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Children’s mental health during the COVID-19 pandemic: a population-based cohort study in the United States

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Abstract

Purpose: Examine children’s mental health symptoms, including changes during the COVID-19 pandemic.

Methods: The COVID Experiences Surveys, designed to be representative of the U.S. household population, were administered online to parents of children aged 5–12 years (wave 1 (W1), October–November 2020, n = 1561; wave 2 (W2), March–May 2021, n = 1287). We modeled changes in children’s symptoms of anxiety, depression, and psychological stress and examined associations between demographic characteristics, COVID-19 related experiences, and protective factors with symptoms across both waves using generalized estimating equations.

Results: Based on parent-report, children’s symptoms of anxiety and depression decreased from W1 to W2 (t -score anxiety = -1.8 [95% confidence intervals (CI): $-2.5, -1.0$]; t -score depression = -1.0 [CI: $-1.7, -0.3$]). Psychological stress remained consistent. Across waves, older children and children with an emotional, mental, developmental, behavioral, physical, or medical condition were more likely to have specific poor mental health symptoms. Poor mental health symptoms were more likely among children with several contextual stressors (e. g., economic stress, parental emotional strain) and less likely among children with protective factors (e.g., daily routines, neighborhood cohesion).

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Conclusions: Establishing programs that support mental health, improving access to mental health services, and fostering collaborations to advance children's mental health is important.

Keywords

Children; Mental health; Anxiety; Depression; Stress; COVID-19; Disparities

Introduction

The COVID-19 pandemic has been identified as a global, trauma-inducing crisis that has potentially catalyzed a parallel mental health crisis among children and adults alike [1–4]. Since the start of the COVID-19 pandemic, children have experienced a myriad of stressful situations that may exacerbate or contribute to negative mental health outcomes. Isolation due to illness, family economic hardship, traumatic adversities, such as loss of family members or friends due to COVID-19, and abrupt disruptions to schooling and daily life have all been identified as potentially contributing to declines in the mental health of children [5].

Early evidence related to the mental health of children amidst the pandemic suggests that symptoms of depression, anxiety, and post-traumatic stress have increased, as have mental health crisis events necessitating emergency intervention and care [2, 6–8]. For example, analysis of emergency department (ED) syndromic surveillance data from March 2020–January 2022 found increases in mental health-related ED visits for children aged 5–17 years, especially among adolescent females, compared to 2019 [8, 9]. However, there remains a need to investigate changes in mental health symptoms of school age children aged 5–12 years occurring during the pandemic.

Previous research has described how stress exposures during public health emergencies increase risk for short- and long-term mental health problems for children of all ages [10, 11]. However, research also suggests that given adequate support many children recover from exposure to stressors associated with public health emergencies, with recovery pathways depending on predisaster vulnerabilities and the intersection of individual, social, historical, and environmental risk and protective factors [10–14]. To date, less is known about how risk factors for poor mental health outcomes during crisis, such as family economic insecurity, may have affected the mental health of children during the pandemic or how protective factors may have affected resilience.

This study uses longitudinal data to examine changes in poor mental health symptoms among children aged 5–12 years; identify child populations with risk for negative mental health outcomes during the pandemic; and provide insight into factors that might influence resilience.

Methods

Data

The COVID Experiences (CovEx) nationwide, longitudinal surveys were administered online or via telephone at two points to parents or legal guardians (hereafter referred to

as “parents”) of children aged 5–12 years using the National Opinion Research Center at the University of Chicago AmeriSpeak panel to help understand the impact of COVID-19 on children’s well-being. The AmeriSpeak panel includes ~40,000 households recruited using random sampling from an address-based sample [15]. Potential respondents were selected from the Ameri-Speak panel using sampling strata based on age, race/ethnicity, education, and sex of the adult respondent. Wave 1 (W1) surveys were administered between October 8 and November 13, 2020, to 1561 parents (97% completion rate), and wave 2 (W2) surveys were administered to 1287 W1 respondents (82% retention) between March 24 and May 7, 2021. Parents with multiple children in the eligible age range were asked to report on their child with the most recent birthday. Participants were given the cash equivalent of \$10 for completing each survey. Survey weights were applied to account for nonresponse and to be representative of benchmark estimates of U.S. parents of children aged 5–12. The multi-step process of producing the final survey weights incorporated panel-based sampling weights (computed as the inverse of probability of selection from the National Opinion Research Center National Frame or address-based sample), nonresponse bias associated with sampled panel members who did not complete the initial screener for the study, and adjustment to the external population. Supplemental Table 1 compares demographic characteristics of the sample to that of the benchmark estimates in the United States, using the Census Bureau’s Current Population Survey.

Measures

Child’s symptoms of poor mental health—The Patient Reported Outcomes Measurement Information System (PROMIS) parent-report, short-form screening measures for children’s depressive symptoms (v2.0, 5 items), anxiety (v2.0, 8 items), and psychological stress experiences (v1.0, 4 items) were included in each wave of the CovEx survey as measures of children’s mental health symptoms. These PROMIS mental health measures have demonstrated concurrent validity against similar measures and are used in research as well as clinical pediatric settings for needs assessment, screening of symptoms, and monitoring changes over time [16].

Raw, sum scores for item sets are standardized to *t*-scores with a mean of 50 and a standard deviation of 10 using [HealthMeasures.net](https://www.healthmeasures.net). Higher *t*-scores represent more of the construct being measured with *t*-score ≥ 60 indicating moderate/high to severe/very high symptoms. To enable assessment of any changes to symptoms over time, *t*-scores for anxiety, depression, and psychological stress were treated as a continuous outcome. Additionally, we created an indicator of elevated poor mental health symptoms based on a clinically meaningful *t*-score threshold of ≥ 65 (i.e., 1.5 SDs higher than the mean of the reference population and outside the range of normal limits) for anxiety, depression, or psychological stress, which aligns with moderate/high to severe/very high symptoms that are associated with elevated risk for mental disorders.

COVID-19 experiences and protective factors—Applying a bioecological systems perspective [17, 18], we examined individual, household, neighborhood, and community-level factors potentially associated with child mental health during the COVID-19 pandemic [19, 20]. Parents reported on COVID-19 experiences, including persistent

economic stressors including food insecurity and housing insecurity, persistent household conflict, parental emotional strain, child's primary mode of school instruction (e.g., in-person, virtual), and experiences with COVID-19 related death of loved-ones. Protective factors examined included family resilience, family practices to address stress including establishment of routines, characteristics of neighborhood built environment, and neighborhood cohesion (i. e., perceived supportiveness of the social network existing within the neighborhood). All COVID-19 experiences and protective factors used in this analysis were captured at W1. Full descriptions of measures, including their operationalization, are presented in Supplemental Table 2.

Statistical analysis

We calculated unweighted counts, unweighted percents, and weighted prevalence estimates of child-, parent-, and household- characteristics of study participants for both waves. We also calculated mean *t*-scores and 95% confidence intervals (CI) for anxiety, depression, and psychological stress and calculated prevalence and 95% CIs for elevated poor mental health symptoms at both waves.

We ran a series of generalized estimating equation models with exchangeable correlation structure to account for repeated observations. To examine whether demographic characteristics, COVID-19 experiences, and protective factors were associated with changes in anxiety, depression, and psychological stress scores from W1 to W2, the change in the *t*-score for anxiety, depression, and psychological stress symptoms were the dependent variables and demographic characteristics, COVID-19 experiences, and protective factors were included separately as independent variables, controlling for wave. We present model-based marginal probabilities obtained through marginal standardization of changes in mean anxiety, depression, and psychological stress scores by characteristics, representing the population-based average change in *t*-scores from W1 to W2, and the mean *t*-score at W1. For the second set of models examining demographic characteristics associated with mental health outcomes averaging across data from both waves, we ran linear regression and logistic regression models with anxiety, depression, psychological stress scores and elevated mental health symptoms as the outcome and adjusted for wave and each characteristic separately. For linear models, we present beta coefficients and 95% CIs depicting the association between each characteristic and anxiety, depression, and psychological stress scores and model-based marginal mean *t*-scores by each demographic characteristic, representing the average *t*-score by demographic subgroups averaging across waves. For logistic models, we present adjusted prevalence ratios (APR) and 95% CIs depicting the association between each characteristic and elevated poor mental health symptoms and the model-based marginal prevalence of elevated poor mental health symptoms by each characteristic. Additionally, we ran a final set of linear and logistic generalized estimating equation models examining associations between COVID-19 related experiences and protective factors with mental health outcomes, adjusting for the wave indicator as well as child demographics (age; sex; emotional, mental, developmental, or behavioral condition; and physical condition). All models accounted for weights and the complex survey design.

Results

Table 1 presents sample characteristics at both waves. At W1, the sample was equally distributed among males and females (50.3% male, 49.7% female) and 57.0% were ages 9–12 years. Most W1 respondents were White, non-Hispanic (55.2%) followed by Hispanic (23.1%), Black, non-Hispanic (11.3%), and other non-Hispanic (10.4%).

At W1, the mean *t*-scores for anxiety, depression, and psychological stress were 47.9 (95% CI: 47.1, 48.7), 49.0 (95% CI: 48.4, 49.7), and 49.9 (95% CI: 49.2, 50.7) and at W2, they were 46.3 (95% CI: 45.6, 47.0), 48.0 (95% CI: 47.4, 48.5), and 49.6 (95% CI: 48.9, 50.2), respectively (data not shown). Supplemental Table 3 presents average change in anxiety, depression, and psychological stress *t*-scores from W1 to W2, including by demographic characteristics. From W1 to W2, there were significant reductions in children's mean anxiety (*t*-score: -1.8 , 95% CI: -2.5 , -1.0) and depression (*t*-score: -1.0 , 95% CI: -1.7 , -0.3 ; Supplemental Table 3) symptoms. Psychological stress did not significantly differ across the two waves (*t*-score: -0.5 , 95% CI: -1.4 , 0.4). Reductions in anxiety symptoms from W1 to W2 were more substantial among children aged 5–8 years (*t*-score: -2.5 , 95% CI: -3.4 , -1.6) compared to children aged 9–12 years (*t*-score: -1.3 , 95% CI: -2.3 , -0.3). Reductions in anxiety symptoms from W1 to W2 were more substantial among children living in households experiencing persistent economic stressors (*t*-score: -3.5 , 95% CI: -5.3 , -1.7) compared to children in households not experiencing persistent economic stressors (*t*-score: -1.4 , 95% CI: -2.3 , -0.4). However, children in households experiencing persistent economic stressors had higher mean anxiety scores at W1 compared to children in households not experiencing persistent economic stressors (mean *t*-score 52.3 vs. 47.1).

Compared to children aged 5–8 years, children aged 9–12 years had higher anxiety ($\beta = 2.1$, 95% CI: 0.6, 3.6), depression ($\beta = 2.7$, 95% CI: 1.5, 3.9), and psychological stress scores ($\beta = 3.8$, 95% CI: 2.4, 5.3), and a higher prevalence of elevated poor mental health symptoms (APR = 2.1, 95% CI: 1.5, 3.0) averaged across both waves (Table 2). Children with an emotional, mental, developmental, or behavioral condition, physical condition, or medical condition had greater symptoms of poor mental health compared to children without each respective condition. For example, children with an emotional, mental, developmental, or behavioral condition had an anxiety score that was 6.0 greater (95% CI: 4.0, 7.9) than children without an aforementioned condition averaged across both waves. Non-Hispanic Black respondents were more likely to report elevated poor mental health symptoms for their child than non-Hispanic White respondents (APR = 1.6, 95% CI: 1.1, 2.5) averaged across both waves. Respondents who were married or living with partner were less likely to report elevated mental health symptoms for their child than respondents who were never married, divorced, widowed, or separated (APR: 0.6, 95% CI: 0.4, 0.9).

Table 3 presents associations between COVID-19 related experiences and protective factors reported at W1 with elevated poor mental health symptoms across both waves, including after adjustment for demographics. Children in households experiencing persistent economic stressors (APR = 2.2, 95% CI: 1.6, 3.1), household conflict (APR = 3.1, 95% CI: 2.2, 4.5), and parental emotional strain (APR = 2.8, 95% CI: 2.0, 3.8) at W1 were more

likely to experience elevated poor mental health symptoms averaged across both waves than children not experiencing each respective stressor, adjusting for demographics (Table 3). Children with a daily routine at W1 were 40% less likely to have elevated poor mental health symptoms averaging across both waves (APR = 0.6, 95% CI: 0.5, 0.9) than those who did not. Compared to children in households with low family resilience and low neighborhood cohesion, children in households with high family resilience and high neighborhood cohesion were 60% (APR = 0.4) less likely to have elevated mental health symptoms averaging across both waves (95% CIs: 0.3, 0.7 and 0.2, 0.7, respectively).

Figure 1 presents associations adjusted for demographics between COVID-19 related experiences and protective factors reported at W1 with average anxiety, depression, and psychological stress scores averaging across both waves. Children in households that experienced persistent economic stressors, household conflict, and parental emotional strain had on average higher anxiety, depression, and psychological stress scores averaging across both waves than children who did not, after adjustment for child demographics. Children who experienced a COVID-19 related death of a loved one had on average higher depression scores averaging across both waves than children who did not. Children with a daily routine (vs. no daily routine) and children in households with a high level of family resilience (vs. low resilience) had on average lower anxiety, depression, and psychological stress scores averaging across both waves.

Discussion

This study advances our understanding of factors associated with children's symptoms of poor mental health amidst the COVID-19 pandemic. We found population-level decreases in children's symptoms of anxiety and depression across two time points from fall 2020 to spring 2021. Poor mental health symptoms were more likely among children with several contextual risk factors (e.g., economic stress, parental emotional strain) and less likely among children with protective factors (e.g., daily routines, neighborhood cohesion).

Similar to other studies indicating that age might result in varied emotional responses among children following public health emergencies [9, 10, 21], we found that children ages 9–12 years had higher mean anxiety, depression, and psychological stress scores, and a higher prevalence of elevated symptoms of poor mental health across the two waves than children ages 5–8 years. However, differences in prevalence may stem from the commonly reported difficulty of identifying symptoms among younger children due to developmental differences in the way emotional experiences and traumatic events are processed and expressed as well as the overlap in behavioral changes and experiences that are a part of early childhood development [12]. We also found that female children had a higher prevalence of elevated symptoms of poor mental health, which is consistent with sex differences identified in post disaster mental health outcomes for females (adults and children) [22, 23]. Emergency situations may increase risk for gender-based violence and worsen gender inequalities that may contribute to poor mental health outcomes for girls [21]. Yet, it is difficult to know if sex differences in parent-reported symptoms reflect true differences in symptoms or differences in symptom expression that may be noticed by a parent [12].

Across the two waves of data, children with an emotional, mental, developmental, behavioral, physical, or medical condition had poorer mental health than children without these conditions. Social and health-related inequities may result in children with disability or medical conditions showing comparatively higher symptoms of poor mental health during the pandemic than children without a disability or condition [21, 24, 25]. Furthermore, disruption to routines, continuity of health service, and support networks amidst the pandemic might have impacted children's overall functioning. Children with a disability, mental health condition, or medical conditions often rely on complex support networks that include health care professionals, education specialists, and psychologists and may have also had difficulty understanding the basis for disruptions, which can make emotional adjustment difficult [24, 26].

Providing structure and support to children during public health emergencies can buffer stress [27, 28]. In this study, children of parents who reported the use of positive strategies to help their children cope amidst the pandemic including establishing and maintaining daily routines, and implementing strategies to strengthen family resilience (e. g., talking about what to do in the face of problems, working together on solutions) had fewer symptoms of anxiety, depression, and psychological stress. Such findings demonstrate the strength of specific family practices that may help establish a sense of safety and support.

Conversely, we found indicators of high stress experienced by parents to be associated with children's elevated mental health symptoms. As previously demonstrated, emergency situations disrupt the capacity of parents (or the family unit at large) to serve in protective and supportive roles [27, 29, 30]. At any time, stressors, such as financial instability, health problems, work challenges, and relationship difficulties, can increase parental emotional distress, impact the quality of parenting including emotional responsiveness, and increase likelihood of negative interactions between parent and child, which can lead to poor psychological well-being and negative academic and behavioral outcomes [29]. Likewise, studies examining parent mental health during the pandemic have found relationships between increased stress among parents and worsening of their own mental health [28–30]. Prior research has shown associations between symptoms of poor mental health among parents (e.g., post-traumatic stress disorder symptoms) and child symptoms of poor mental health [31]. To that end, we found indicators of high stress experienced by parents amidst the pandemic to be associated with children's elevated mental health symptoms. Consistent with family systems theory and disaster mental health research, these findings underscore the interrelatedness of household stress, parenting, and child mental health outcomes and add to previous research outlining ways that pandemic-related disruptions and loss of loved ones may have affected household dynamics, caregiver burden, and parent-child relationships [30, 32–34].

In this study, mode of school instruction and neighborhood built environment were not significantly associated with symptoms of poor mental health among children. However, children whose parents reported high neighborhood cohesion, a construct related to social capital and based on perceived trust and supportiveness of one's neighborhood social network, were less likely to have elevated symptoms of poor mental health. Previous research has explored associations among neighborhood cohesion, stress, substance use,

and mental health for adults and adolescents, with findings that indicate perceptions of high levels of neighborhood cohesion are associated with less stress, mental distress, and substance use, each of which might affect parent-child relationship quality and in turn child outcomes [20, 34, 35].

This study is subject to several limitations. First, parent-report of children's experiences may be subject to various biases, including social desirability and recall biases, as well as the parent's emotional wellbeing at the time of survey administration. Second, this study included only two time points of data collected during the COVID-19 pandemic, which prohibited us from examining changes in children's mental health compared to before the pandemic started or examining longer-term symptom trajectories, as well as any potential impacts due to seasonality. Third, surveys were only administered in English, either online or by telephone; therefore, findings may not be representative of non-English-speaking households or households with limited access to technology, including families and children experiencing homelessness. Although data are weighted to represent a U.S. parent population, our sample included a notably greater percent of parents from lower-income households which may also impact the representativeness of these findings (Supplemental Table 1). Fourth, disaggregation of data based on specific type of emotional, mental, developmental, behavioral, physical, or medical condition was not possible. Fifth, although we identified two factors (i.e., sex and persistent economic stressors) associated with changes in symptoms of poor mental health over time, a larger sample size and additional time points of data may be needed to detect additional differences. Study strengths include longitudinal data representative of the U.S. household population, the use of validated scales for use as parent-report instruments to measure children's symptoms of poor mental health, and the multitude of contextual factors captured.

Findings highlight the importance of establishing programs and policies that support families and communities, improve access to mental health services, and foster collaborations across clinical, public health, and education sectors to promote children's mental health. Similar to previous research on reactions of children to disasters and on social determinants of mental health, results of this study indicate how economic, social, and environmental circumstances can affect mental health outcomes of children following a public health emergency and highlight areas where public health interventions might support recovery [11–14, 23–25]. For example, partnerships between schools and community health providers have been effective in helping schools identify mental health and social support needs of children and families and link to critical services [36]. Schools are a natural environment for the provision of public health interventions including preparedness activities and postcrisis interventions such as psychoeducation, social support, and assessment of needs [14, 40, 43, 44]. School-based, trauma-informed activities that promote social and emotional development have also been shown as effective in helping children understand and express emotions following emergencies and in helping schools establish safe and supportive environments that enhance connectedness, buffer stress, and support children's mental health [37–41]. Professionals may also need additional training to recognize signs and symptoms of mental distress among all children, including those with disabilities; to understand the effects of pandemic-related stress on children's mental health; and to facilitate linkage to support services and interventions for families. Findings from this

study point to ways that public health providers can plan and prepare to mobilize resources to protect children, support families, and promote community resilience in future public health emergencies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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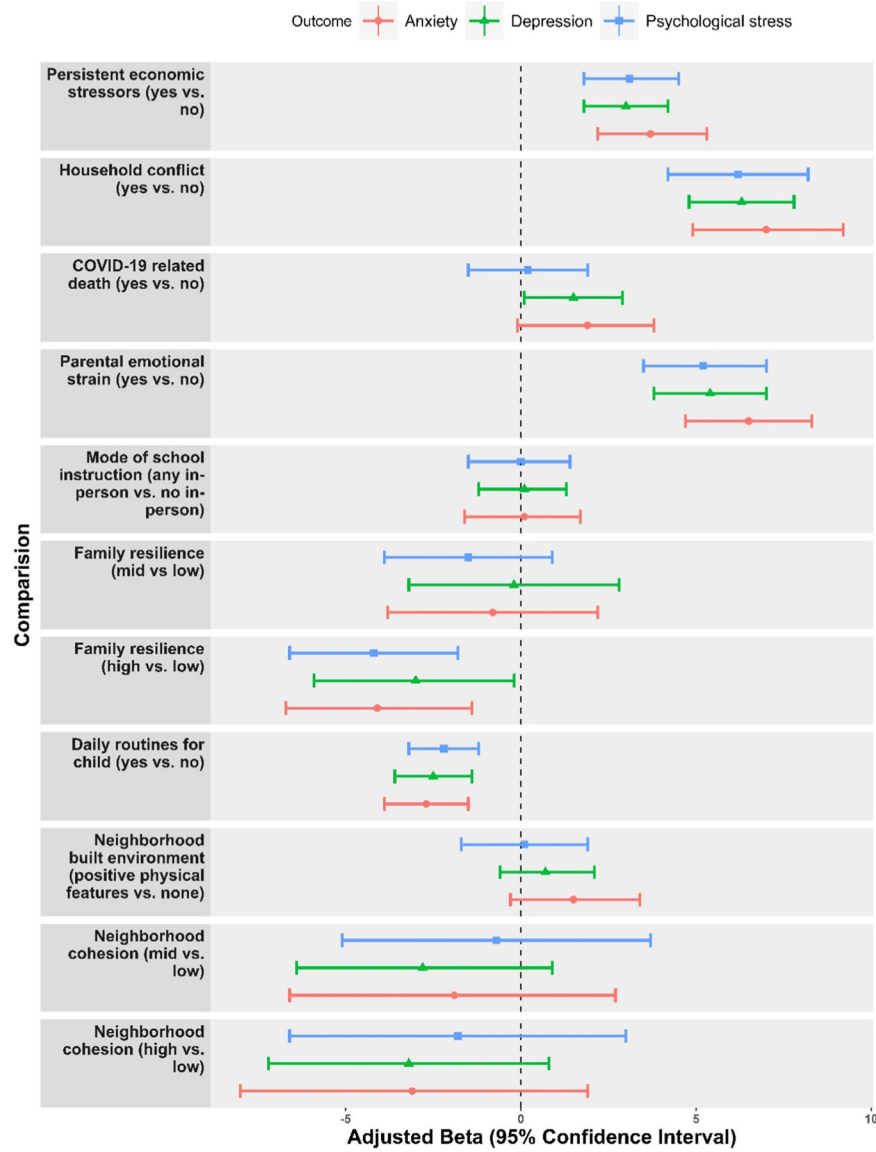


Fig. 1. Adjusted linear regression was used to model the relationship between each COVID-19 related experience and protective factor experienced at W1 with symptoms of anxiety, depression, and psychological stress averaging across both waves, after adjustment for the wave indicator and child demographics (age, sex, emotional, mental, developmental, behavioral condition, and physical condition). Full descriptions of COVID-19 experiences and protective factors, including their operationalization, are presented in Supplemental Table 2.

	Wave 1 (October–November 2020)			Wave 2 (March–May 2021)		
	Sample size	Unweighted percent	Weighted prevalence	Sample size	Unweighted percent	Weighted prevalence
Working	1165	74.6	72.8	963	74.8	72.3
Not working	396	25.4	27.2	324	25.2	27.7
Marital status						
Married or living with partner	1262	80.8	81.6	1066	82.8	82.6
Never married, divorced, widowed, or separated	299	19.2	18.4	221	17.2	17.4

* Based on affirmative response to the question: “Does [child’s name] have any kind of emotional, mental, developmental, or behavioral condition for which they need or get treatment, therapy, or counseling?”

† Based on affirmative response to the question: “Does [child’s name] have any kind of physical condition or delay for which they need or get special therapy such as occupational, physical, or speech therapy?”

‡ Based on affirmative response to the question: “Prior to the COVID-19 outbreak, did [child’s name] have a medical condition that put them at risk for severe illness from COVID-19?”

Table 2

Association between demographic characteristics and symptoms of anxiety, depression, and psychological stress averaging across both waves (October 2020–May 2021) among children ages 5–12—COVID Experiences Survey, United States

	Anxiety symptoms*		Depression symptoms*		Psychological stress symptoms*		Elevated poor mental health symptoms [†]	
	Mean [‡]	β (95% CI) [‡]	Mean [‡]	β (95% CI) [‡]	Mean [‡]	β (95% CI) [‡]	% [§]	APR (95% CI) [§]
Child characteristics								
Sex								
Male	47.0	-0.4 (-1.9, 1.0)	48.3	-0.3 (-1.6, 1.0)	49.9	0.2 (-1.3, 1.6)	11.2	0.9 (0.6, 1.2)
Female	47.4	ref	48.6	ref	49.7	ref	13.1	ref
Age group, yrs								
5–8	46.0	ref	46.9	ref	47.6	ref	7.4	ref
9–12	48.1	2.1 (0.6, 3.6)	49.6	2.7 (1.5, 3.9)	51.5	3.8 (2.4, 5.3)	15.9	2.1 (1.5, 3.0)
Emotional, mental, developmental, behavioral condition for child [¶]								
Yes	52.0	6.0 (4.0, 7.9)	52.6	5.1 (3.9, 6.4)	54.8	6.2 (4.5, 7.9)	26.5	3.0 (2.1, 4.2)
No	46.0	ref	47.5	ref	48.6	ref	8.8	ref
Physical condition for child [¶]								
Yes	51.1	4.4 (1.5, 7.3)	51.2	3.0 (1.2, 4.8)	52.6	3.2 (1.0, 5.3)	23.2	2.1 (1.4, 3.2)
No	46.7	ref	48.2	ref	49.5	ref	10.9	ref
Medical condition [#]								
Yes	50.8	4.2 (1.6, 6.8)	51.1	3.0 (0.8, 5.2)	52.6	3.2 (1.2, 5.2)	20.6	1.9 (1.3, 2.8)
No	46.6	ref	48.1	ref	49.4	ref	10.9	ref
Parent and household characteristics								
Parent race/ethnicity								
White, non-Hispanic	47.4	ref	48.7	ref	50.2	ref	10.8	ref
Black, non-Hispanic	46.7	-0.8 (-3.2, 1.7)	48.2	-0.5 (-2.8, 1.8)	49.0	-1.2 (-3.7, 1.3)	17.6	1.6 (1.1, 2.5)
Hispanic	46.9	-0.5 (-2.6, 1.6)	47.8	-0.9 (-2.5, 0.6)	49.2	-1.0 (-2.5, 0.6)	11.6	1.1 (0.7, 1.7)
Other, non-Hispanic	47.0	-0.4 (-2.1, 1.3)	49.0	0.3 (-1.4, 2.0)	49.8	-0.4 (-2.2, 1.3)	15.1	1.4 (0.8, 2.3)
Annual household income								
<\$30,000	46.9	-0.4 (-2.5, 1.7)	48.6	0.2 (-1.7, 2.1)	49.1	-0.9 (-2.7, 0.8)	16.1	1.5 (1.0, 2.2)
\$30,000	47.3	ref	48.4	ref	50.0	ref	11.0	ref

	Anxiety symptoms*		Depression symptoms*		Psychological stress symptoms*		Elevated poor mental health symptoms [†]	
	Mean [‡]	β (95% CI) [‡]	Mean [‡]	β (95% CI) [‡]	Mean [‡]	β (95% CI) [‡]	% [§]	APR (95% CI) [§]
Employment status								
Working	47.2	0.2 (-1.5, 1.8)	48.5	-0.1 (-1.5, 1.4)	49.7	-0.2 (-1.6, 1.2)	11.3	0.8 (0.5, 1.2)
Not working	47.0	ref	48.5	ref	49.9	ref	14.5	ref
Marital status								
Married or living with partner	47.1	-0.7 (-2.7, 1.3)	48.4	-0.6 (-2.3, 1.1)	49.7	-0.3 (-2.1, 1.5)	11.1	0.6 (0.4, 0.9)
Never married, divorced, widowed, or separated	47.7	ref	48.9	ref	50.0	ref	17.4	ref

APR = adjusted prevalence ratios; CI = confidence interval.

* Patient Reported Outcomes Measurement Information System (PROMIS) parent-report, short-form screening measures for children’s depressive symptoms (v2.0, 5 items), anxiety (v2.0, 8 items), and psychological stress experiences (v1.0, 4 items) were included in each wave of the CovEx survey as measures of children’s mental health symptoms. Raw, sum scores for item sets are standardized to *t*-scores with a mean of 50 and a standard deviation of 10. Higher *t*-scores represent more of the concept being measured. Automated scoring was provided through Northwestern University, HealthMeasures: https://www.assessmentcenter.net/ac_scoring/service external icon.

[†]Elevated symptoms of poor mental health were categorized as those with anxiety, depression, or and psychological stress *t*-scores ≥ 65, 1.5 SDs higher than the mean of the reference population.

[‡]Linear regression models were fit with anxiety, depression, and psychological stress *t*-scores as the outcomes, adjusting for the wave indicator and each demographic characteristic separately. We present adjusted beta coefficients and 95% CIs depicting the association between each demographic characteristic and anxiety, depression, and psychological stress *t*-scores and model-based marginal mean *t*-scores by each demographic characteristic. The marginal mean is a weighted average of the *t*-score averaging across both waves.

[§]Logistic regression models were fit with elevated poor mental health symptoms as the outcome, adjusted for the wave indicator and each demographic characteristic separately. We present adjusted prevalence ratios (APR) and 95% CIs depicting the association between each demographic characteristic and elevated poor mental health symptoms and the model-based marginal prevalence of elevated poor mental health symptoms by each demographic characteristic. The marginal prevalence is the prevalence of elevated poor mental health symptoms averaging across both waves.

[¶]Based on affirmative response to the question: “Does [child’s name] have any kind of emotional, mental, developmental, or behavioral condition for which they need or get treatment, therapy, or counseling?”

^{¶¶}Based on affirmative response to the question: “Does [child’s name] have any kind of physical condition or delay for which they need or get special therapy such as occupational, physical, or speech therapy?”

[#]Based on affirmative response to the question: “Prior to the COVID-19 outbreak, did [child’s name] have a medical condition that put them at risk for severe illness from COVID-19?”

Table 3

Adjusted associations between COVID-19 related experiences and protective factors measured at wave 1 (October–November 2020) with elevated poor mental health symptoms across both waves (October 2020–May 2021) among children aged 5–12—COVID Experiences Survey, United States

	Elevated poor mental health symptoms*		
	% [†]	PR (95% CI) [†]	APR (95% CI) [‡]
COVID-19 related experiences [§]			
Persistent economic stressors			
Yes	23.4	2.4 (1.7, 3.4)	2.2 (1.6, 3.1)
No	9.6	ref	ref
Household conflict			
Yes	36.7	3.8 (2.7, 5.4)	3.1 (2.2, 4.5)
No	9.6	ref	ref
COVID-19 related death			
Yes	17.8	1.6 (1.0, 2.3)	1.5 (1.0, 2.3)
No	11.4	ref	ref
Parental emotional strain			
Yes	29.8	3.2 (2.2, 4.6)	2.8 (2.0, 3.8)
No	9.3	ref	ref
Mode of school instruction			
Any in-person	10.9	0.8 (0.6, 1.2)	0.9 (0.6, 1.3)
No in-person	12.9	ref	ref
Protective factors [§]			
Family resilience			
Low	20.8	ref	ref
Mid	15.3	0.7 (0.4, 1.2)	0.6 (0.4, 1.1)
High	9.5	0.5 (0.3, 0.8)	0.4 (0.3, 0.7)
Daily routines for child			
Yes	10.0	0.7 (0.5, 0.9)	0.6 (0.5, 0.9)
No	15.1	ref	ref
Neighborhood built environment			
Either sidewalks, walking paths, park or playgrounds	12.3	1.2 (0.8, 1.8)	1.2 (0.8, 1.9)
Neither sidewalks, walking paths, park or playgrounds	10.5	ref	ref
Neighborhood cohesion			
Low	33.1	ref	ref
Mid	12.3	0.4 (0.2, 0.7)	0.5 (0.3, 1.0)
High	9.7	0.3 (0.2, 0.5)	0.4 (0.2, 0.7)

APR = adjusted prevalence ratio; CI = confidence interval.

* Elevated symptoms of poor mental health were categorized as those with anxiety, depression, or psychological stress *t*-scores ≥ 65, 1.5 SDs higher than the mean of the reference population.

[†] Logistic regression was used to model the relationship between each COVID-19 related experience and protective factor experienced at W1 with elevated poor mental health symptoms across both waves, after adjustment for the wave indicator. Prevalence ratios (PR) and 95% CIs and the model-based marginal prevalence of elevated poor mental health symptoms, which represents the prevalence averaging across waves, by each COVID-19 experience and protective factor are presented.

[‡] Logistic regression was used to model the relationship between each COVID-19 related experience and protective factor experienced at W1 with elevated poor mental health symptoms across both waves, after adjustment for the wave indicator and child demographics (age, sex, emotional, mental, developmental, behavioral condition, and physical condition). Adjusted prevalence ratios (APR) and 95% CIs are presented.

[§] All COVID-19 experiences and protective factors were captured at wave 1. Full descriptions of COVID-19 experiences and protective factors, including their operationalization, are presented in Supplemental Table 2.

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