Household Chaos and Caregivers’ and Young Children’s Mental Health during the COVID-19 Pandemic: A Mediation Model

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Abstract
Based on 764 households with young children in Wuhan, China, where the COVID-19 pandemic started, this study investigated how household chaos during the pandemic was associated with the mental health problems of children and their caregivers. It also examined the familial correlates of household chaos. The results showed that household chaos was associated with caregiver-rated symptoms of anxiety/withdrawal, fearfulness and acting out exhibited by young children and the symptoms of anxiety and depression in their caregivers. Moreover, caregivers’ depression and anxiety mediated the relations between household chaos and caregiver-rated child mental health problems. Additionally, caregivers living in families with a single caregiver, a larger family size, poorer physical health, and more significant income loss reported greater levels of household chaos during the pandemic. These findings highlight the importance of reducing household chaos to promote the mental health of young children and their caregivers during the pandemic. They also underscore the need to identify families with high levels of chaos based on key background variables.

Keywords Household chaos · Mental health · Young children · Caregivers · COVID-19

Highlights
- Household chaos is associated with young children’s emotional distress and caregivers’ anxiety and depression.
- Caregivers’ depression mediates the relation between household chaos and children’s emotional distress.
- Caregivers living in families with a single caregiver and a larger family size reported greater levels of household chaos.
- Caregivers living in families with poorer physical health and more significant income loss reported greater levels of household chaos.

The COVID-19 pandemic has had profound impacts on individuals and their families. Many people have either become infected by the coronavirus or worried about possible infection, have lost their jobs or even their loved ones (Zhang et al., 2020), and have had their pre-crisis ways of life disrupted by social distancing and home quarantine (Nicola et al., 2020), all of which may have increased the level of chaos and confusion in their families. The pandemic poses particular challenges to families with young children, because school closures, which are implemented in many countries, often force them to stay at home and cause their parents to struggle to fulfill multiple responsibilities (e.g., managing jobs, chores, childcare and home schooling; Garbe et al., 2020) and achieve work–life balance (Craig & Churchill, 2020). The focus of this study is the chaos and confusion arising in families with young children in Wuhan, China, where the COVID-19 pandemic started. The aim of this study is to examine how household chaos is associated with mental health problems in young children and their caregivers in the time of the COVID-19 pandemic. We also investigate the extent to which a large pool of familial characteristics is related to the ensuing household chaos.
Household Chaos and the Mental Health of Children and Their Caregivers

Household chaos can be described as a family environment characterized by noise, crowding and a lack of order and routine (Evans & Wachs, 2010). A growing number of studies have linked household chaos to child, caregiver and family outcomes (Marsh et al., 2020). Most researchers have used the Confusion, Hubbub, and Order Scale (CHAOS; Matheny et al., 1995), which is a brief, reliable and valid caregiver-reported measure of a variety of chaos indicators, including noise, irregularity and confusion. The CHAOS scale has been associated with problematic parenting and family dysfunction variables such as increased levels of hostile parenting (Pike et al., 2016), decreased levels of responsive parenting (Corapci & Wachs, 2002), decreased parental support of children’s emotions (Nelson et al., 2009) and increased conflict and decreased closeness in parent–child relationships (Barnes et al., 2014). Moreover, this scale has been linked to a wide range of adverse childhood outcomes across the physical, language–cognitive and social–emotional domains (Evans & Wachs, 2010; Marsh et al., 2020).

Overwhelmingly, household chaos has been found to be a risk factor of mental health problems in the early years of childhood. For example, in a cross-sectional sample of 118 families with two children aged 4 to 8 years, Coldwell et al. (2006) showed that household chaos was associated with children’s behavior problems (e.g., hyperactivity, emotional symptoms, conduct problems and peer problems) over and above the style of parenting. Only a few studies have examined the role of household chaos in caregiver-level outcomes. These studies have shown household chaos to be associated with poor maternal executive functions (Deater-Deckard et al., 2012), maternal depression (Madigan et al., 2017) and maternal sleep problems (Whitesell et al., 2018). For instance, one cross-sectional study found that household chaos was associated with depression and sleep problems in mothers of infants (Thomas & Spieker, 2016). Not surprisingly, a number of studies have demonstrated that caregiver-level variables mediate the relations between household chaos and child-level outcomes (e.g., Vernon-Feagans et al., 2012). In a longitudinal study, for example, Mills-Koonce and colleagues (2016) found that mothers’ sensitive and harsh-intrusive parenting behavior mediated the associations of household chaos with their young children’s conduct problems and callous-unemotional behaviors. Yet, these researchers also showed that household chaos remained to be a significant predictor of child behaviors even when mothers’ parenting behavior was taken into account, indicating that the adverse effect of living in a chaotic family may not always be fully explained by caregiver-level variables.

In the literature, researchers have addressed the relation between household chaos and child- and caregiver-level outcomes during periods of relatively mild life difficulties such as transition to motherhood (Thomas and Spieker (2016)). However, little attention has been paid to times of social crisis, such as a pandemic. During the COVID-19 pandemic, due to work-from-home arrangements and school closures, children and their caregivers around the world have spent unprecedented amounts of time at home. As such, household environments, including family chaos, may exert stronger influences on children and their caregivers in the time of COVID-19 than they did prior to the pandemic.

Risk Factors of Household Chaos during the Pandemic

Because household chaos might have a drastic effect on the mental health of children and their caregivers, an examination of the factors associated with household chaos is warranted. In the literature, single parenthood, lower levels of caregiver education and household income and a greater number of people living in the household have been linked to higher levels of chaos in the home (Dumas et al., 2005; Vernon-Feagans et al., 2012). It is expected that these factors would continue to contribute to household chaos in the time of COVID-19.

Moreover, the pandemic itself may also lead to household chaos. The pandemic has simultaneously caused at least two emergencies in many families, namely health and economic emergencies, both of which can themselves result in household chaos. First, the time and resources required to care for sick family members, such as those infected with the coronavirus, may result in the carer having little available time for work (Noonan et al., 2005) and much unfinished work (Smith, 2002), which may lead to work–family conflict and, in turn, household chaos. Moreover, physical health problems in a family, such as having a child with a severe health condition, may be associated with an increased risk of residential overcrowding, inadequate utilities, and poor housing quality (Curtis et al., 2010) and reduced time for cleaning and household organization tasks (Leonard et al., 1992). Second, rising unemployment due to the coronavirus lockdown has pushed many families into poverty or at least significant income loss. In the literature, income loss has a well-established relationship to household chaos (Brown et al., 2019). Thus, physical health problems and income loss in a family are expected to be associated with household chaos.
The Present Study

The present study was conducted in Wuhan, China. The city of Wuhan was chosen as the study site as it is where the COVID-19 pandemic started. Moreover, Wuhan was hit the hardest by the pandemic and endured the imposition of the toughest quarantine restrictions in China. People in Wuhan are more likely than inhabitants of other cities in China to have experienced the loss of loved ones and have been infected by the coronavirus themselves, or at least to have worried about their family members’ and their own potential for infection. Moreover, people in Wuhan experienced one of the most extensive and stringent set of quarantine restrictions in the world. On 23 January 2020, the central government of China imposed a lockdown and suspended all public transport in Wuhan. Although people were allowed to travel outside their homes to buy necessities in all public transport in Wuhan, by mid-February no one was allowed to leave their residences (Chong et al., 2020). After 76 days of lockdown, many people might have lost their jobs and experienced income loss. Such an economic crisis might have increased the risk of chaos in Wuhan families (Zhang et al., 2020).

One aim of the present study was to investigate how household chaos was associated with the mental health problems of young children and their caregivers. The second aim was to examine the extent to which a large pool of familial variables, including the primary caregivers’ marital status, socioeconomic status of the family (parental education, parental occupation and household income), the number of people living in the home, the physical health conditions of family members and changes in household income, were associated with household chaos. Based on the above literature review, we anticipated that families with a single caregiver, lower socioeconomic status, a greater number of people living in the home, poorer physical health, and greater income loss would be associated with higher levels of household chaos. We also hypothesized that household chaos would be associated with the poor mental health of both young children and their caregivers and that caregivers’ mental health problems would at least partially mediate the relations between household chaos and children’s mental health problems.

This study contributes to theories of household chaos in crisis situations. In previous studies, household chaos has been studied with respect to normal non-crisis situations or during periods of relatively mild life transitions. Crisis situations such as a pandemic differ from normal or mildly difficult situations in that the former can be life altering (e.g., serious illness or hospitalisation, loss of a family member, loss of employment, financial hardship). As such, crisis situations might involve a breakdown or disruption in individual and family functioning and trigger extreme tension and stress in individuals and families. By studying the period of the COVID-19 pandemic, the work of previous researchers is extended by assessing whether household chaos plays a particularly important role in the mental health of children and their caregivers during social crisis. In addition, the pandemic provides a valuable opportunity to study how household chaos is affected by a public health crisis that imposes multiple challenges on the physical and economic health of families. The results of this study will facilitate our understanding of household chaos in a public health crisis.

Method

Participants and Procedure

Using the typical case sampling method, an exploratory sampling strategy that can be applied to identify the typical cases of kindergartens, children and their caregivers, the researchers initially contacted 22 kindergartens located across the three towns of Wuhan, and nine agreed to participate. The term ‘kindergarten’ in China is equivalent to ‘preschool’ in the United States. Chinese children typically receive three years of early childhood education in stand-alone kindergartens. The children are generally grouped by age, and three groupings are prevalent (Zhang, 2011): junior class (3- to 4-year-olds), middle class (4- to 5-year-olds) and senior class (5- to 6-year-olds). The study participants included households with young children recruited from the nine kindergartens, and the children were from all three kindergarten groupings to maximize the response rates and minimize attrition rates in the ongoing follow-up. Data were collected between mid-June and mid-July 2020, when Wuhan was gradually opened up after the 76-day lockdown and strict restrictions, but all schools remained closed. The researchers first obtained the consent of the kindergarten principals, to whom they then mailed 1,200 questionnaires. In seven kindergartens, the children’s primary caregivers were asked to pick up consent forms and questionnaires from the kindergarten, fill them out at home, and then return the completed questionnaires to the kindergarten. In the other two kindergartens, primary caregivers were asked to complete the consent forms and questionnaires at the kindergarten. All of the completed questionnaires were mailed to the researchers by the kindergartens. Of the 790 questionnaires returned, 764 were valid. The Institutional Review Board of the first author’s university approved the data collection procedures.

Most participants were the children’s mothers (n = 517), followed by fathers (n = 198), grandparents (n = 20) and other relatives (n = 5); the remaining participants (n = 24) did not indicate their relationship to the child.
Online supplementary Table 1S presents the demographics of the sample.

**Measures**

**Household Chaos**

Primary caregivers were asked to rate the chaos in their households from the start of the pandemic using the five-item Chinese version of the CHAOS–Short Form (Matheny et al., 1995) on a five-point Likert scale (1 = definitely untrue, 2 = somewhat untrue, 3 = neutral, 4 = somewhat true and 5 = definitely true). The five items were “You can’t hear yourself think in our home,” “It’s a real zoo in our home,” “Children have a regular bedtime routine in our home,” “We are usually able to stay on top of things,” and “The atmosphere in our home is calm.” The Chinese version differed from the English version in that one item (‘Usually a television is turned on somewhere in our home.’) was removed due to its low factor loading. Confirmatory factor analysis showed that a single-factor measurement model had a good fit to the data, $\chi^2 (4, N = 643) = 4.219, p = 0.377$, $CFI = 1.000$, $TLI = 0.999$, $RMSEA = 0.009$ (90% CI: 0.000–0.061), $SRMR = 0.013$. The factor loadings of the five items ranged from 0.32 to 0.91. The Cronbach’s $\alpha$ was 0.70. Composite scores were calculated. Higher scores indicate higher levels of household chaos.

**Caregiver Anxiety**

Primary caregivers rated their own anxiety symptoms with respect to the previous two weeks using the Chinese version of the Generalized Anxiety Disorder 7-Item Scale (Spitzer et al., 2006) on a four-point Likert scale (0 = not at all, 1 = several days, 2 = more than half the days and 3 = nearly every day). The Cronbach’s $\alpha$ was 0.89. Composite scores were calculated. Higher scores indicate symptoms associated with greater levels of anxiety.

**Caregiver Depression**

Primary caregivers rated their own depressive symptoms during the previous week using the Chinese version of the Center of Epidemiological Studies of Depression Short Form (10 items; Björgvinsson et al., 2013) on a four-point Likert scale (0 = rarely or none of the time [less than 1 day], 1 = some or a little of the time [1-2 days], 2 = occasionally or a moderate amount of time [3-4 days] and 3 = all of the time [5-7 days]). The Cronbach’s $\alpha$ was 0.76. Composite scores were calculated. Higher scores indicate more depressive symptoms.

**Mental Health Problems of Children**

Primary caregivers rated the mental health problems of their child using the 21-item Chinese version of the Pediatric Emotional Distress Scale (PEDS): A Brief Screening Measure for Young Children Exposed to Traumatic Events (Saylor et al., 1999) on a four-point Likert scale (0 = almost never, 1 = sometimes, 2 = often and 3 = very often). This scale measures four aspects of emotional distress, namely anxiety/withdrawal (7 items; $\alpha = 0.74$), fearfulness (5 items; $\alpha = 0.65$), acting out (6 items; $\alpha = 0.71$) and trauma (4 items; $\alpha = 0.61$). The phrase ‘the COVID-19 pandemic’ was inserted into the blank space originally shown on the trauma subscale. Composite scores were calculated for each subscale. Higher scores indicate more mental health problems.

**Physical Health of the Family**

Primary caregivers rated their own physical health status and that of their child using two items (‘Since January 20, 2020 [the start of the pandemic], how would you rate your overall physical health?’ and ‘Since January 20, 2020, how would you rate your child’s overall physical health?’) on a five-point Likert scale (1 = excellent, 2 = fair, 3 = good, 4 = very good and 5 = poor). Composite scores were calculated as an indicator of the physical health of the family. The Cronbach’s $\alpha$ was 0.91. We reverse-coded the items, so that higher scores indicate better physical health.

**Changes in Household Income**

Primary caregivers were asked to rate the changes in their household income using one item (‘How has your monthly household income changed since the start of the pandemic?’) on a five-point Likert scale (1 = increased a lot, 2 = increased a little, 3 = stayed the same, 4 = decreased a little and 5 = decreased a lot). We reverse-coded the items, so that low scores indicate decreases in household income and high scores indicate increases in household income.

**Demographic Variables**

Primary caregivers reported their child’s birth date and sex, their own marital status, the number of people living in their home, their annual household income in 2019, and the education level and occupation of the child’s mother and father (see online supplementary Table 1S for the numeric codes of these variables). Because paternal education was strongly correlated with maternal education ($r = 0.73, p < 0.001$) and paternal occupation was strongly correlated with maternal occupation ($r = 0.47, p < 0.001$), the highest
Results

Table 1 presents the means and standard deviations of and inter-correlations among the study variables. Household chaos was found to be correlated with all caregiver-reported measures of the mental health problems of young children (anxiety/withdrawal, fearfulness, acting out and trauma for caregivers) and with a large pool of familial variables, including primary caregivers’ mental health on both household chaos and caregivers’ mental health. In the indirect-effect path model the pool of familial variables described above were regressed on household chaos, the pool of familial variables and caregivers’ mental health. In the direct-effect path model was estimated using the full information maximum likelihood estimation method. Although both the direct-effect and the indirect-effect path models are saturated, they enable the interpretation of the path coefficients (Muthen & Muthen, 1998–2012).

Table 1 Means and standard deviations of and inter-correlations among the study variables

| 1. Household chaos | 12.43 (3.83) | – | – | – | – | – | – | – | – | – | – | – | – |
| 2. Caregiver’s anxiety | 4.48 (3.68) | 0.25 | – | – | – | – | – | – | – | – | – | – | – |
| 3. Caregiver’s depression | 5.67 (4.33) | 0.28 | 0.57 | – | – | – | – | – | – | – | – | – | – |
| 4. Child’s anxiety/withdrawal | 9.68 (2.52) | 0.14 | 0.25 | 0.32 | – | – | – | – | – | – | – | – | – |
| 5. Child’s fearfulness | 8.82 (2.33) | 0.17 | 0.21 | 0.55 | – | – | – | – | – | – | – | – | – |
| 6. Child’s acting out | 11.06 (2.46) | 0.16 | 0.19 | 0.20 | 0.50 | 0.51 | – | – | – | – | – | – | – |
| 7. Child’s COVID-19 related trauma | 6.80 (1.72) | –0.01 | 0.17 | 0.18 | 0.38 | 0.23 | 0.30 | – | – | – | – | – | – |
| 8. Child’s age in months | 59.07 (12.28) | –0.00 | 0.03 | 0.07 | 0.00 | –0.13 | –0.02 | 0.05 | – | – | – | – | – |
| 9. Child’s sex | 0.53 (0.50) | 0.01 | –0.03 | 0.00 | 0.04 | –0.01 | 0.02 | 0.04 | 0.05 | – | – | – | – |
| 10. Caregiver’s marital status | 0.03 (0.17) | 0.09 | 0.06 | 0.02 | 0.06 | 0.03 | 0.08 | –0.02 | 0.05 | –0.03 | – | – | – |
| 11. Number of people in the home | 4.87 (1.75) | 0.11 | 0.02 | 0.02 | 0.06 | –0.05 | –0.01 | –0.03 | 0.11 | 0.06 | –0.14 | – | – |
| 12. Parental education | 4.03 (1.09) | 0.04 | –0.01 | –0.06 | –0.11 | 0.06 | 0.04 | –0.02 | 0.27 | –0.13 | 0.05 | –0.16 | – |
| 13. Parental occupation | 3.06 (1.09) | 0.07 | –0.02 | –0.07 | –0.12 | 0.01 | 0.05 | –0.03 | 0.16 | –0.06 | 0.04 | –0.06 | 0.49 | – |
| 14. Annual household income in 2019 | 11.36 (6.36) | –0.10 | –0.05 | –0.17 | –0.13 | 0.01 | 0.03 | –0.05 | 0.28 | –0.06 | 0.08 | –0.12 | 0.38 | 0.39 | – |
| 15. Change in monthly household income during the pandemic | 2.03 (0.94) | –0.16 | –0.16 | –0.16 | –0.07 | –0.08 | –0.05 | –0.03 | –0.01 | 0.00 | –0.01 | –0.05 | 0.22 | 0.18 | 0.09 | – |
| 16. Family’s physical health during the pandemic | 8.99 (1.43) | –0.13 | –0.15 | –0.17 | –0.11 | –0.12 | 0.02 | 0.05 | –0.00 | 0.02 | –0.00 | 0.04 | –0.06 | –0.01 | 0.04 | 0.11 | – |

Note. N = 575–764. M = Mean, SD = Standard deviation. Sex: 0 = girls, 1 = boys. Marital status: 0 = couple, 1 = single. Correlations equal to or greater than 0.08 were significant at p < 0.05; correlations equal to or greater than 0.11 were significant at p < 0.01; correlations equal to or greater than 0.13 were significant at p < 0.001.
living in the household, annual household income in 2019, and caregiver-reported changes in the family’s monthly income and physical health status during the pandemic.

Table 2 presents the direct-effect path model described above. Families with a single caregiver, a greater number of people living in the home, greater loss of income and poorer physical health, rated by caregivers, experienced higher levels of chaos. After controlling for the physical health status of family members, changes in household income and demographic variables, household chaos was positively associated with the anxiety and depression of the primary caregivers and the anxiety/withdrawal, fearfulness and acting out of young children rated by caregivers, but not COVID-19-related trauma. In other words, children living in families with higher levels of chaos had more caregiver-reported symptoms of anxiety/withdrawal, fearfulness and acting out, and primary caregivers living in such families experienced more symptoms of anxiety and depression. The direct-effect path model explained 8.2% (p < 0.001) of the variance in household chaos and 6.6% (p < 0.001), 11.9% (p < 0.001), 5.5% (p < 0.001), 6.1% (p < 0.001), 3.9% (p = 0.007) and 0.7% (p = 0.26) of the variances in the anxiety and depression of caregivers and the anxiety/withdrawal, fearfulness, acting out and COVID-19-related trauma of young children reported by the caregivers, respectively.

Table 3 presents the indirect-effect path model described above, in which caregivers’ anxiety and depression were treated as independent mediators in the relation between household chaos and caregiver-reported child mental health problems. As shown in Table 3, caregivers’ depression was positively associated with caregiver-reported symptoms of anxiety/withdrawal, fearfulness, acting out, and COVID-19-related trauma in young children and also with household chaos. Caregivers’ anxiety was positively associated with caregiver-reported symptoms of COVID-19-related trauma in young children and also with household chaos. Moreover, when the mediator effects of caregivers’ anxiety and depression were taken into account, the direct effects of household chaos on caregiver-reported symptoms of anxiety/withdrawal, fearfulness, acting out, and COVID-19-related trauma in young children were reduced to standardized β = 0.035, 0.111, 0.111, and −0.056, respectively. The reductions caused by the mediation effects of caregivers’ depression were statistically significant for all the caregiver-reported child outcome variables, as shown in Table 4 by the positive indirect effects with the 99% confidence interval (CI) not including zero (the 99% CI was used because multiple tests were applied). In contrast, none of the reductions caused by the mediation effects of caregivers’ anxiety was statistically significant.

Because caregivers’ depression and anxiety were moderately correlated, simultaneously including them as mediator variables may cause a multicollinearity issue and, in
Table 3  Standardized path coefficients in the indirect-effect path model predicting children’s mental health from household chaos via caregivers’ mental health

| Predictor                                      | Caregivers’ Mental Health | Young Children’s Mental Health |
|-----------------------------------------------|---------------------------|-------------------------------|
|                                               | Anxiety                   | Depression                    | Anxiety/Withdrawal | Fearfulness | Acting Out | COVID-19-related Trauma |
|                                               | β  | S.E. | β  | S.E. | β  | S.E. | β  | S.E. | β  | S.E. | β  | S.E. |
| Child’s age in months                         | -0.094*                   | 0.038 | 0.027 | 0.037 | -0.055 | 0.037 | -0.119** | 0.037 | -0.014 | 0.038 | 0.039 | 0.038 |
| Child’s sex                                   | -0.058                    | 0.043 | -0.009 | 0.036 | 0.022 | 0.035 | 0.002 | 0.035 | 0.030 | 0.036 | 0.040 | 0.036 |
| Primary caregivers’ marital status            | 0.048                     | 0.037 | -0.006 | 0.036 | 0.050 | 0.035 | 0.004 | 0.036 | 0.054 | 0.036 | -0.033 | 0.037 |
| Number of people living in the home           | 0.041                     | 0.039 | -0.019 | 0.040 | 0.045 | 0.041 | -0.051 | 0.041 | -0.101 | 0.041 | -0.027 | 0.042 |
| Parental education                            | 0.059                     | 0.047 | 0.009 | 0.045 | -0.091* | 0.044 | 0.044 | 0.045 | 0.080 | 0.045 | -0.001 | 0.046 |
| Parental occupation                           | 0.018                     | 0.053 | 0.020 | 0.044 | -0.060 | 0.042 | -0.014 | 0.043 | -0.074 | 0.044 | -0.021 | 0.044 |
| Annual household income in 2019               | -0.054                    | 0.045 | -0.141** | 0.045 | -0.005 | 0.046 | 0.005 | 0.047 | 0.006 | 0.047 | 0.000 | 0.050 |
| Change in monthly household income during the pandemic | -0.098*        | 0.039 | -0.073 | 0.038 | 0.017 | 0.040 | -0.033 | 0.039 | -0.033 | 0.039 | 0.000 | 0.042 |
| Physical health of family during the pandemic  | -0.132***                 | 0.036 | -0.125*** | 0.036 | -0.057 | 0.035 | -0.060 | 0.036 | 0.015 | 0.037 | 0.086* | 0.037 |
| Household chaos                               | 0.149***                  | 0.038 | 0.234*** | 0.037 | 0.035 | 0.039 | 0.111** | 0.039 | 0.111** | 0.039 | -0.056 | 0.040 |
| Caregivers’ anxiety                           | -                 | - | - | - | 0.073 | 0.047 | 0.055 | 0.042 | 0.053 | 0.043 | 0.143*** | 0.043 |
| Caregivers’ depression                        | -                 | - | - | - | - | - | - | - | - | - | - | - |

Note. N = 764. Sex: 0 = girl, 1 = boy. Marital status: 0 = couple, 1 = single. *p < 0.05; **p < 0.01; ***p < 0.001

Discussion

Based on a sample of households with young children in Wuhan, this study yielded findings about the associations between household chaos during the COVID-19 pandemic and caregiver-rated child mental health problems. The path analysis results presented here reveal that household chaos during the COVID-19 pandemic was significantly associated with the caregiver-rated child mental health problems. Importantly, the relations between household chaos and caregiver-rated child mental health problems remained as a significant correlate when caregivers’ mental health problems were considered. In turn, the nonsignificant mediation effects of caregivers’ mental health (anxiety, depression) were consistent with the hypothesis that the indirect effects of household chaos on child mental health problems were mediated by caregivers’ mental health. However, the mediation effects of caregivers’ mental health were statistically significant when household chaos and anxiety were considered. Specifically, household chaos had a unique relation to caregivers’ mental health in terms of anxiety and depression. To the best of our knowledge, this study is the first to examine the indirect effects of household chaos on caregivers’ mental health problems mediated by caregivers’ mental health. Overall, the results of this study suggest that household chaos during the COVID-19 pandemic has a significant impact on caregivers’ mental health, which in turn mediates the association between household chaos and child mental health problems. Therefore, interventions aimed at reducing household chaos may help prevent caregivers’ mental health problems and, in turn, improve the mental health of children.
chaos and maternal depression in a longitudinal sample of mothers of infants. Presumably, caregivers who live in noisy, overcrowded and chaotic homes are more likely to experience fatigue (Thomas & Spiker, 2016) and fragmented sleep (Whitesell et al., 2018), which, in turn, may result in their experiencing higher levels of depressive and anxious symptoms. However, it should be noted that the observed relation between household chaos and caregivers’ mental health may also be driven by the possibility that caregivers’ mental health problems lead to household chaos rather than vice versa.

Consistent with our hypothesis, the results revealed that young children living in more chaotic households in Wuhan had more symptoms of anxiety/withdrawal, fearfulness and acting out reported by their caregivers during the pandemic. This finding supplements evidence from previous cross-sectional studies of preschool-aged children that points to household chaos as a strong correlate of children’s internalizing and externalizing symptoms (Coldwell et al., 2006; Dumas et al., 2005; Larsen & Jordan, 2020). Consistent with the study hypothesis, the results further showed that caregivers’ depression and anxiety significantly mediated the associations of household chaos with caregiver-rated child mental health problems. This finding joins evidence from previous longitudinal studies of young children showing that caregiver-level variables mediated the relation between household chaos and child-level outcomes (Mills-Koonce et al., 2016; Vernon-Feagans et al., 2012). Thus, caregivers’ symptoms of depression and anxiety might be the mechanism through which household chaos is related to children’s symptoms of psychopathology. Caregivers living in more chaotic households during the pandemic might experience more depressive and anxious mood and, in turn, might be more likely to adopt hostile parenting styles (Pike et al., 2016) and less likely to provide their children with emotional support (Nelson et al., 2009). These negative parenting practices might have led to young children’s mental health problems. Notably, due to the cross-sectional nature of this study, we cannot rule out an alternative explanation that children’s mental health problems lead to household chaos.

It is interesting to note that caregivers’ anxiety mediated the relations between household chaos and caregiver-reported child mental health problems when entered alone as the mediator in the direct-effect path model but did not do so when entered simultaneously with caregivers’ depression. One possible explanation is that caregivers’ depression, compared with their anxiety, is a more important mechanism through which household chaos is related to children’s mental health problems. However, it should be

| Table 4 | Test of indirect effects in the indirect-effect path model that simultaneously included caregivers’ anxiety and depression |
|---------|-------------------------------------------------------------------------------------------------------------------|
| Children’s mental health outcomes | Test of indirect effects |
| | Caregivers’ anxiety as a mediator | Caregivers’ depression as a mediator |
| | 99% CI | 99% CI |
| | Coef. | Lower | Upper | Stand. | Coef. | Lower | Upper | Stand. |
| Children’s anxiety/withdrawal | 0.007 | -0.006 | 0.020 | 0.011 | 0.039*** | 0.015 | 0.062 | 0.059*** |
| Children’s fearfulness | 0.005 | -0.005 | 0.015 | 0.008 | 0.026*** | 0.006 | 0.045 | 0.042*** |
| Children’s acting out | 0.005 | -0.006 | 0.016 | 0.008 | 0.022** | 0.002 | 0.041 | 0.034** |
| Children’s COVID-19-related trauma | 0.010 | 0.000 | 0.019 | 0.021 | 0.014** | 0.001 | 0.028 | 0.032** |

Note. *N* = 764. **p < 0.01; ***p < 0.001

| Table 5 | Test of indirect effects in the indirect-effect path model that included caregivers’ anxiety and depression separately |
|---------|-------------------------------------------------------------------------------------------------------------------|
| Children’s Mental Health Outcomes | Test of Indirect Effects |
| | Caregivers’ Anxiety as a Mediator | Caregivers’ Depression as a Mediator |
| | 99% CI | 99% CI |
| | Coef. | Lower | Upper | Stand. | Coef. | Lower | Upper | Stand. |
| Children’s anxiety/withdrawal | 0.021** | 0.004 | 0.038 | 0.031** | 0.045*** | 0.021 | 0.068 | 0.068*** |
| Children’s fearfulness | 0.013** | 0.001 | 0.025 | 0.021** | 0.030*** | 0.011 | 0.048 | 0.049*** |
| Children’s acting out | 0.012** | >0.000 | 0.024 | 0.019** | 0.025*** | 0.007 | 0.044 | 0.040*** |
| Children’s COVID-19-related trauma | 0.014** | 0.002 | 0.025 | 0.030** | 0.022*** | 0.008 | 0.036 | 0.049*** |

Note. *N* = 764. **p < 0.01; ***p < 0.001
noted that caregivers’ anxiety was rated for the past two weeks and depression for the past week. Consequently, it is also possible that the methodological difference increases the likelihood that caregivers who rated themselves as depressed were more likely to be concurrently depressed, in comparison to those rating themselves as anxious.

It is worth noting that household chaos remained to be a significant correlate of caregiver-rated fearfulness and acting out of young children even when caregivers’ mental health problems were taken into account. This finding supplements evidence from a longitudinal study that documented the unique relation from household chaos to young children’s conduct problems and callous-unemotional behaviors above and beyond mothers’ parenting behavior (Mills-Koonce et al., 2016). Together, these findings suggest that there exist other mechanisms, such as family dysfunction and negative parenting, that mediate the relation between household chaos and child mental health problems. In other words, children living in chaotic households may experience poor family functioning such as inconsistent family routines (Larsen & Jordan, 2020) and hostile parenting (Pike et al., 2016), which, in turn, lead to their mental health problems.

Unexpectedly, household chaos was not associated with caregiver-rated COVID-19-related trauma of young children. The trauma subscale of the PEDS is designed for children who have experienced trauma (Saylor et al., 1999). Although the COVID-19 pandemic and the accompanying containment measures may have impacted children and triggered trauma-like responses, these events may not be as traumatic as disasters such as earthquakes and hurricanes. In this study, both the mean and standard deviation of the trauma subscale were small, indicating that most children had not been traumatized. This might be why no significant relation was observed between household chaos and caregiver-reported trauma. Another explanation is that household chaos might not affect children’s COVID-19-related trauma. In this study, caregivers’ symptoms of depression and anxiety were found to be associated with caregiver-rated child trauma. Thus, it seems that children might be more likely to be traumatized in families with emotionally overwhelmed caregivers, compared to families with chaotic environments.

Consistent with our hypotheses and previous research findings (Dumas et al., 2005, Vernon-Feagans et al., 2012), families with a single caregiver and a greater number of people living in the household had higher levels of chaos. This finding is not surprising, because households with more people are often noisier and more overcrowded and performing multiple tasks is a major challenge to a single caregiver and may reduce his or her time for household organization (Dumas et al., 2005). Contrary to the study hypotheses, annual household income in 2019 and parental education and occupation were not associated with household chaos. However, caregivers who experienced greater income loss reported higher levels of chaos in their households. These findings suggest that changes in economic status play a more important role in determining household chaos than a consistent economic status measured annually. Indeed, income instability itself has been considered to be a type of household chaos (Hill et al., 2013). Families experiencing greater income loss are more likely to change their residences and have less regularity in their family routines and thus are more likely to experience chaos. This finding is cause for alarm, given the fact that the COVID-19 pandemic has pushed many families into poverty due to increasing levels of unemployment.

Children and primary caregivers with poorer physical health rated by the caregivers were found to experience more chaotic family environments, which is consistent with the study hypothesis. Caring for family members with physical health problems requires a considerable amount of time and energy, which may reduce the amount of time and energy available for household organization (Leonard et al., 1992). This might be especially true when a family member becomes infected with the coronavirus or has COVID-19-like symptoms, because other family members may worry about their own potential for infection and take extra measures to protect themselves against coronavirus while taking care of that family member.

Several limitations of this study should be noted. First, all of the study variables were reported by children’s primary caregivers, which might have led to shared method variance and thus biased the results. Moreover, because more depressed caregivers tend to view their children’s behavior more negatively (Field et al., 1993), the observed relation between caregivers’ depression and caregiver-rated child mental health problems may reflect caregivers’ cognitive bias instead of the actual causal relation between the two constructs. It would be useful for future researchers to use alternative methods to measure children’s mental health problems.

Second, this study focused on only one aspect of chaos, namely household disorganization, and ignored aspects such as household instability (Evans & Wachs, 2010). Instability, which is defined as changes in the household composition and residential environments, has been found to be a unique predictor of children’s adverse outcomes (Tiesler et al., 2013). Future research should include instability (e.g., change in the people living in the household) and assess its consequences for the mental health of children and their caregivers during the pandemic.

Third, the study sample was drawn from Wuhan and had a low response rate, which might limit the generalizability of the findings. Wuhan is a unique setting in the COVID-19 pandemic, because this is where the pandemic started and
residents experienced one of the toughest set of quarantine restrictions in the world while knowing little about how contagious and dangerous COVID-19 was (Kupferschmidt & Cohen, 2020). The impact of the pandemic and the accompanying containment measures on households in Wuhan may have differed from elsewhere. It remains to be seen whether these results are unique to households in Wuhan or universal with respect to samples across different regions in China and countries around the world.

Fourth, a few measures, such as the fearfulness and trauma scales, had low reliabilities, which might contribute to the low correlation observed between household chaos and COVID-related trauma. Additionally, this study did not distinguish between children’s symptoms of anxiety and withdrawal, but these two symptoms can be manifested in different forms and have differential implications for children’s social adjustment (Zhang, 2015). Future research should adopt a more reliable and valid measure to assess children’s mental health problems.

Fifth, this study did not assess family dysfunction and negative parenting as the potential mediating mechanisms through which household chaos and caregivers’ mental health problems are associated with children’s mental health problems. Future studies should examine these mechanisms.

Last but not least, this study was cross-sectional in nature and did not permit us to draw causal inferences. The observed relations between household chaos and the mental health of children and caregivers may be driven by an alternative causal relation in which mental health problems lead to a disorganized home environment. Moreover, the relations between caregivers’ and their children’s mental health may be caused by potential shared genetic factors. Future studies should adopt longitudinal or experimental designs to address causality or at least the direction of causality.

Despite these caveats, the results of this study provide evidence for the potential role of household chaos in explaining individual differences in the mental health problems of young children and their primary caregivers during the COVID-19 pandemic. The results underscore the possible role of caregivers’ mental health problems in explaining the relation between household chaos and children’s mental health problems. They also highlight several familial variables that may be associated with household chaos amidst the pandemic. The findings have crucial theoretical implications, suggesting that it is essential to understand household chaos during social crises such as a pandemic.

On the practical front, the results suggest that lower levels of household chaos in the time of COVID-19 may mean the family environment is more conducive to the promotion of the mental health of young children and their caregivers. Understanding household chaos might be important for designing interventions and policies to mitigate the negative impact of the pandemic on children and their families. Based on the study findings, we propose the following three implications with respect to implementing effective family-based intervention programs. First, it might be crucial to use the key risk factors to identify families at risk of becoming chaotic. The study results suggest that such risk factors might include single parenthood, a large number of people living in the home, significant income loss, and having family members with physical health problems. Evaluating these risk factors may be an efficient way to identify families most at risk. Second, evaluating families’ needs based on these risk factors may also facilitate the development and implementation of family interventions. The results imply that programs that include earning supplements and health care services could be effective in preventing families from becoming chaotic. Third, because the present findings suggest that household chaos can explain the unique variance in the mental health problems of young children and their caregivers beyond those risk factors, intervention programs could also target reducing chaos and establishing order and regularity of routine in families.

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Compliance with Ethical Standards
Conflict of Interest The author declares no competing interests.

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