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## Understanding patterns of food insecurity and family well-being amid the COVID-19 pandemic using daily surveys

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### Abstract

This paper investigates economic and psychological hardship during the COVID-19 pandemic among a diverse sample (61% Latinx; 16% White; 9% Black; 14% mixed/other race) of socioeconomically disadvantaged parents (90% mothers; mean age = 35 years) and their elementary school-aged children (ages 4–11; 49% female) in rural Pennsylvania ( $N = 272$ ). Families participating in a local food assistance program reported on food insecurity (FI) and parent and child mood and behavior daily from January to May 2020. Longitudinal models revealed that FI, negative parent and child mood, and child misbehavior significantly increased when schools closed; only FI and parent depression later decreased. FI decreased most among those who received the local food assistance program; Supplemental Nutrition Assistance Program receipt uniquely predicted decreases in child FI.

The COVID-19 pandemic has severely disrupted the lives of U.S. families in unprecedented ways. Households with children have experienced dramatic spikes in economic and psychological hardship, captured by surges in food insecurity (FI) and psychological distress among parents and children, which have been disproportionately borne by low-income families (Bauer et al., 2020; Gassman-Pines et al., 2020). These spikes are not only tied to the loss or decline of wages the pandemic triggered (Ananat & Gassman-Pines, 2020), but also to disruptions in food, childcare, and social support access amid COVID-related restrictions, such as school closures (Moreland et al., 2020). Specifically, when schools around the country abruptly closed in March 2020, many low-income families immediately lost access to essential assistance programs, such as the National School Lunch Program and School Breakfast Program (Dunn et al., 2020), which serve millions of U.S. children annually (Coleman-Jensen et al., 2020). Parents were also suddenly faced with having to care for their children, now home full-time, which caused some parents to forego work hours or juggle working from home while supervising children (Gassman-Pines et al., 2020).

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#### SUPPORTING INFORMATION

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

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

These conditions may contribute to increased household chaos (Johnson et al., in press) and substantially increase psychological distress for families, particularly those already struggling to make ends meet (Prime et al., 2020).

While there is no question that rates of economic and psychological hardship increased with the onset of the COVID-19 pandemic, the trajectories of these increases as the pandemic spread throughout the spring of 2020 are unclear. Understanding these trends is important, as different patterns of suffering should invoke different policy responses. Hypothetically, two distinct patterns could have emerged in the spring: an immediate spike in one or both outcomes when school closures were initially imposed, followed by a gradual decline as families adjusted to this restriction; or an immediate spike in outcomes that remained stable or even increased in the months to follow. Moreover, economic and psychological hardship could have followed different trajectories, with one remaining elevated throughout the early months of the pandemic while the other declined after school closures.

The present study investigates these trends using data collected during the first half of 2020 from a sample of low-income families in rural Pennsylvania as part of an ongoing evaluation of a school-based, backpack food assistance program, the Power Packs Project (PPP). From January through May 2020, families responded to daily text-message surveys about their FI—a key indicator of economic hardship—and their psychological distress, including depression, irritability, and harsh discipline. Daily surveys also asked about children’s psychological distress via questions about a focal child’s mood and behavior problems. Because our study spanned the period before and after statewide school closures on March 13 (Moreland et al., 2020), the data allow us to track how this restriction immediately affected families’ daily FI and parent and child psychological distress, and how these dynamics may have abated or increased as the lockdown protracted in a way that simple snapshots of these outcomes, even at a monthly level, could not.

School closures also severely disrupted the provision of the PPP, leaving many families unable to receive their weekly food packs. Our data allow us to determine whether families who continued to receive their packs after restrictions fared better in terms of their FI than those who did not receive their packs, a difference that could illuminate the potential buffering effect of this unique food assistance program. We also measured receipt of the Supplemental Nutrition Assistance Program (SNAP) as well as the frequency with which families accessed Grab and Go meals at their children’s schools, which replaced the free or reduced-price school meals children would normally receive, thus allowing us to explore the role of state and federal food assistance amid the pandemic in addition to the PPP. In these ways, the data position us to understand the lived experiences of rural, low-income families during the COVID-19 pandemic and inform policies and programs to support families in the event of future restrictions.

## Family economic and psychological well-being

Food insecurity, defined as consistently lacking access to the adequate amount of food necessary to fuel a healthy lifestyle for all household members (Coleman-Jensen et al., 2020), is a key dimension of household economic hardship, and is more common among,

though not restricted to, low-income households (Johnson & Markowitz, 2018). FI is prevalent during normal times—for instance, one in five households with young children were food insecure in 2019 (Coleman-Jensen et al., 2020)—but has notably increased during the pandemic (Bauer et al., 2020). This surge is worrisome because FI consistently predicts poor parent and child physical health (e.g., Gundersen & Ziliak, 2015), including iron deficiency and oral health problems, and poor mental health, including increased adult parenting stress, depression, and anxiety (Johnson & Markowitz, 2018; Whitaker et al., 2006), and negative child cognitive, academic, and socioemotional outcomes (Alaimo et al., 2001). These relations reflect both the direct, biological effects of hunger and poor nutrition (Kiff et al., 2011; Tanner & Finn-Stevenson, 2002), and how worry about food can trigger emotional stress and behavioral dysregulation in parents and children (Belsky et al., 2010; Johnson & Markowitz, 2018).

Parent and child psychological well-being are also key indicators of healthy household functioning. Links between parent psychological distress—including depression, parenting stress, and anxiety—and poor child outcomes are well-established: indeed, it is one of the most robust findings in the developmental psychology literature that the presence of a sensitive, responsive caregiver can buffer children against the negative effects of stressors (e.g., Shonkoff, 2010), such as those related to the pandemic. Parents experiencing psychological distress tend to have more difficulty acting as sensitive caregivers (Dix et al., 2004), which can contribute to children's increased behavior problems and difficulties managing emotions, in turn making parenting more stressful and further incapacitating parents' ability to act responsively (Kiff et al., 2011). Thus, both parents' and children's emotional well-being, which have been significantly impaired by the pandemic, can have direct, harmful implications for family functioning.

## Family economic and psychological well-being during COVID-19

Multiple psychological theories, alongside evidence from prior sociohistorical crises, implicate the COVID-19 pandemic in having proximate, detrimental effects on families. The bioecological model (Bronfenbrenner & Ceci, 1994), for instance, posits that the pandemic, a major macrosystem event, altered all aspects of the exo- and microsystems that drive child development. School closures disrupted parents' ability to work (exosystem), families' access to services (exosystem), and children's access to child care and education (microsystem; Garbe et al., 2020). These disruptions to the microsystem, in turn, may undermine both parent and child mood and behavior (e.g., Dix et al., 2004; Kiff et al., 2011). Moreover, these disruptions have impacted low-income families more than higher-income families because the former had fewer financial and emotional protective factors within their exo- and microsystems prior to the crisis (Dunn et al., 2020). Further, life course theory, as well as research from the Severe Acute Respiratory Syndrome outbreak and the Great Recession, suggest that these negative effects on material and psychological well-being that emerged in response to the pandemic were likely immediate (Benner & Mistry, 2020; Kalil, 2013; Ko et al., 2006; Sprang & Silman, 2013) and disproportionately borne by families most directly impacted by the crisis (Ko et al., 2006; Sprang & Silman, 2013).

Although it has been established that economic and psychological well-being have declined amid the pandemic, nearly all reports on these outcomes have relied upon cross-sectional, retrospective measures that assess family economic and psychological well-being over weeks or months (e.g., Bauer et al., 2020; Xiong et al., 2020). This approach likely obscures important trends in FI and psychological distress during the pandemic, as research indicates that both of these outcomes vary meaningfully from day-to-day and thus within months and even weeks. For example, in a study that examined daily FI in response to the timing of SNAP disbursement, Gassman-Pines and Schenck-Fontaine (2019) found that families experience higher FI in the days towards the end of the month when their SNAP benefits are depleted and lower rates at the beginning of the month when benefits are refilled. Similarly, a large literature has documented that adults' psychological well-being varies day-to-day (e.g., Bolger et al., 2003), and that child socioemotional well-being varies in tandem with parents' (e.g., Gassman-Pines, 2011). For instance, with 6 weeks of daily surveys from married couples, Bolger et al. (1989) found that a fifth of the changes in couples' moods could be explained by daily stressors, suggesting that psychological processes change alongside daily variation in context and stressors. Together, these findings indicate that more frequent, time-sensitive measures of FI and parent and child mood and behavior may more accurately capture families' experiences amid the pandemic than point-in-time surveys.

In sum, extant research on the pandemic reveals that FI and parent and child psychological distress increased at some point after school closures were enacted, but not how families fared economically or psychologically in the months that followed. One possibility is that families experienced an immediate increase in FI and distress in response to school closures, which subsided as they secured the help or resources they required. Alternatively, these outcomes could have remained elevated or increased further following school closures if families experienced protracted job or income loss without sufficient assistance. Moreover, these patterns may differ for an economic hardship, such as FI, versus an indicator of psychological distress, like parent depression. For instance, state and federal governments worked to increase low-income families' access to food and cash assistance through expanded SNAP eligibility, Grab and Go meals distributed at schools, U.S. Department of Agriculture food boxes distributed at pantries, and stimulus checks (Coronavirus Aid, Relief, & Economic Security Act, 2020; Families First Coronavirus Response Act, 2020). These tangible supports could plausibly have reduced FI among low-income families, but potentially not the psychological strain of economic uncertainty, work-child care conflicts, and quarantine. Only daily measures of both types of outcomes can accurately chart any differential trajectories of family well-being in these crucial, early months of the pandemic.

## The role of food assistance during COVID-19

Families' experiences of FI may have been altered by sources of food assistance that remained or became available in the months following school closures, and different patterns may emerge for families who were differentially able to access those resources. First, for families in our study, continued access to food assistance from the PPP could have meaningfully moderated the pandemic's effects on FI. The PPP, a non-profit organization funded almost entirely through private donations, provides families with elementary school-aged children in two rural counties in Pennsylvania with packs of food to consume over

the weekend, a time when free or reduced-price school meals are unavailable (Power Packs Project, 2020). The packs are sized to feed the entire household and provide fresh meat, vegetables, and dairy, as well as some non-perishables, alongside accompanying recipes for families to make and eat together. Prior to COVID-related closures, many students brought their packs home from school, but when Pennsylvania closed its public schools on March 13, 2020, one school district began distributing packs for pickup at limited locations for only 2 h per week, while the other school district stopped providing packs altogether. Children being home from school, coupled with parents having restricted transportation and movement during COVID-19, led to pick-up rates in our sample dropping from about 65% of families per week before schools closed to only 30% afterwards. A central question is whether families who were able to receive their food packs despite restrictions experienced smaller spikes in FI at the time of school closures, or greater reductions in FI in months following, relative to those who did not receive their packs, as previous research indicates that the provision of food assistance amid surges in FI can contribute to significantly lower FI (Schazenbach et al., 2016). Identifying differences in trends by program participation will provide both a nuanced description of how important indicators of family well-being altered in this unprecedented time and the potential of a unique, place-based program to support low-income families.

In addition to Power Packs, most program families received state and federal food assistance after school closures that could also have alleviated FI amid the pandemic. Specifically, many schools that normally offered free or reduced-price breakfast and lunch began distributing Grab and Go meals as replacements for in-school meals. In the two school districts in Pennsylvania that utilize the PPP, schools distributed Grab and Go meals for families to pick up all of their meals for the week, twice per week after schools closed, which about 37% of families reported using regularly in our sample. It is possible, then, that the families who were able access this source of food experienced greater declines in FI after schools closed compared to those who may have not been able to access it. The reverse is also possible, however, that the most food insecure families relied upon Grab and Go meals, a pattern that has been displayed in literature on food assistance receipt (Nord & Golla, 2009). In this case, those that had the greatest spikes in FI when schools closed and elevated FI thereafter may have also been those who reported using Grab and Go meals.

Another source of federal food assistance that may have affected families' FI is SNAP. Once again, patterns could indicate either that use of the program was associated with decreased FI over time, or increased FI if the neediest families reported using it. Something that is unique to SNAP, though, is that many households applied for this benefit amid the pandemic, which slowed down applications and made the approvals and money slow to reach new applicants (Center on Budget & Policy Priorities, 2020). Further, many items were difficult to access in grocery stores when the pandemic first hit, which could have made it difficult for families to use their SNAP benefits (Kinsey et al., 2020). Indeed, among SNAP users in our sample, 75% reported having some trouble using their benefits. Thus, we may see further variation in FI among SNAP recipients in terms of those who reported having trouble accessing or using their SNAP benefits, compared to those who did not. An additional source of federal food assistance, known as Pandemic-EBT, was also offered to low-income families during the pandemic (Bauer et al., 2020), but unfortunately this benefit

was distributed in Pennsylvania at the end of our data collection, so we cannot investigate its role.

If receipt of food assistance, from Power Packs, school-provided meals, or SNAP, alleviated FI after school closures, it is possible that receipt of those programs also enhanced parent and child psychological well-being. As explained above, FI predicts higher levels of parental stress and depression (Johnson & Markowitz, 2018; Whitaker et al., 2006) and higher levels of child internalizing and externalizing behaviors (Alaimo et al., 2001). It follows, then, that by enhancing families' food security, these programs could have also enhanced families' psychological well-being. If so, receipt and use of these programs would predict greater reductions in parent and child psychological distress after school closures. Alternatively, it is possible that amid the many stressors families experienced during the pandemic, including job and income loss, sudden homeschooling, and social isolation resulting from stay-at-home orders, the stress associated with FI was simply not central enough to the stress families experienced for its alleviation alone to sufficiently enhance parent and child well-being. If so, receipt and use of these programs would not predict parent or child psychological outcomes after school closures. Adjudicating between these scenarios will reveal not only the role food assistance played during COVID-19, but also the extent to which elevations in FI occurred alongside elevations in parent and child distress.

## Present study

By blending daily diary data with Power Packs program participation data, the present study investigates the implications of COVID-19 for families' FI and parent and child psychological distress, as well as how receipt of food assistance programs may have buffered those effects. Specifically, we ask: (1) How did families' daily FI, parent depression, parent irritability and anger, parent discipline of child, and child behavior and mood, alter in the weeks and months immediately after COVID-19-related school closures were imposed? (2) Did receipt of food assistance, specifically the Power Packs Project, SNAP, or Grab and Go meals, buffer families from COVID-related changes in food security and family well-being? (3) Did any of these patterns differ for families' FI versus psychological well-being? Answering these questions will provide insights into the disproportionate consequences of COVID-19 on a racially and ethnically diverse sample of low-income families' FI and psychological distress, as well as the potential for scalable solutions to mitigate that harm. Further, by providing evidence about the extent to which FI and family psychological well-being followed similar trajectories after school closures, results may also help explain the role FI played in shaping families' psychological response to the pandemic. We note that given the unexpectedness of the COVID-19 pandemic during our data collection period, as well as the novelty of collecting daily measures of FI and psychological distress for nearly six months, that these analyses are largely exploratory. While this study focuses on a specific community, it can nonetheless illuminate the implications of COVID-related restrictions for the many low-income communities around the United States struggling amid this unprecedented pandemic.

## METHODS

### Data

Data were collected as part of an ongoing study of a food assistance program located in rural Pennsylvania, the PPP. Participants were recruited in the fall of 2019 from six elementary schools in two school districts that partner with Power Packs. Primary caregivers responded via text-message to daily surveys—or diaries—for two consecutive weeks each month from January 9 to May 30, 2020, in either English or Spanish, in accordance with their preference. Participants were randomly assigned to one of two groups: the first group responded during the first 2 weeks of the month and the second group responded during the second 2 weeks, which provided us with diary information every day throughout the study period. PPP participation data were obtained from a tablet-based application the program uses to capture weekly, family-level pack pickup, as well as via daily questions in our surveys. The initial study was designed to link weekly receipt of Power Packs with daily experiences of FI and family functioning. COVID-19-related school closures and social restrictions were instituted 2 months into data collection, however, thus the ongoing daily diary surveys combined with PPP participation data were leveraged to examine the associations between school closures in the spring and families' daily FI and psychological distress, as well as how program participation may have altered these associations, in an exploratory study. We obtained updated participant demographic information, alongside information regarding participation in other food assistance programs like SNAP and Grab and Go meals, from a one-time, end-of-year survey collected in June 2020, which allowed us to examine the effects of these programs on COVID-related changes in FI and psychological distress.

### Sample

The PPP operates in 45 schools across 16 school districts in Pennsylvania. All students who qualify for free and reduced-price lunch at participating schools are eligible to enroll in Power Packs, although participation is entirely voluntary and requires parents' active enrollment. We selected a subset of six schools across two school districts for this study. To do so, we used the following criteria: first, we chose only elementary schools (pre-kindergarten through fifth grade), because the literature makes clear that FI is most strongly linked with child well-being among younger children, in part because young children are almost entirely dependent on their home environment for food (Johnson & Markowitz, 2018; Whitaker et al., 2006). Moreover, children in elementary school are still experiencing fundamental neurological development in brain regions that subserve behavioral and emotional regulation, and that development hinges on adequate nutrition (Alaimo et al., 2001; Belsky et al., 2010). Second, we needed to obtain contracts with each school district separately to recruit and collect data. Thus, we prioritized the two school districts with the largest numbers of PPP schools. Within these school districts, we focused on those schools serving 50 or more Power Packs families so that we could reliably account in statistical analyses for school-level variation.

Of the 684 families enrolled in the PPP across the six study schools, 272 families agreed to participate in the text-based daily surveys (40% enrollment rate). There were no significant demographic differences between parents at the study schools who participated in the study

compared to those who did not participate in terms of race, ethnicity, and education levels (available from authors upon request). Table 1 details sample characteristics, which indicates that the majority of families in the sample were Latinx and the majority of parents had at least a high school degree. One adult per household was able to receive the daily diaries, which was the mother 90% of the time, and given that the questions sought to track a specific child's set of behaviors over time, the youngest child in the household was selected as the focal child, which yielded a range of sample children aged 4–11 years old. Response rates to the daily diaries resemble those of comparable studies (e.g., Gassman-Pines & Schenck-Fontaine, 2019): 65%–70% responded multiple nights each week and 55% responded every night. Despite the disruptions associated with COVID-19 restrictions to family life, response rates remained stable after March, suggesting no non-random attrition after school closures.

## Measures

### Time

**School closures:** All Pennsylvania schools were closed on March 13, 2020, in response to the COVID-19 pandemic (Moreland et al., 2020). We created one indicator variable for whether a daily survey was fielded on or after March 13.

**Days:** To be able to adequately capture changes over time, we created a variable centered around the number of days since schools closed on March 13.

### Outcomes

**Food insecurity:** Four daily survey questions assessed families' levels of FI, all of which were taken from the Current Population Survey Food Security Supplement (Coleman-Jensen et al., 2020) and adapted for daily use (Gassman-Pines & Schenck-Fontaine, 2019). Participants were asked "Today, were you ever worried that your food would run out before you got money to buy more?," "Today, did you eat less than you felt you should because there wasn't enough money to buy food?," "Did your child eat less today than you felt he/she should because there wasn't enough money to buy food?," and "Did you or your child have to skip a meal today because your family didn't have enough money for food?" Participants answered "yes" or "no" to each of the four questions. We also created a sum of the four FI questions as a measure of the degree of FI on a given day, which ranged from zero (answered "no" to all four questions) to four (answered "yes" to all four questions).

Prior research has used a highly similar measure of daily FI and provided evidence of its predictive validity: for instance, the combined measure of daily FI has been shown to have meaningful within-person variation and is predicted by the amount of time that has elapsed since SNAP transfer (Gassman-Pines & Schenck-Fontaine, 2019). Further, the relation between SNAP timing and daily FI is observed over and above daily negative mood. To assess the reliability of the FI scale in the present study, we used the recommended variance components approach (Cranford et al., 2006), as having the scale completed daily by multiple reporters requires a more complex approach to calculating reliability than cross-sectional studies (Gassman-Pines, 2013). We found that both between-person reliability and



reliability of individual-level change reached acceptable levels, at alphas of .88 and .70, respectively.

**Parent psychological distress:** Two daily survey questions assessed negative parent mood and two assessed negative parenting behaviors. To capture mood, parents were asked: “How much of the time today did you feel worried or depressed?” and “How much of the time today did you feel angry or irritable?,” both of which were drawn from the Healthy Utilities Index (Furlong et al., 2001) and have been validated for daily use (Ananat & Gassman-Pines, 2020; Gassman-Pines & Schenck-Fontaine, 2019). Participants responded to these questions on a scale of one to three, with one representing “not at all,” two representing “some of the time,” and three representing “all the time.” To capture parenting behaviors, parents were asked, “Did you lose your temper with your child today?” and “Did you punish your child today?,” to which they responded “yes” or “no.” These items were drawn from multi-item scales that measure parenting behaviors (Repetti & Wood, 1997) and have been adapted and validated for use with both low-income families (Gassman-Pines, 2011) and Latinx families (Gassman-Pines, 2015).

**Child psychological distress:** Daily surveys asked parents one question about their child’s negative mood and one about their child’s negative behavior: “How much did your child seem sad or worried today?” and “How much was your child uncooperative today?” Four response options were: “not at all,” “just a little,” “some,” and “a lot.” These questions were drawn from the Preschool Behavior Questionnaire (Behar & Stringfield, 1974) and the Inattention/Overactivity with Aggression Conners Rating Scale (Loney & Milich, 1982), and have been validated as measures of children’s internalizing and externalizing behavior problems as well as adapted for daily use (Gassman-Pines, 2015; Gassman-Pines et al., 2020).

### **Food assistance use**

**Power Packs Project:** We created a variable to analyze the frequency of pack receipt by using a daily question from our surveys: “Did you pick up your Power Pack this week?” with response options for “yes” or “no.” We calculated a percent pickup variable by summing the number of times a participant responded “yes” at any point in a week out of the number of weeks the participant responded to surveys.

**SNAP:** We asked parents in our end-of-year survey whether their family receives SNAP, to which they could respond “yes” or “no.” We further asked families who reported receiving SNAP: “Since March, how much trouble have you had using your SNAP benefits because of the coronavirus (can’t get to a store; food items not in store; stores closed)?” to which they could reply “none,” which we coded as having no trouble using SNAP, or “some” or “a lot,” which we coded as having trouble using SNAP.

**Grab and Go:** In the end-of-year survey we fielded, we asked families how often they used the Grab and Go meal option that was offered to all families in our sample once schools closed. Parents could respond that they picked up “multiple times per week” or “once per

week,” which we deemed was frequent use of the service, as well as “once a month,” “a few times,” or “never,” which we coded as infrequent use.

### Covariates

**Weekend:** We included an indicator variable for whether a survey day was on a weekend, as both family functioning and FI may meaningfully improve on the weekend (Ryan et al., 2010; Shrout et al., 2010).

**Parent education level:** When families enrolled in the program, the adult signing the family up for the program reported their education level to program administrators, which was part of the program-level data that the PPP shared with us. We also asked participants the highest level of education they obtained in our end-of-year survey. When available, we used the end-of-year survey education information, but if end-of-year survey data was not available we used the program-level education information. Drawing upon these two sources, we created indicator variables for “high school degree or general education diploma (GED)” and “more than high school degree or GED,” with “less than high school degree or GED” left as the reference category.

**Respondent relationship with child:** We included an indicator variable for whether the survey respondent reported being a mother of the focal child; prior research demonstrates that mothers take on the burden of FI in a food insecure household (Martin & Lippert, 2012).

**School:** To minimize the influence of omitted factors distinguishing families across schools, we included school fixed effects in all models by entering indicator variables for each school.

### Analytic plan

To assess how school closures relate to FI and family well-being, we used multilevel, mixed-effects models, which allowed us to capture immediate changes at the time of school closures, while accounting for individual changes over the study period.

Equation (1) displays the model used to answer our first research question. Here,  $Y_{ti}$  represents any given FI or psychological distress outcome.  $\beta_1$  represents the time trend for the given outcome prior to school closures,  $\beta_2$  represents how much the outcome changed when schools were closed relative to just before they closed, and  $\beta_3$  indicates the change in time trend from before school closures to after school closures. To obtain the time trend after school closures, we sum  $\beta_1$  and  $\beta_3$ . Finally, we include school fixed effects, parent characteristics, as well as an indicator for weekend days as covariates.

$$\begin{aligned}
 Y_{ti} = & \beta_0 + \beta_1(\text{Days})_{ti} + \beta_2(\text{Closure})_{ti} \\
 & + \beta_3(\text{Days} \times \text{Closure})_{ti} + \beta_4(\text{Weekend})_{ti} \\
 & + \sum \beta_{5-9}(\text{School})_i + \sum \beta_{10-j}(\text{ParentChars})_i \\
 & + \epsilon_{ti}.
 \end{aligned}
 \tag{1}$$

Next, we estimated the moderating effects of the use of food assistance programs—the PPP, SNAP, trouble using SNAP, and Grab and Go meals—individually, on all of our FI and psychological distress outcomes, using the model displayed in Equation (2). In these models,  $\beta_1$  represents the time trend before school closures for families who reported not using food assistance after the onset of the pandemic,  $\beta_2$  represents the change in intercepts at school closures for these families who reported not using food assistance, and  $\beta_3$  represents the change in slope from before schools closed to after schools closed for this group. Finally, the sum of  $\beta_1$  and  $\beta_3$  represents the time trend after schools closed for families who did not rely upon food assistance programs when schools closed. For families who reported using a given food assistance program,  $\beta_4$  represents the mean difference between their outcome before closures relative to families who did not use the program,  $\beta_5$  represents the difference in their time trends before schools closed,  $\beta_6$  represents the difference in their intercept change when schools closed, and  $\beta_7$  represents the difference in the change in time trend after school closures, all relative to families who did not use food assistance after school closures. Thus, the sum of  $\beta_1$ ,  $\beta_3$ ,  $\beta_5$ , and  $\beta_7$  represents the time trend after schools closed for families who used the program.

$$\begin{aligned}
 Y_{ti} = & \beta_0 + \beta_1(\text{Days})_{ti} + \beta_2(\text{Closure})_{ti} \\
 & + \beta_3(\text{Days} \times \text{Closure})_{ti} + \beta_4(\text{FoodAssistanceUse})_{ti} \\
 & + \beta_5(\text{Days} \times \text{FoodAssistanceUse})_{ti} \\
 & + \beta_6(\text{Closure} \times \text{FoodAssistanceUse})_{ti} \\
 & + \beta_7(\text{Days} \times \text{Closure} \times \text{FoodAssistanceUse})_{ti} \\
 & + \beta_8(\text{Weekend})_{ti} + \sum \beta_{9-13}(\text{School})_i \\
 & + \sum \beta_{14-j}(\text{ParentChar})_i + \varepsilon_{ti}.
 \end{aligned} \tag{2}$$

## RESULTS

### Descriptive patterns

Across the sample, average reports of FI and psychological distress before and after school closures indicate that there are significant increases in most, but not all of our outcomes of interest (Table 2). These patterns are depicted in detail in Figure 1, which show unadjusted trends in daily averages for select indicators of daily FI, parent distress, and child distress. As displayed in the top left of Figure 1, the trend of parents' daily average level of FI in the months leading up to school closures was slightly downward sloping. Then, on the day schools closed, there was a large increase, which declined in the months after school closures. Parent worry and depression followed a largely similar trend (top right of Figure 1), where the slope before school closures was decreasing, then the daily average increased substantially on the day of school closures and decreased in the days to follow. Parent anger and child sadness, however, followed a different pattern (bottom left and right of Figure 1). The daily averages for these outcomes did not change in the months leading up to school closures. Then, there was a sharp increase in both parent anger and child sadness at school closures, but unlike our other outcomes, the trends after school closures stayed elevated.

## Overall trends in food insecurity and psychological distress

**Food insecurity**—The results of the multilevel regression models showed that all indicators of daily FI significantly increased when schools closed in March, and gradually decreased in the days and months to follow, albeit at different magnitudes and rates (Table 3). Specifically, on the day of school closures, the least severe measure of FI, worry about food, increased by about 10 percentage points, and the most severe measure, parent or child skipping a meal, increased by about 5 percentage points, from bases of 37 and 13 the previous day. Following these increases, the time trends after school closures for all measures of FI significantly decreased. Parental worry about food, parents eating less than they should, and total daily FI all decreased at a faster rate than their pre-school closure time trends, while children eating less than they should and parent skipping a meal decreased at about the same rate. Measures with the largest increases at school closures, including worry about food and parents eating less than they should, had steeper downward slopes, decreasing by about 0.1 percentage points each day, which correspond to overall decreases of 5.5 and 7.0 percentage points from the start of school closures to the end of the study period, respectively. Measures with slightly smaller increases at school closures, such as children eating less than they should or a family member skipping a meal, decreased by about 0.04 and 0.06 percentage points each day, respectively. Over time, these changes correspond to a total of 2.5 and 3.5 percentage point changes from the day schools closed to the end of the study period. Overall, these patterns of results indicate that there was a spike across all measures of FI when schools closed in March, but families were steadily able to recover in the months following, largely aligning with the jumps and post-school closure trends displayed in the upper-left of Figure 1.

**Parent and child psychological distress**—A different pattern of results emerged for measures of parent and child distress (Table 4). Negative parent mood, negative child mood, and child problem behaviors all increased significantly when schools closed in March, but parenting behaviors—losing one’s temper and punishing child—remained mostly unchanged throughout the study period. Parent worry and depression increased the most at school closures, jumping up by over half of a standard deviation (SD), while parent anger, child sadness, and child uncooperativeness, jumped by a range of 0.13–0.23 of a SD. Where these outcomes substantively differed, however, is in their time trends before and after school closures. Only parental depression significantly decreased in the months following school closures, declining by a total of about a third of a SD from the day schools closed to the end of the study period, mirroring the pattern displayed in the upper right of Figure 1, and notably, the pattern of FI displayed in the upper left. Parent anger, child sadness, and child uncooperativeness, on the other hand, all remained elevated following closures. With the exception of child behavior, these outcomes had flat time trends leading up to school closures, and then all became or remained flat after school closures, indicating that families did not recover from their school closure increase, aligning with the patterns shown in the bottom two panels in Figure 1.

## Trends in food insecurity and psychological distress by use of food assistance

### PPP use

**Food insecurity:** Results showed that families who experienced greater surges in FI at school closures were more likely to rely upon the PPP, but that picking up their packs was also associated with greater recovery throughout the pandemic (see Table A1). These patterns are depicted via unadjusted daily averages in Figure 2. Families who reported consistently picking up their packs after school closures experienced a 10 percentage point greater increase in worry about food when schools closed, from a base of 38% the day prior, and roughly a fifth of a SD greater increase in daily total FI the day schools closed, relative to those who reported that they did not use the program at all.

It is also important to consider these increases in the context of time trends before and after school closures. Families who later relied upon the program had either flat or increasing time trends across all FI outcomes leading up to school closures, suggesting that their FI was either stable or worsening beforehand. Those who did not use the program after school closures, however, were consistently decreasing across most FI outcomes, or becoming more food secure, in the time leading up to school closures. After school closures, families who did not use the program returned back to the same trend they were on before school closures, while those who always picked up their packs moved to a decreasing one afterwards, and importantly, these decreases were steeper for families who always picked up their packs than those who never did across nearly every FI outcome. Together, these results suggest that families who experienced greater surges in FI at school closures were more likely to rely upon the Power Packs Project, and that picking up packs was associated with greater recovery throughout the pandemic.

**Psychological distress:** As displayed in Table A2, use of the PPP had slightly different associations with psychological distress than it did with FI. Those who always picked up their packs compared to those who never picked up their packs looked roughly equivalent in terms of parent depression, child uncooperativeness, and parenting behaviors. Child sadness and parent irritability, however, followed different patterns for these two groups. Families who reported always using the program after schools closed had a decreasing time trend in child sadness in the time leading up to school closures, which spiked by half of a SD on the day that schools closed and remained elevated in the months to follow. Those who did not use the program, conversely, saw no significant changes in trends of child sadness over the course of the study period. Both families who never and always used the program experienced unchanging parent irritability over time leading up to school closures, and experienced equivalent increases on the day that schools closed but differed in their post-school closures slopes. Families who used the program reported an increasing trend in parent anger, which increased by about 0.004 of a SD per day, while those who never used the program saw trend-level decreases in anger over time. These results suggest that families who used the program fared the same as those who did not across most parent psychological distress outcomes and child negative behaviors, but they fared worse in terms of negative child mood and parent anger.

## SNAP use

**Food insecurity:** Table B1 displays trends of FI for families who used SNAP compared to those who did not use SNAP. These two groups reported roughly equivalent experiences over the course of the study period in terms of their worry about food, parents eating less than they should, and the sum of their FI questions, but differences emerged for children eating less than they should and parents or children skipping meals. Specifically, while both groups had flat time trends for skipping a meal leading up to school closures, only SNAP recipients reported spikes in this outcome on the day that schools closed, jumping up by about 6 percentage points from a base of 12% the day before, whereas families who did not receive SNAP did not see any increase. However, in the time after schools closed, the proportion of SNAP users who skipped meals declined over time, decreasing by about 0.08 percentage points per day, while the proportion of non-SNAP users who skipped a meal continued to be unchanged. Finally, while non-SNAP recipients had a decreasing time trend in children eating less than they should leading up to school closures and SNAP recipients had a flat one, the reverse pattern occurred following their school closures increase. That is, non-SNAP recipients remained stably high in terms of reporting that their child ate less than they should, whereas SNAP recipients reported it at a decreasing rate in the time after school closures by about 0.06 percentage points per day. Together, these findings indicate that SNAP receipt was associated with increases across more FI outcomes when schools closed, but also with meaningful declines afterwards with regard to child FI.

When we look at these same trends in FI among SNAP recipients by those who reported having no trouble using their benefits during the pandemic compared to those who reported having trouble using them, a more nuanced picture emerges (see Table B2). On the day that schools closed, families who had trouble using their benefits experienced significant increases in FI across all outcomes, whereas those who had no trouble experienced either smaller increases or no change in their FI at all. These results suggest that trouble using SNAP benefits appeared to mostly harm families at the start of the pandemic, and conversely, having no trouble using SNAP benefits buffered families against the shock of school closures. Despite these initial differences, though, both groups reported declining FI in the months to follow for any outcomes in which they experienced increases at school closures.

**Psychological distress:** Table B3 details the role of SNAP receipt on our measures of psychological distress. There are some measures for which being a SNAP recipient played a buffering role at school closures, but other outcomes for which it appeared to be a risk factor. Specifically, SNAP recipients saw smaller spikes in parent depression and parent anger when schools closed compared to non-SNAP recipients. Both groups experienced significant declines in parent depression in the months following school closures, and both experienced stable levels of parent anger following their school closure jumps. In terms of child misbehavior at school closures, only SNAP users saw a spike in child uncooperativeness, which increased by about a fifth of a SD, while non-SNAP recipients did not see any significant shift on the same day. For SNAP users, child uncooperativeness remained stably high following school closures, and continued to not change over time for non-SNAP users.

Parenting behaviors and child mood followed roughly similar patterns for both SNAP recipients and non-recipients, with some exceptions. Parents who received SNAP reported having an increasingly worse temper in the time leading up to school closures, which did not change significantly on the day that schools closed and plateaued in the time afterwards. However, use of parent punishment followed the reverse pattern: it was unchanging over time leading up to school closures, and then decreased in the time afterwards. Together, these findings suggest that SNAP use appeared to be protective against increases in negative parent mood and behaviors immediately when schools closed but was a risk factor for negative child behaviors at this time. Then, in the time after schools closed, SNAP use was associated with sustained negative parent mood and child behaviors.

We see further differences in psychological distress among SNAP recipients based on whether they had trouble using their benefits in the time after school closures (see Table B4). These findings indicate that increases in psychological distress at school closures among SNAP recipients appear to largely be driven by families who had trouble using their benefits, whereas being able to use these benefits served as a protective factor against the shock of school closures. Finally, SNAP recipients who were able to use their benefits were able to recover from any small increases they experienced when schools closed, while those who had issues using their benefits were only able to recover for some outcomes, not all.

**Grab and Go use**—Unlike the PPP and SNAP, use of Grab and Go meals did not have clear associations with changes in FI nor psychological distress (see Appendix C). Both families who used Grab and Go meals frequently as well as those who did not rely upon the program experienced significant increases across nearly all FI outcomes when schools closed, although there was only a trend-level increase in skipping a meal for families who would later report using Grab and Go meals. There were no notable differences in terms of how Grab and Go versus non-Grab and Go users experienced psychological distress.

### Sensitivity tests

We conducted several sensitivity tests to assess the robustness of these results (available upon request). First, in effort to retain the largest analytic sample possible, we coded missing values for education level and relationship to the child to be part of their respective reference groups. Results did not reveal a meaningfully different pattern of results in terms of size of significance upon including these individuals, so those with missing parent demographic information were retained as part of the reference group in the final models. Next, we analyzed whether there were differences among participants who completed more surveys versus fewer by running the same analyses on only those who completed about 30% of the surveys ( $n = 199$ ), those who had completed at least 50% of the surveys ( $n = 186$ ), and those who completed about 90% of the surveys ( $n = 133$ ). Similarly, these tests did not meaningfully change the pattern of results from using the full sample, suggesting that our main results are not driven by individuals who completed their surveys more frequently.

## DISCUSSION

In the terms of Bronfenbrenner's bioecological model (Bronfenbrenner & Ceci, 1994), the COVID-19 pandemic was a macrosystem event that disrupted all aspects of family

life. These disruptions were most profound for low-income families in under-resourced communities like those that the Power Packs Project serves, most of whom were struggling to make ends meet before the economic and psychological impact of the pandemic hit (Parker et al., 2020). The present study captured trends in both economic and psychological hardship during the initial months of the pandemic via daily surveys of families' FI and parent and child psychological distress. We found that while both FI and parent and child psychological distress increased significantly at school closures, by 10 percentage points for worry about food and up to a half a standard deviation for parent well-being, FI levels reduced over time, particularly for those who used the PPP. Conversely, parent and child psychological distress largely remained elevated, occurring more often for families who used the PPP. Furthermore, SNAP receipt was associated with spikes across more FI outcomes at school closures compared to non-receipt, which appears to be driven by individuals who had trouble using their benefits due to COVID-related challenges, but receipt was also associated with greater declines in child FI in particular. SNAP receipt was not associated with decreases in psychological distress but being able to use SNAP benefits did buffer families against large spikes in psychological distress when schools closed. Lastly, Grab and Go use did not have an effect on trends of families' FI nor their psychological distress.

### **Patterns of food insecurity amid the pandemic**

Our findings indicate that FI increased substantially when schools closed, but families recovered from this spike in the months that followed. There are a few possible reasons why this pattern of recovery may have emerged. First, several federal supports were approved in March 2020 that provided economic relief to families in the months after schools closed. The Families First Coronavirus Response Act (2020) and the Coronavirus Aid Relief and Economic Security (CARES) Act (2020) provided financial supports to families during the pandemic, including stimulus checks, increased unemployment benefits, and increased SNAP allotments, which emerging evidence indicates provided critical, short-term aid that was associated with decreased FI (Gassman-Pines & Gennetian, 2020).

Second, another source of heterogeneity in FI trends may have been families' ability to use the PPP after school closures. Specifically, our results showed that use of the PPP was associated with meaningful decreases in families' FI. Therefore, it is possible that this local program played an important role, alongside the other supports available, in aiding families during the pandemic, especially in the earliest days. Evidence to date indicates that federal supports were largely effective (Gassman-Pines & Gennetian, 2020), but they were not able to reach families as quickly as local programs, some of which were able to rapidly alter their operations to continuing serving families. These findings are further supported by the fact that only families who reported being able to use their SNAP benefits experienced smaller spikes in FI or no spikes at all when schools closed, suggesting that families who had trouble using these federal supports fared worse at onset of the pandemic. Plus, given that a large proportion of Power Packs families are Latinx, it is possible that some were ineligible for federal benefits due to their undocumented status, or reluctant to use these services due to fears of the public charge rule, which made obtaining a permanent residence more difficult for immigrants if they received public assistance such as SNAP (Barofsky et al., 2020; Inadmissibility on Public Charge Grounds, 2019; Pelto et al., 2020). Thus, some families



may have been reticent or unable to rely on federal aid during the spring, which could have made Power Packs a more viable source of food assistance when they were struggling. It is worth noting, though, that we were unable to compare pickup rates among immigrant and non-immigrant families because we feared asking about nativity status would seed distrust or anxiety in our participants.

Alternatively, the families who used Power Packs most often may have also accessed other local and federal food assistance most often, including SNAP and Grab and Go meals, making it possible that those supports alone or in combination with the PPP, rather than the PPP alone, accounted for the steeper decline in FI among the most engaged families. Trends for families who accessed SNAP and Grab and Go meals provide only mixed support for this hypothesis, however. Being enrolled in SNAP was only associated with greater declines in child FI, and using Grab and Go meals was not uniquely associated with reductions in FI. Moreover, receiving and using SNAP benefits was associated with fewer FI indicators than engagement in the PPP on the day that schools closed. In fact, the ability to use SNAP buffered many families against experiencing changes in FI when schools closed altogether, whereas the PPP was relied upon by families who experienced intense spikes in FI at school closures, suggesting different families may have used SNAP versus the PPP. Together, these findings suggest that the PPP alleviated families' FI independent of other food assistance programs. Because all programs were available at once, however, it is not possible to isolate their independent, causal effect on families' FI or well-being.

### **Patterns of psychological distress amid the pandemic**

Unlike the patterns of FI, psychological distress largely remained elevated for parents and children in the months after schools closed. One possible explanation for these different patterns is that while some of families' economic hardships may have been addressed by local and federal supports, many of their sources of psychological distress were not. Throughout the post-school closures study period, parents were consistently managing children's online learning and daily supervision, which hindered many families' ability to work and forced others to work from home while also caring for their children (Ananat & Gassman-Pines, 2020). Furthermore, having multiple family members in the house at once for extended periods of time may have contributed to or exacerbated household crowding and noise, two key characteristics of household chaos, which has documented links with disrupted well-being for both parents and children (Garrett-Peters et al., 2016; Mills-Koonce et al., 2016). This crowding combined with the social isolation of quarantine likely persisted throughout the study period and beyond (Moreland et al., 2020), continually elevating both parents' and children's psychological distress.

Moreover, COVID-related restrictions cut off access to school personnel like teachers and counselors who are important for identifying and providing mental health supports to families (Masonbrink & Hurley, 2020). This limitation means that mental health problems were not only more likely to occur during this time, but also more likely to go undetected and unfettered. At the same time, throughout the post-school closures study period, unemployment rates continued to climb, and work became increasingly difficult to find (Parker et al., 2020), the uncertainty of which further could have contributed to

psychological distress in this low-income population (Prime et al., 2020). Finally, it is possible that the participants in our study may have contracted COVID-19, or known someone who did, so the unknown course of the virus itself could have kept families' stress elevated during this time. Families could have experienced any combination of these stressors amid the pandemic, which could contribute to sustained psychological distress, particularly in the absence of supports or relief to alleviate them.

While most measures of psychological distress increased when schools closed and remained elevated over time, parent depression or worry actually decreased in the weeks and months following school closures, and negative parenting behaviors did not significantly change at all over the course of the study period. Parent depression may have declined after the initial increase as parents made plans to address the immediate consequences of the pandemic, relieving their immediate worries, whereas the realities of virtual schooling, social isolation, and household chaos contributed to persistent irritability and anger. One reason why parenting behaviors may have remained unaltered throughout the pandemic is that parents may have effectively prevented their stress from spilling over into their parenting, just as parents often shield their children from household FI (Martin & Lippert, 2012). This interpretation highlights the emotional and behavioral resilience of parents in this low-income, predominantly Latinx community. Another possibility is that there may have been variation in parenting behaviors over the study period, obscuring the patterns overall. For instance, Kalil et al. (2020) found that parents who lost work but not income during the pandemic, like those who may have been receiving increased unemployment benefits under the CARES Act, displayed more positive parenting behaviors on average after schools closed, while those who lost work and lost income displayed more negative parenting behaviors. Thus, this type of heterogeneity among families could have produced the appearance of no change in parenting behaviors.

Finally, it is important to note that whereas receipt of food assistance predicted declines in FI, it largely did not predict declines in parent or child psychological distress. Specifically, families who picked up Power Packs regularly actually experienced elevated parent irritability and child sadness after school closures. Only SNAP receipt was associated with improved family well-being, specifically SNAP recipients reported steeper declines in parent worry after school closures; otherwise, the ability to use SNAP was associated with unchanging trends of psychological distress over time, not declining ones. This pattern of null findings does not necessarily mean that food assistance cannot enhance families' psychological well-being as it reduces FI. Rather, it is likely that food assistance simply did not address the many other stressors that beset low-income families in the early months of the pandemic. It is also possible that the families who used food assistance most often were also the most economically at-risk, which the larger spikes in FI for these families at the time of school closures suggests. In this case, higher risk levels could have masked any positive association between food assistance and family well-being. Because families were not randomly assigned to receipt of food assistance, we cannot identify the causal association between assistance and psychological outcomes or rule out bidirectional associations between FI and psychological distress. Finally, the disparate longitudinal patterns for FI and family well-being, both on average and with respect to food assistance

receipt, suggest that increases in FI were not likely driving trends in parent and child well-being.

### Limitations

There are several limitations that should be considered before reflecting upon the implications of these results. First, this study relied on participants from one community in one state with a specific set of demographic characteristics, so the findings may not generalize to other low-income communities. However, the sample is also very policy-relevant one, as it encapsulated the experiences of predominantly Latinx families, a demographic group hit particularly hard by the pandemic (Webb Hooper et al., 2020). Another limitation is our lack of information about aspects of economic hardship other than FI, such as income or employment, which could have moderated or explained the patterns of FI and psychological distress we identified. Our diaries also did not capture illness-related information, such as whether participants or household members contracted COVID-19, likely a key stressor for some families. All of these factors could have contributed to the meaningful heterogeneity in FI and parent and child well-being trends identified, as the pandemic likely disrupted some families' lives far more than others.

Additionally, the interrupted time-series approach does not rule out the possibility that events other than school closures drove the patterns we identified, such as whether families lost employment or became infected. This limitation also applies to our findings with regard to the benefits of the PPP and the ability to use SNAP. As aforementioned, families were not randomly assigned to receive these programs, thus we cannot rule out the possibility that families who used them more often also accessed other supports that helped reduce their FI. Moreover, families who were able to pick up packs during COVID-19, because they had the transportation and schedule flexibility to do so, might differ from those who could not in ways that help explain our findings. Finally, the increases in FI and parent and child distress, while statistically and practically significant, were not as large as the increases in these outcomes documented elsewhere during COVID-19 (Bauer et al., 2020; Gassman-Pines et al., 2020). In spite of these limitations, the strength of our design is that we measured outcomes at the daily level and our analyses captured changes in trends with respect to specific days, so families would have had to experience employment or illness changes on precisely the same days that restrictions were issued for them to confound our findings.

### Policy implications

Our findings have a number of policy implications to consider in light of the COVID-19 pandemic and future sociodemographic crises. First, although we cannot identify the causal effect of the Power Packs program with these data, the patterns with respect to its usage suggest the importance of local food assistance programs in battling FI, particularly during this pandemic, and their role as a key supplement to, though not a replacement for, federal food assistance (Ananat et al., 2020; Barofsky et al., 2020; Pelto et al., 2020). Here, it is important to note that using the PPP was more strongly associated with declines in FI during the pandemic than access to SNAP or Grab and Go meals, although the benefits of federal food assistance to family well-being are well-documented (Bauer et al., 2020).

Second, consistently elevated levels of some indicators of psychological distress in parents and children indicate a dire need for family mental health services at a time when access to typical sources of mental health support has been restricted. Given that much of the stress families with children have faced stems from the impact child care and education demands have had on parents' work and, in many cases, income (Prime et al., 2020), our findings suggest that monetary supports to allow families to care for children at home without facing extreme income or productivity loss, such as the expansion of the Child Tax Credit introduced in the American Rescue Plan Act (2021), could alleviate parents' anger and irritability.

The fact that local, school-based supports such as the PPP may offset FI suggests there may be similar local approaches to supporting family well-being that could be leveraged amid restrictions. For instance, one low-cost support for bolstering psychological well-being in the context of school-administered, remote learning would be to build regular mental health check-ins with a school social worker or nurse into a child's daily schedule. This approach has the benefit of both being easy to do remotely via video-chat, and allowing parents to join, if needed. Finally, fostering connections between families could help buffer psychological distress. For instance, school districts emphasizing virtual play or affinity groups could help build connections to support children's mental health, which could also alleviate parents' concerns.

## CONCLUSION

At the time of this writing, it appears that the COVID-19 pandemic will continue for many more months, and just as surely new crises will arise, which will disproportionately impact low-income and racially-minoritized communities. Our results suggest that without intervention, such crises will likely yield a sustained increase in household economic and psychological hardships. Encouragingly though, our results join with emerging findings from other studies around the globe, highlighting actionable items for shoring up these vulnerable households against future shocks and promoting optimal family and child well-being.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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## Abbreviations:

<b>CARES</b>	Coronavirus Aid Relief and Economic Security
<b>FI</b>	food insecurity
<b>PPP</b>	Power Packs Project

<b>SNAP</b>	Supplemental Nutrition Assistance Program
<b>GED</b>	general education diploma
<b>SD</b>	standard deviation

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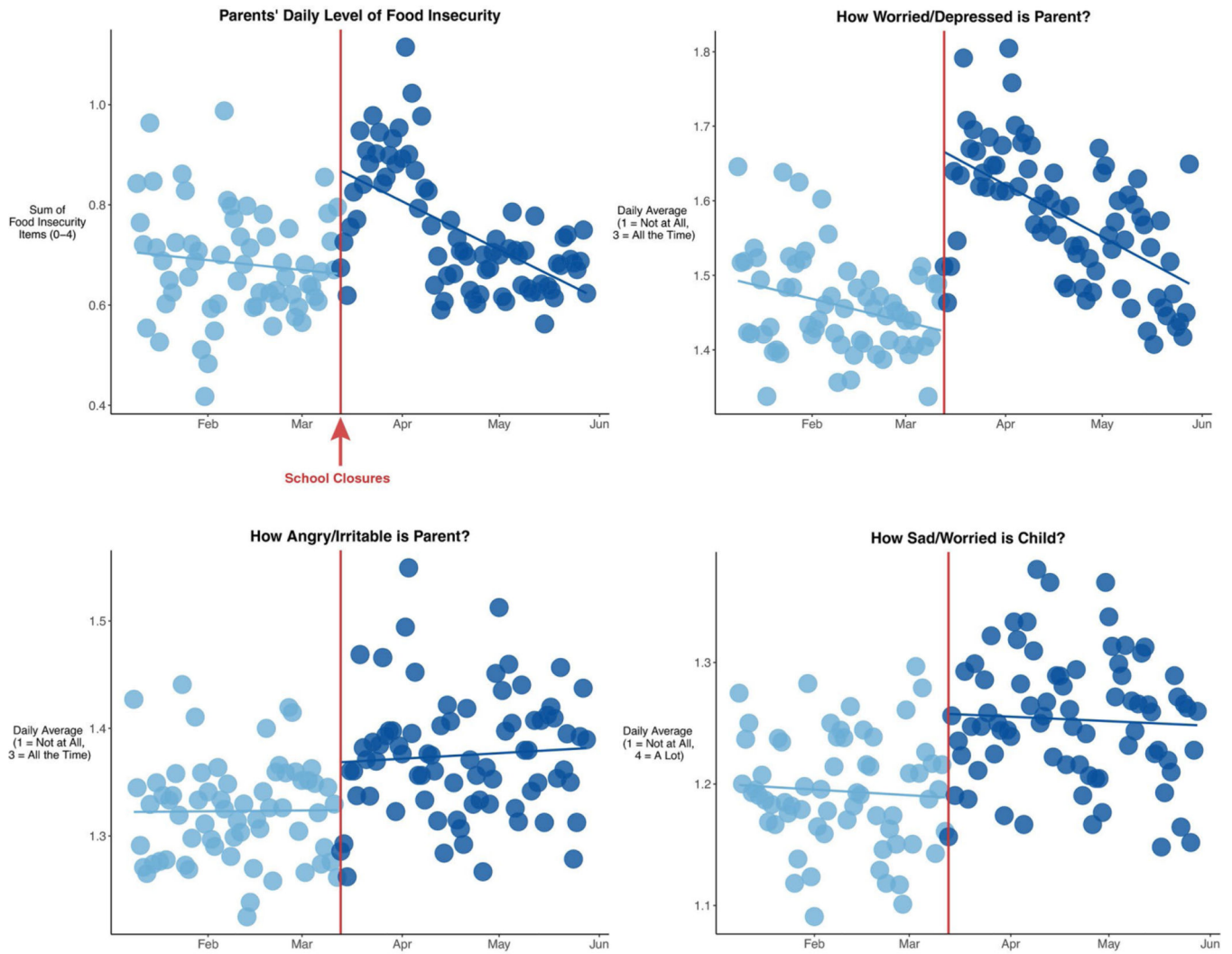
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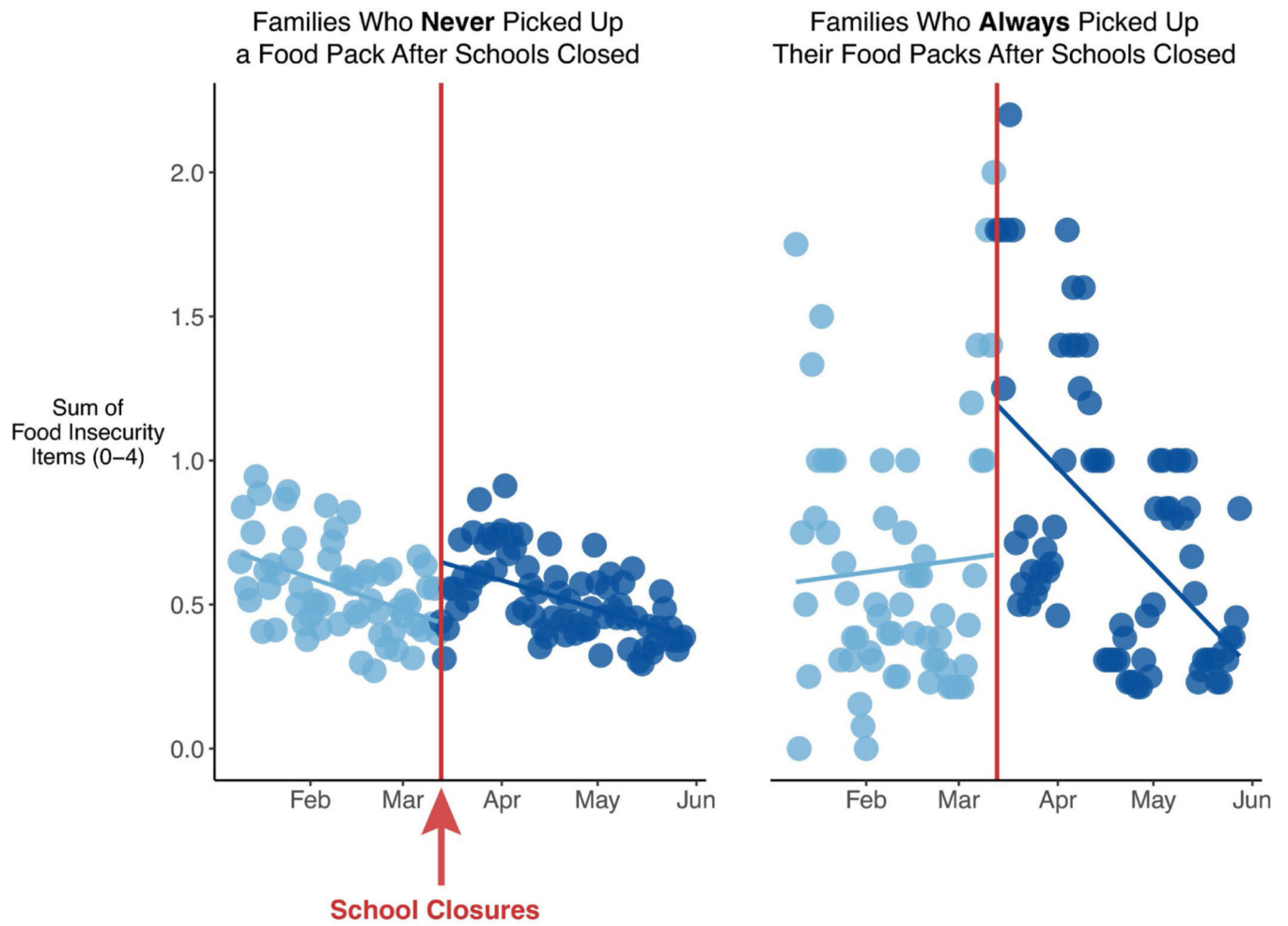
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**FIGURE 1.** Unadjusted daily averages of food insecurity and parent and child psychological distress



**FIGURE 2.** Unadjusted daily averages of food insecurity by participation in the Power Packs Project

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**TABLE 1**

Descriptive statistics on parent and household characteristics

	Full sample
Parent education level (%)	
Less than HS degree	20.5
HS degree or GED only	47.0
More than HS degree	32.5
Parent race or ethnicity (%)	
White, non-Latinx	16.0
Black, non-Latinx	9.16
Latinx	60.7
Mixed or other race	14.1
Family food assistance use (%)	
Received free/reduced-price lunch	91.1
Received SNAP	65.6
Had no trouble using SNAP during COVID	25.7
Used Grab and Go meals often	37.1
Respondent is child's mother (%)	89.9
Respondent average age (M [SD])	35.2 (8.89)
Child grade (%)	
Kindergarten	32.3
1st grade	16.9
2nd grade	18.2
3rd grade	12.1
4th grade	10.9
5th grade	9.68
Child is female (%)	48.8
Surveys completed (%)	64.9
<i>N</i>	173– 271

*Note:* Range appears for *N* because some measures came from the study's end-of-the-year survey, which was completed by about two-thirds of the study sample.

Abbreviation: HS, high school; GED, General Education Diploma; SNAP, Supplemental Nutrition Assistance Program.

TABLE 2

Descriptive statistics on outcome variables before and after school closures

	Before school closures M (SD)	After school closures M (SD)	$\chi^2$ or <i>t</i>
Food insecurity (%)			
Worry about running out of food	33.5	38.7	85.0***
Parent ate less than should	22.5	22.2	0.24
Child ate less than should	9.95	10.0	0.04
Parent or child skipped meal	11.2	12.8	14.2***
Sum of food insecurity questions (0–4)	0.77 (1.00)	0.84 (1.00)	27.0**
Parent mood (1–3)			
How much of day worried/depressed	1.47 (0.44)	1.59 (0.44)	153.1***
How much of day angry	1.32 (0.34)	1.37 (0.34)	35.9***
Parenting behavior (%)			
Lost temper with child	5.90	7.28	11.4***
Punished child	5.17	5.67	1.65
Child behavior (1–4)			
How much of day child sad	1.19 (0.31)	1.25 (0.31)	51.8***
How much of day child uncooperative	1.46 (0.48)	1.45 (0.48)	1.46
Pack pickup (%)	62.7	32.0	10.2***
<i>N</i>	235–244		

\*\*  
*p* < .01.;\*\*\*  
*p* < .001.

The effect of school closures on food insecurity trends

TABLE 3

	<u>Worry about food</u>	<u>Parent ate less than should</u>	<u>Child ate less than should</u>	<u>Parent or child skipped meal</u>	<u>Total daily food insecurity</u>
	<i>B (SE)</i>	<i>B (SE)</i>	<i>B (SE)</i>	<i>B (SE)</i>	<i>B (SE)</i>
Days	-0.0001 (0.0002)	-0.0005 (0.0002)*	-0.0003 (0.0002) <sup>+</sup>	-0.0003 (0.0002)	-0.001 (0.001)*
Date is after schools closed	0.100 (0.011)***	0.060 (0.010)***	0.023 (0.007)**	0.046 (0.008)***	0.227 (0.025)***
Days × date is after schools closed	-0.001 (0.0003)***	-0.001 (0.0003)**	-0.0001 (0.0002)	-0.0003 (0.0002)	-0.002 (0.001)***
Constant	0.484 (0.068)***	0.305 (0.055)***	0.127 (0.042)**	0.154 (0.044)***	1.059 (0.185)***
Number of observations	12,199	12,136	12,106	12,084	12,074
Number of individuals	244	237	236	235	235

Note: School fixed effects, parent characteristics, and an indicator for weekend were included in each model but are not displayed in the table.

<sup>+</sup>  $p < .10$ ;

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*  $p < .001$ .

The effect of school closures on trends in parent and child emotional and behavioral distress

**TABLE 4**

	Parent worry/depression <i>B(SE)</i>	Parent anger/irritability <i>B(SE)</i>	Parent lost temper <i>B(SE)</i>	Parent punished child <i>B(SE)</i>	Child sadness/worry <i>B(SE)</i>	Child uncooperative behavior <i>B(SE)</i>
Days	-0.001 (0.0004)**	-0.0002 (0.0003)	0.0003 (0.0002) <sup>+</sup>	0.0001 (0.0002)	-0.0002 (0.0003)	-0.002 (0.0004)***
Date is after schools closed	0.246 (0.018)***	0.051 (0.016)**	0.003 (0.008)	0.007 (0.008)	0.070 (0.017)***	0.064 (0.020)**
Days × date is after schools closed	-0.001 (0.0005)*	0.0002 (0.0004)	-0.0002 (0.0002)	-0.0002 (0.0002)	0.0001 (0.0004)	0.002 (0.0005)***
Constant	1.489 (0.086)***	1.341 (0.071)***	0.092 (0.027)***	0.061 (0.020)**	1.086 (0.063)***	1.254 (0.096)***
Number of observations	12,209	12,201	12,116	12,149	12,123	12,107
Number of individuals	242	241	240	240	238	238

Note: School fixed effects, parent characteristics, and an indicator for weekend were included in each model but are not displayed in the table.

<sup>+</sup>  $p < .10$ ;

\*  $p < .05$ ;

\*\*  $p < .01$ ;

\*\*\*  $p < .001$ .