(0.032)	6.744	0.00	0.163	0.269	0.432	(0.047)	9.248	0.00	0.355	0.509	0.197	(0.034)	5.756	0.00	0.141	0.254	0.189	(0.031)	6.161	0.00	0.139	0.239
N person	676						678						676						676					
N person-days	16961						17010						16905						16919					

Note: Within-subject (j) mediation of X (school disruption) on Y (child outcome), mediated by parent mood and parent behavior (M).
a is the path from the independent variable (school disruption) to the mediator, b is the path from the mediator to the child outcome. c' is the unmediated portion of the X to Y relation.
Cov(ajbj) is the covariance of the between-subjects differences in the X-to-M and M-to-Y relationships.