Examining psychological distress in parents of children with food allergies and asthma during the COVID-19 pandemic

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Examining Psychological Distress in Parents of Children with Food Allergies and Asthma

During the COVID-19 Pandemic

by

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Thesis

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Abstract

The COVID-19 pandemic in the United States (U.S.) was anticipated to have a tremendous impact on mental health, leading to heightened anxiety, depression, and post-traumatic stress disorder. The current study examined the psychological impact of the COVID-19 pandemic in parents of children with food allergies and asthma compared to parents of healthy children, examined associations between disease-specific measures and broad measures of anxiety, and explored moderating variables impacting the relationship between COVID-19-related stressors and psychological outcomes. A national sample of 265 parents completed an online survey between April and June 2020. Parents of children with food allergies and asthma experienced greater psychological distress than parents of healthy children; however, disease-specific measures were not associated with broad measures of anxiety. Results suggested that parents of children with food allergies and asthma were uniquely affected early in the COVID-19 pandemic and in need of psychosocial support.
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Introduction

The novel coronavirus SARS-CoV-2, which causes the respiratory disease COVID-19, originated in December 2019 and spread globally in the early months of 2020 (World Health Organization [WHO], 2020). On January 21, 2020, the first confirmed case was reported in the U.S. and on March 11, 2020, the WHO declared COVID-19 a global pandemic. In response to the pandemic, public health initiatives were implemented across the U.S. to slow the spread of the virus, including the promotion of hand hygiene, wearing of face masks, remaining physically distant from members outside of one’s household and infected individuals, and disinfecting frequently touched surfaces (Centers for Disease Control and Prevention [CDC], 2020c). In addition, state municipalities implemented social distancing directives, including stay-at-home orders, quarantine requirements for potentially exposed individuals, and limited the size of public and private gatherings. Further, all non-essential services were shut down nationwide, contributing to work, school, and daycare closures; inadequate resources for medical care; deficient distribution of necessities; and economic insecurity (Pfefferbaum & North, 2020).

Together, the COVID-19 pandemic has led to significant changes in almost all aspects of daily life in the U.S. leading to a tremendous impact on the health, safety, and economic well-being of Americans.

Rapidly published research on the impact of the COVID-19 pandemic highlighted the tremendous detriment the pandemic is having on mental health (Bavel et al., 2020; Dubey et al., 2020; Fisher et al., 2020; Hossain et al., 2020; Park et al., 2020; Twenge & Joiner, 2020; Wright et al., 2020). It is anticipated that there will be detrimental effects on psychosocial functioning during and following the COVID-19, pandemic leading to depression, anxiety, post-traumatic stress disorder (PTSD), psychosomatic preoccupations, insomnia, substance abuse, and domestic
violence (Pfefferbaum & North, 2020). Previous research on mental health outcomes following public health disasters, such as the severe acute respiratory syndrome (SARS) epidemic, the Middle East respiratory syndrome coronavirus (MERS-CoV) epidemic, and the A(H1N1)pdm09 virus (commonly known as the H1N1 influenza virus) pandemic, provide insight into the potential impact the COVID-19 pandemic will have on mental health. For example, a study conducted to explore the community response to the SARS epidemic reported that moderate to severe stress was reported in approximately 16% of respondents, with 27-38% reporting an increased level of stress with the onset of the SARS epidemic. In addition, 62-73% of respondents felt horrified, apprehensive, or helpless, with these feelings more likely to be reported in those who were female, older, and less educated (Lau et al., 2006). Further, a recent rapid review conducted by Brooks et al. (2020) explored the effects of quarantine on mental health and psychological well-being during previous public health disasters. The authors suggested that the psychological impact of quarantine is wide-ranging, substantial, and can be long-lasting and that the longer the quarantine period, the poorer the psychological outcomes.

The research on previous public health disasters suggests that emotional distress following an event is ubiquitous, including depression, anxiety, and PTSD. It is anticipated that the implications on emotional and social functioning will have disproportionate effects on vulnerable populations, broadly defined (Pfefferbaum & North, 2020). Brooks et al. (2020) wrote that although strong evidence does not exist for particular demographic factors that put individuals at risk for poorer mental health outcomes, individuals with a history of mental illness and healthcare workers may be at increased risk. Individuals with preexisting medical and psychiatric conditions may also be more vulnerable to the psychosocial effects of pandemics (Pfefferbaum & North, 2020). Further, the COVID-19 pandemic has disproportionately affected
racial and ethnic minority groups, elderly individuals, individuals with underlying chronic health conditions, and low socioeconomic groups, leaving these individuals more susceptible to adverse outcomes than others (Rolland, 2020). The psychosocial impact of the COVID-19 pandemic on vulnerable groups may be exacerbated by the prolonged community spread of the virus, contributing to extended social distancing requirements and chronic uncertainty.

Parents of children under the age of 18 also experience a unique burden of the COVID-19 pandemic and may be at increased risk for poor psychological outcomes. Parents are facing numerous psychological and socioeconomic stressors such as changes in income, employment, and childcare, which are associated with adverse psychosocial outcomes (Cameron et al., 2020). With school and childcare closures, parents take on the primary education and caretaking needs for their children. Meanwhile, working parents are either working high-risk essential jobs, working from home, or losing employment. The demand on parents during the COVID-19 pandemic to maintain the well-being of their families and themselves is immense with lack of access to social and structural support (Cluver et al., 2020). A recent survey study conducted by Patrick et al. (2020) randomly selected parents and asked if their mental health had gotten better, worse, or had not changed since March 2020 at the start of the COVID-19 pandemic in the U.S. Although approximately 27% of parents reported worsening mental health, this is likely an underestimate due to the study sample and nature of the survey item. Understanding the unique impact of the COVID-19 pandemic on parents is crucial to provide appropriate and targeted mental health care to parents, children, and families.

Psychosocial Impact of Public Health Disasters on Parents and Families

Research on previous public health disasters provide insight into the impact a global pandemic can have on parent and child mental health. The National Commission on Children
and Disasters published a report in 2010 with recommendations for the President and Congress on how to close gaps in disaster preparedness, response, and recovery, calling for enhancement of the research agenda on children’s disaster mental and behavioral health (National Commission on Children and Disasters, 2010). Parents play an integral role in promoting and maintaining child mental health, especially in response to a disaster. General associations between parent mental health and child mental health are widely acknowledged (Bennett et al., 2012). It has also been established that parental psychopathology and distress post-disaster predict children’s distress (Cobham et al., 2016). Therefore, improved understanding of adverse mental health outcomes in parents, such as PTSD, anxiety, depression, and stress, will be integral to promoting mental health in children and families during and following the COVID-19 pandemic.

**Post-Traumatic Stress Disorder**

PTSD is one of the most commonly studied psychological disorders in the aftermath of disasters (Neria et al., 2008). PTSD is defined in the *Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013)* by exposure to a traumatic event related to death, serious injury, or violence followed by symptoms of intrusion, avoidance, negative alterations in cognitions or mood, and alterations in arousal or activity. Exposure to a community disaster may qualify as a traumatic event and can result in psychological and physical health problems (Adams & Boscarino, 2006). However, the course of PTSD after disasters is unclear and explicit identification of who is at risk for PTSD is largely undefined (Neria et al., 2008).

Previous research on the psychological response to public health disasters similar to the COVID-19 pandemic suggest that PTSD symptoms following these events are heightened. Hawryluck and colleagues (2004) explored the psychological functioning of individuals who
were quarantined during the SARS outbreak in Toronto, Canada. Results of the survey study suggested that 35% of the sample had elevated PTSD symptoms, which were highly correlated with the presence of depressive symptoms. In addition, individuals with lower annual household income reported increased symptoms of PTSD and depression. Sprang and Silman (2013) investigated the psychosocial responses of children and their parents to health-related disasters. The authors surveyed parents who were impacted by the H1N1 pandemic and found that of parents who experienced quarantine or isolation, 25% reported scores that indicated they were at risk for PTSD and 28% met the diagnostic criteria of PTSD as measured by the PTSD Check List-Civilian Version (PCL-CL), a widely used PTSD self-report measure.

The COVID-19 pandemic has been an ongoing health-related disaster in the U.S. since March 2020. The impact of the prolonged risk and uncertainty that defines the pandemic has unknown implications on the risk of developing PTSD. A recent study exploring PTSD in Wuhan, China, during the COVID-19 pandemic reported posttraumatic stress symptoms (PTSS) based on groups classified by risk of infection. The authors reported a prevalence of PTSS in 4.6% of the overall sample, with the prevalence in low-risk public approximately 5%, high-risk public approximately 18%, and healthcare workers 4% (Sun et al., 2020). A survey study conducted in Italy in March 2020 reported PTSD symptomatology in 27.5% of their community sample (Forte et al., 2020). In a U.S. sample of adults aged 18 to 30, 31.85% of participants reported clinically elevated levels of PTSD symptoms (Liu et al., 2020). Variable rates of PTSD are reported across samples and firm estimates of the prevalence of PTSD symptoms in parents in the U.S. during the COVID-19 pandemic have yet to be reported.
Depression

Environmental stressors such as health-related disasters have been correlated with increased risk of depression (Person et al., 2006). Major depressive disorder (MDD) is defined in the DSM-5 as at least a 2-week period of depressed mood or loss of pleasure and changes in mood, cognition, and physical symptoms (APA, 2013). Data from the U.S. Department of Health and Human Services estimated that 8.1% of American adults aged 20 and older had depression in any 2-week period between 2013 and 2016, with women twice as likely than men to have depression, and 80% of adults with depression reporting at least some difficulty with work, home, and social activities (Brody et al., 2018). Depression was estimated to be one of the most prevalent lifetime disorders in a national household survey with 18.3% of American’s experiencing at least one episode in their lifetime (Kessler et al., 2012). The prevalence and burden of depression in the U.S. is high and the risk for increased rates during and following the COVID-19 pandemic must be monitored closely.

Hawryluck et al. (2004) surveyed individuals during the SARS outbreak in Toronto, Canada, in 2003. The authors reported elevated depression scores in 31.2% of quarantined participants, with increased rates of depression in participants with lower household income. A study assessing the psychological impact of the COVID-19 outbreak in China reported the overall prevalence of depressive symptoms in 20.1% of the sample, with a significantly higher risk for depression in participants under the age 35 compared to over the age of 35 (Huang & Matricardi, 2019). Data from the U.S. Census Bureau suggested that compared to the first half of 2019, adults were more than three times as likely to screen positive for depression between April and May 2020 (Twenge & Joiner, 2020). Further, a recent systematic review and meta-analysis
of the prevalence of stress, anxiety, and depression in the general population during the COVID-19 pandemic estimated the prevalence of depression to be 33.7% (Salari et al., 2020).

Pregnant women, parents, and children are at increased risk for developing mental health disorders during the COVID-19 pandemic, including depression (Wright et al., 2020). A recent survey study of women who were pregnant or one-year post-delivery reported that 40.7% of participants reported scores indicative of depression compared to 15% of participants before the pandemic. In a sample of mothers of children aged 0 to 8, 41.51% met the clinical cut-off scores for depression. Mothers who had a previous mental health history, lower education, and employment loss or financial strain were more likely to report increased rates of depression (Cameron et al., 2020). Sociodemographic factors such as gender, age, and burden of caretaking likely place mothers at increased risk for depression during the COVID-19 pandemic and require ongoing monitoring.

**Anxiety**

Most disaster research has focused on PTSD and depression, with less focus on the prevalence and risk associated with developing post-disaster anxiety (Goldmann & Galea, 2014). However, studies suggest that anxiety is observed commonly after disasters and other traumatic experiences (Makwana, 2019). Anxiety disorders are the most common mental illness in the U.S., with a lifetime prevalence rate of 33.7% and higher rates in women than men (Kessler et al., 2012). Anxiety disorders are characterized in the *DSM-5* by fear (i.e., the emotional response to imminent threat) and anxiety (i.e., the anticipation of future threat) that are excessive or persist beyond developmentally normative periods (APA, 2013). Chronic uncertainty that occurs during natural disasters could lead to increased anxiety (Agyapong et al., 2018), and it has been argued
that successful management of uncertainty should be a primary goal in disaster response (Afifi et al., 2012).

Several studies have reported anxiety during the COVID-19 pandemic. A recent review conducted by Hossain et al. (2020) explored the epidemiology of mental health during COVID-19 in China. The authors found that several factors related to the presence of mental health problems, including anxiety, such as fear of an ongoing outbreak, susceptibility of infection, and exposure or close contact to someone with COVID-19. Further, individuals in younger and older age groups, women, and those who faced unemployment, loss of income, and economic challenges were at increased risk for adverse mental health outcomes. According to the U.S. Census Bureau during April through May 2020, adults were more than three times as likely to screen positive for an anxiety disorder compared to the first half of 2019. There was some indication of anxiety symptoms decreasing between late April and late May, which could indicate individuals were adapting to the threat of the pandemic (Twenge & Joiner, 2020).

Research has also explored anxiety in parents and specifically mothers during the COVID-19 pandemic. A recent study conducted by Cameron et al. (2020) examined the prevalence of depression and anxiety in mothers of children aged 0-8. The results suggested that mothers were experiencing clinically elevated symptoms of anxiety, with 36.27% of mothers with children aged 0 to 18 months, 32.62% of mothers with children aged 18 months to 4 years, and 29.59% of mothers with children aged 5 to 8 years meeting clinical cut-off scores for anxiety, which was significantly higher than pre-pandemic population norms. Davenport et al. (2020) surveyed women who were pregnant or within the first year after delivery between April and May 2020 and reported moderate to high anxiety in 29% of women before the pandemic compared to 72% of women during the pandemic. Last, a study assessing parenting and stress
during the COVID-19 pandemic reported that approximately 80% of the participants surveyed indicated they had experienced high levels of anxiety symptoms (Brown et al., 2020). These data suggest heightened levels of anxiety in parents during the COVID-19 pandemic and the need for ongoing research.

**Stress**

Psychological stress is a widely used indicator of mental health and is vaguely defined as a state of emotional suffering characterized by symptoms of depression and anxiety in response to a stressor (Drapeau et al., 2012). A recently published systematic review and meta-analysis of stress among the general population during the COVID-19 pandemic reported that the prevalence of stress in a sample of 9,704 participants was 29.6% as measured by the Depression, Anxiety, and Stress Scale (DASS-21; Salari et al., 2020). The APA (2020) Stress in America 2020 report highlighted the impact the pandemic is having on stress in parents in the U.S. The report stated that although many Americans are experiencing considerable stress related to coronavirus, on average, parents are reporting higher levels of stress than adults without children. Specifically, approximately 46% of parenting adults reported high stress levels compared to 28% of non-parent adults. In addition, the report stated that 71% of parents reported that managing distance and online learning for their child was a significant source of stress and compared to non-parents, parents were more like to report that meeting basic needs and accessing health care services were a significant source of stress.

Perceived stress is subjective stress appraisal or the degree to which an individual appraises a situation in their lives as stressful (Cohen et al., 1983). The extent to which an individual perceives one’s life as stressful can influence outcomes; meaning, perceived stress may modify the relationship between stress that is experienced and psychological impact. A
study conducted by Brown et al. (2020) assessed parent perceived stress during the COVID-19 pandemic. Results suggested that cumulative stressors resulting from COVID-19 were positively associated with perceived stress and that parent support and perceived control over the COVID-19 pandemic were negatively associated with perceived stress. Further, higher anxiety and depressive symptoms were associated with higher parental perceived stress. The authors suggested that interventions targeting perceived stress may improve psychological outcomes such as anxiety and depression. Perceived stress may be a meaningful indicator of an individual’s appraisal of stressful experiences such as the COVID-19 pandemic. Further research is needed to understand the associations between perceived stress and psychological outcomes such as anxiety, depression, and PTSD.

**Summary of Relevant Literature**

Research from previous health disasters and rapidly published research on the COVID-19 pandemic suggests that parents are at increased risk for adverse mental health outcomes during the COVID-19 pandemic such as anxiety, depression, PTSD, and stress. Previous research suggests that parental experience of distress that is specific to a traumatic event uniquely predicts children’s wellbeing (Juth et al., 2015). In an effort to respond to the psychosocial needs of parents, children, and families during the COVID-19 pandemic, it is critical that research is conducted to understand parent functioning in response to a global health disaster.

The psychological impact the pandemic has on parents varies widely depending on individual factors and contextual stressors parents experience. Patrick et al. (2020) reported that approximately 27% of parents reported worsening of mental health during the COVID-19 pandemic. Rates were similar across most racial/ethnic groups, income, education groups, and U.S. Census regions; however, female and unmarried parents reported higher rates of worsening
mental health. Further, families with younger children reported worsening parent mental health and child behavioral health compared to families with older children. For children with developmental delays, chronic emotional or behavioral difficulties, or other health challenges, the demands are increased (Coyne et al., 2020). Although the response to disaster is heterogeneous, understanding who is at risk for poor outcomes in response to a public health disaster is critical to manage long-term, community-wide, psychosocial distress.

**Parenting Children with Chronic Medical Conditions**

Parents of children with chronic medical conditions may be a highly vulnerable group to adverse mental health outcomes during the COVID-19 pandemic. As highlighted above, parents are vulnerable to increased PTSD, depression, anxiety, and stress following a public health disaster, and the response may vary depending on individual and contextual factors. For families with children with a chronic illness, the burden of parenting during a global pandemic is in addition to their child’s daily illness management and illness-related concerns. Previous research suggests that parents of chronically ill children have significantly more burnout symptoms than parents of healthy children (Lindström et al., 2010). Efforts have focused on understanding stressors faced by parents of children with chronic medical conditions and interventions to reduce burden and promote effective coping; however, the impact of health-related disasters on these families is largely unknown.

Few studies have been published assessing the mental health of parents of children with chronic medical conditions in the COVID-19 era. van Tilburg et al. (2020) reported that parents of children with chronic medical conditions reported significantly higher levels of stress, anxiety, and depression compared to parents of healthy children. A study exploring the impact of the COVID-19 pandemic on mothers of children with cystic fibrosis, a life-threatening chronic lung
disease, reported that anxiety scores were higher for mothers of children with CF compared to a control group. Further, anxiety for mothers of children with CF was found to be especially high for those with younger children compared to older children (Senkalfa et al., 2020). A recently published article by Protudjer et al. (2020) reported that for mothers of children with food allergies aged 1.5-8 years old, anxiety was significantly higher than age-matched controls with 44.4% reaching clinical levels of anxiety. These results suggest that anxiety may be heightened during the COVID-19 pandemic in parents of children with chronic medical conditions. Further examination of other outcomes and predictors of distress is warranted.

In particular, parents of children with food allergies and asthma have faced unique threats during the COVID-19 pandemic including lack of access to safe foods, uncertainty about their child’s illness management guidelines, fear of having to go to the emergency room, and the higher risk of individuals with asthma to have a more severe illness presentation. Protudjer et al. (2020) interviewed mothers of children with food allergies and reported themes in perceptions of food allergy during the pandemic including unexpected challenges of food shopping, less food-related anxiety, and differences and delays in testing or therapy. In addition, parents of children with food allergies and asthma are prone to increased anxiety, depression, and decreased quality of life (Lau et al., 2014; Molzon et al., 2011). Pediatric food allergy and asthma both involve unpredictable episodes, regular doctors’ visits, medication management, and life-threatening reactions that may require treatment in an emergency department. The stressors associated with the COVID-19 pandemic and the underlying burden of caring for a child with food allergies or asthma may lead to increased risk of adverse psychological effects.
**Pediatric Food Allergy**

**Definition and Prevalence.** The U.S. National Institute of Allergy and Infectious Diseases defines food allergy as “an adverse health effect arising from an immune response that occurs reproducibly on exposure to a given food” (Boyce et al., 2010). Firm estimates of the prevalence of food allergy are lacking due to variability in allergy definitions, study populations, diagnostic testing methodologies, and clinical presentations (Sicherer, 2011); however, there is strong evidence that the rate of food allergy, particularly in developed countries, is increasing (Tang & Mullins, 2017). In a U.S. household survey, the prevalence of food allergy in children was approximately 9%, with 40% of these children reporting multiple food allergies (Gupta et al., 2018). Food allergies are broadly categorized into IgE-mediated and non-IgE mediated (Ho et al., 2014). In most children, food allergies are caused by IgE reactions following the ingestion of a food protein (Sicherer & Sampson, 2014). IgE-mediated food allergies are characterized by the rapid onset of anaphylactic symptoms within minutes to hours after the ingestion of a food allergen and include urticaria (i.e., hives), angioedema (i.e., swelling), as well as respiratory, gastrointestinal, and cardiovascular symptoms that range in severity from mild to fatal (Anvari et al., 2019; Ho et al., 2014). The “Big Eight” are the most common foods associated with IgE-mediated food allergy and include peanuts, tree nuts, cow’s milk, soy, wheat, hen’s eggs, fish, and crustaceans (Chapman et al., 2006). Childhood allergies to milk, egg, wheat, and soy typically resolve during childhood (first 10 years of life), while allergies to peanut, tree nut, fish, and shellfish usually persist (Waserman & Watson, 2011).

**Disease Management and Psychosocial Functioning.** The proper management of food allergies is critical to avoid possible fatal food reactions and includes the recognition of anaphylaxis, availability of epinephrine, avoidance of food allergens, and education about safe
foods (Jones & Burks, 2017). Children with food allergies are prescribed an elimination diet and required to remove the allergen from their diet indefinitely (Waserman & Watson, 2011). Physician-recommended behaviors to avoid the risky ingestion of a food allergen requires vigilance by children and their families, leading to significant disease burden.

With the increasing prevalence of pediatric food allergy, increasing interest has been focused on understanding the psychosocial considerations involved in the maintenance and treatment of food allergies in children and their families. Numerous studies have shown that the management of food allergy is pervasive and affects the child’s family, academic, and social experiences (Feng & Kim, 2019; Klinnert & Robinson, 2008). The required daily disease management can affect multiple domains of child and caregiver psychosocial functioning including health-related quality of life (HRQoL; Herbert et al., 2016), child and parent anxiety and distress (Feng & Kim, 2019; LeBovidge et al., 2009), and maladaptive feeding behaviors (Haas, 2010). Gupta et al. (2018) suggested food allergy seriously impacts the health and wellbeing of families in many ways including socially, psychologically, and economically.

Pediatric food allergy has been primarily associated with caregiver anxiety due to the unpredictability and potentially life-threatening nature of the disease (Lau et al., 2014). Research has found that there is an optimal level of anxiety that is crucial to support engagement in food allergy management behaviors that facilitate adaptive coping; however, high levels of anxiety can become maladaptive and interfere with food allergy management and psychosocial wellbeing (Mandell et al., 2005). The relationship between parent anxiety about food allergy and general anxiety is unclear. A study by Klinnert et al. (2015) reported that food allergy-specific anxiety was not related to self-report of general anxiety in parents of children with food allergy. However, food allergy-specific anxiety and general anxiety were related in children with food
allergies. The authors suggested that parental anxiety may be unique to food allergies and may not represent a general tendency towards generalized anxiety. Little research has been conducted to understand how anxiety in parents of food allergy relates to broad levels of functioning. During times of heightened distress, it remains unknown how psychological functioning is impacted in these parents.

**Pediatric Asthma**

**Definition and Prevalence.** Asthma is the most common chronic disease occurring in childhood, affecting 6.4 million children in the U.S. (Stern et al., 2020), and is among the most frequent reasons for hospital admissions (Ritz et al., 2013). The prevalence of asthma has been increasing worldwide over the past few decades (Ferrante & La Grutta, 2018). Recent national data from the CDC suggest that 7.7% of children currently hold a diagnosis of asthma (CDC, 2020b). According to the American Academy of Allergy, Asthma, and Immunology (AAAAI; n.d.), asthma is a chronic disease that involves inflammation in the airways of the lungs, making the airways very sensitive and reactive to allergens or irritants. In individuals with asthma, the airways react to triggers such as tobacco smoke, dust mites, outdoor air pollution, pests, pets, mold, and disinfectants (CDC, 2020a). Asthma symptoms include wheezing, coughing, chest tightness, and trouble breathing. Papadopoulos et al. (2019) stated that there is no gold standard assessment of asthma in children, diagnosis can be difficult, and asthma management guidelines are not well established due to a lack of randomized controlled trials conducted with this population.

**Disease Management and Psychosocial Functioning.** Asthma can have a significant burden on children and families. Asthma is a chronic medical condition that requires daily management including trigger avoidance and drug therapy regimens (Kemp & Kemp, 2001). A
study conducted by Chiou and Hsieh (2008) reported that parents of children with asthma had higher levels of stress compared to parents of children with epilepsy in domains including role restrictions and parental health. Lenney (1997) reported that the vast majority of parents with a child with asthma feel anxious and worried about their child’s illness, leading them to cancel social events because of their child’s asthma or because of fear of a reaction. Although medication regimens have advanced over the past two decades, research still suggests that disease-related restrictions and asthma severity contribute to asthma-related anxiety (Bruzzese et al., 2011). Further, asthma is known to impact the quality of life of children and their families, and it has been found that the quality of life of children depended on that of their parents and vice versa (Vila et al., 2003). A systematic review and meta-analysis reported that there is evidence that mothers of children with asthma have greater anxious and depressive symptoms compared to mothers of healthy children; however, the mechanisms involved are unclear (Easter et al., 2015). As with pediatric food allergy, it is unclear how the psychosocial impact of asthma relates to overall psychological functioning in caregivers, especially during heightened times of distress such as the COVID-19 pandemic.

**Measuring Psychosocial Functioning in Parents**

Instruments developed to measure psychosocial outcomes in pediatric populations include both generic and disease-specific measures. According to Patrick and Deyo (1989), generic measures are those that are broadly applicable across groups and are designed to summarize concepts that apply to many impairments, illnesses, patients, and populations. Broad measures allow for comparison between populations and settings. In contrast, disease-specific measures are designed to assess specific patient populations and are targeted to problems faced within that population. Therefore, disease-specific measures may be more sensitive to detection
of important concerns of patients within a population and measuring small, clinically meaningful change following intervention.

Broad screening measures of anxiety, depression, and PTSD are commonly used to assess *DSM-5* symptoms and determine who is in need of an in-depth assessment. Self-administered questionnaires are often used as screening tools to detect individuals reporting symptoms that may indicate a psychological diagnosis. Common screening tools for anxiety in adults include the Generalized Anxiety Disorder Screener (GAD-7; Spitzer et al., 2006), State-Trait Anxiety Inventory (STAI; Spielberger, 1983), and the Screen for Adult Anxiety Related Disorders (SCAARED; Angulo et al., 2017). Common screeners for depression include the Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) and the Beck Depression Inventory (BDI; Beck, 1996). Commonly used screeners for PSTD include Short PTSD Rating Interview (SPRINT; Connor & Davidson, 2001) and the PTSD Checklist for *DSM-5* (PCL-5; Blevins et al., 2015). These generic measures have been used across populations and allow for broad comparisons between groups.

In recent years, there has been an increasing call for disease-specific measures of psychosocial distress. Illness or disease-specific measures may help with better understanding the impact of psychological symptoms on health outcomes and allow for targeted interventions. Some studies examining psychosocial distress in pediatric food allergy have used food allergy-specific measures, which may be more sensitive to food allergy anxiety and stress. However, such measures do not allow for comparison of distress scores with other groups or populations (LeBovidge et al., 2009). A recent study conducted by Soller et al. (2020) suggested that the current tools used to screen parents of children with food allergy are inadequate in identifying highly anxious parents and called for the development of a validated food allergy anxiety
screening tool to properly identify parents in need of psychosocial support and resources. Similarly, in parents of children with asthma, research has called for increased research using standardized measures of distress to provide diagnostic information about mental health in parents (Blevins et al., 2015).

Few efforts have been made to develop tools that assess disease-specific anxiety and distress in pediatric food allergy and asthma. The Worry About Food Allergy questionnaire (WAFA) is the first validated instrument designed to measure food allergy-specific worry in parents, adolescents, and children with IgE-mediated food allergies (Poehacker et al., 2020). The youth and parent versions of the Asthma-Related Anxiety Scale (YAAS and PAAS) were the first measures developed to address asthma-specific worry (Bruzzese et al., 2011). Though these measures provide valuable clinical information, they provide little direction for determining who is in need of psychosocial intervention. Little research has been conducted to determine how disease-specific measures contribute to and predict broad psychological outcomes. This relationship is important to understand, specifically during times of increased distress, such as the COVID-19 pandemic.

**Bronfenbrenner’s Ecological Systems Theory**

Urie Bronfenbrenner’s social-ecological model is a widely used theoretical framework for understanding the relationship between the developing individual and the context in which the person actively functions. Bronfenbrenner proposed that human development takes place through reciprocal relationships between the active, evolving human and the individuals, objects, and symbols in their environment (Bronfenbrenner, 1994). The ecological environment consists of nested structures including the microsystems (i.e., immediate environment), mesosystems (i.e., linkages between microsystems), exosystems (i.e., linkages between settings),
macrosystems (i.e., subculture and cultures), and chronosystems (i.e., environmental changes, including major life transitions and historical events). Together, the systems within the ecological environment interact with one another to impact the development of the individual.

The social-ecological model has been applied to pediatric chronic illnesses to provide a framework for how childhood illness and systems surrounding the child affect one another and impact adaptation and coping (Kazak, 1989). The model proposed that reciprocal interactions exist between children with chronic medical illnesses and the systems they exist in, including cultural systems, family systems, peers, schools, and medical providers (Brown, 2002). The model has also been applied to parents of children with chronic illnesses. For example, a study on maternal adjustment to childhood cancer viewed parents as individuals in the center of the concentric circles (e.g., systems; Shapiro et al., 1998).

The chronosystem in Bronfenbrenner’s social ecological model is particularly useful for conceptualizing the impact of major historical events, such as the COVID-19 pandemic, that can influence an individual’s development. van Tilburg (2020) used Bronfenbrenner’s ecological systems to assess the impact of the COVID-19 pandemic on parent’s functioning within the intrapersonal, microsystem/family, mesosystem, and exosystem, in parents of children with chronic medical conditions compared to parents of healthy children. Bronfenbrenner’s social-ecological model provides a theoretical framework to contextualize and understand the impact of the COVID-19 pandemic while considering the multiple systems and passage of time over major historical events that affect parents of children with food allergies and asthma.

Summary of Literature and Specific Aims

Previous research is clear that public health disasters impact mental health leading to increased anxiety, depression, PTSD, and perceived stress. Although who is most at risk for
negative mental health outcomes remains unclear, previous research indicates that parents and children are vulnerable to adverse outcomes during public health disasters. It is anticipated that the additional burden and uncertainty of the COVID-19 pandemic may exacerbate the already increased distress in parents of children with chronic medical conditions. In particular, families of children with food allergies and asthma have been uniquely impacted by the COVID-19 pandemic. To date, no research has examined the psychological impact of the COVID-19 pandemic on families with children with asthma and only one study has examined families with children with food allergy (Prodjuter et al., 2020). Prodjuter and colleagues (2020) only examined parent anxiety and quality of life in parents of children aged 0 to 8. It is anticipated that parents who are younger or who are caring for younger children are at increased risk for adverse mental health outcomes. Therefore, research is needed to examine how parent and child age impacts psychological outcomes across parent and child development. This study fills these gaps in the literature by describing anxiety, depression, PTSD, and perceived stress in parents of children with food allergies and asthma and exploring factors that may lead to increased symptomatology.

In addition, there is limited research available to understand the extent to which disease-specific anxiety impacts broad psychological functioning. It is suggested that disease-specific measures are able to better capture the unique experiences of families living with the burden of pediatric chronic illness. However, the specific mechanisms by which disease-related distress contributes to psychopathology and to what extent are not well established. This study aims to fill these gaps in the literature by exploring associations between disease-specific measures and broad measures of psychological functioning during a time of heightened community distress. The field of pediatric psychology has a duty to identify the clinical needs of parents of children
with food allergies and asthma during a global pandemic to provide appropriate psychosocial intervention. The following are the specific aims and associated hypotheses outlined for the present study:

**Specific Aim 1:** To examine the psychological impact of the COVID-19 pandemic on parents of children with food allergies and asthma.

**Hypothesis 1a.** It is hypothesized that parents of children with food allergies and asthma are experiencing increased distress due to caring for a child with a chronic medical condition that is directly impacted by the COVID-19 pandemic. Therefore, these parents will report higher levels of anxiety, depression, PTSD, and perceived stress compared to parents of children without food allergies or asthma (i.e., healthy controls).

**Hypothesis 1b.** Similarly, it is hypothesized that parents of children with food allergies and asthma will report levels of anxiety, depression, PTSD, and perceived stress that exceed published normative clinical cut-off scores based on community samples.

**Hypothesis 1c.** Accumulated literature has documented a strong association between food allergies and parent distress compared to limited literature documenting the association between asthma and parent distress. Therefore, parents of children with food allergies with or without asthma will have higher distress than parents of children with asthma only (i.e., without food allergies).

**Specific Aim 2:** To examine the associations between disease-specific measures of anxiety (i.e., WAFA and PAAS), broad measures of anxiety (i.e., SCAARED), and disease characteristics.
**Hypothesis 2a.** Based on the accumulated literature documenting anxiety in parents of children with food allergies and asthma and similarity in constructs, it is hypothesized that scores on the WAFA and PAAS will be significantly positively associated with the SCAARED.

**Hypothesis 2b.** Disease-specific measures of distress are sensitive to disease-specific indicators. It is proposed that parents of children with greater disease severity experience greater disease-related distress. Therefore, number of food allergens and number of allergic reactions in the last 6 months will be more strongly associated with disease-specific anxiety on the WAFA than with the SCAARED.

**Hypothesis 2c.** Disease-specific measures of distress are sensitive to disease-specific indicators. It is proposed that parents of children with greater disease severity experience greater disease-related distress. Therefore, number of asthma attacks in the last 6 months will be more strongly associated with disease-specific anxiety on the PAAS than with the SCAARED.

**Specific Aim 3:** To examine the associations between disease-specific measures of anxiety (i.e., WAFA and PAAS) and depression, PTSD, and perceived stress.

**Hypothesis 3a.** Previous literature has indicated associations between disease-specific measures and global measures of distress. It is hypothesized that disease-specific anxiety on the WAFA and PAAS will be positively correlated with depression, PTSD, and perceived stress.

**Specific Aim 4:** To explore moderating variables that may influence the relationship between parent-reported variables assessing the impact of the COVID-19 pandemic and psychological distress.

**Hypothesis 4a.** It is hypothesized that parents who are younger likely have less parenting experience and will experience greater distress due to increased parenting demands during the COVID-19 pandemic and less established coping mechanisms. Therefore, the parent-reported
impact of the COVID-19 pandemic will be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents of younger versus older chronological age.

**Hypothesis 4b.** It is hypothesized that parents of younger children will experience greater distress due to the increased demand of caring for younger children who are more dependent on their parents than for older children who are more independent. Therefore, the parent-reported impact of the COVID-19 pandemic will be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents of children who are younger versus children who are older.

**Hypothesis 4c.** Perceived stress is a cognitive construct that targets an individual’s interpretation of an event. Individuals with higher perceived stress may be at risk for poorer outcomes in response to stressful events. Therefore, parent-reported impact of the COVID-19 pandemic will be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents who report higher levels of perceived stress versus lower levels of perceived stress.

**Hypothesis 4d.** Accumulated literature has documented a strong association between parenting a child with food allergies or asthma and psychological distress. Therefore, it is hypothesized that parent-reported impact of the COVID-19 pandemic will be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents of children with food allergies or asthma compared to parents of children without food allergies or asthma (i.e., healthy controls).
Methods

Participants

Participants were recruited on social media platforms (e.g., Twitter and Facebook), followed by snowball sampling (i.e., asking participants to share the survey link with their contacts to increase participation). As noted by Dusek et al. (2015), the use of social media platforms can facilitate snowball sampling of certain populations to capitalize on a network of interconnected individuals in order to promote chain referral sampling. Inclusion criteria included adult participants aged 18 or older, the parent or primary caregiver of a child under the age of 18, currently residing in the U.S., and the parent or primary caregiver of a child who has been diagnosed by a doctor with asthma, IgE-mediated food allergies, non-IgE-mediated food allergies, or no medical illness or chronic condition. Participants were excluded if they reported they were a parent or primary caregiver of a child who has been diagnosed with another chronic medical condition (e.g., sickle cell disease, diabetes).

Participant demographic variables are reported in Table 1. The sample was predominantly female (96.98%) and identified as White (93.21%); a minority of participants identified as Hispanic (6.04%), Bi-racial/Multi-Racial (3.02%), Black (1.51%), Asian (1.13%), American Indian/Alaskan Native (0.75%), and Other (0.38%). Parents' ages ranged from 19 to 59 years ($M = 38.42, SD = 6.78$). Participants reported high levels of education with 48.64% reporting a professional/post-graduate degree and 38.49% a reporting college degree. The average household size was 3.94 ($SD = 0.94$) and the majority of the sample was married or living with a partner (92.83%).

Prior to the COVID-19 pandemic, the majority of the sample (56.98%) reported they were employed full-time (40 or more hours per week), 23.77% reported they were employed
part-time (1-39 hours per week), 18.49% reported they were not employed, 0.37% reported they were retired, and 0.37% reported they were disabled. At the time of survey completion, and during the COVID-19 pandemic, 49.62% percent reported working full-time, 18.94% reported working part-time, 30.30% reported they were not employed, 0.38% reported they were retired, and 0.76% reported they were disabled. Parent-reported pre-COVID-19 yearly household income was generally high, with the majority of participants (58.41%) reporting an income at or above $100,000.

Parent participants were categorized into four discrete groups: parent of a child with an IgE-mediated and/or non-IgE-mediated food allergy, parent of a child with asthma, parent of a child with both an IgE-mediated and/or non-IgE-mediated food allergy and asthma, or parent of a child with no medical conditions (i.e., healthy control). Seventy-four participants were included in the food allergy only group, 31 participants were included in the asthma only group, 56 participants were included in the food allergy and asthma group, and 104 participants were included in the healthy control group.
### Table 1

**Demographic Characteristics of Parents (N = 265)**

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### Table 1 continued

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<td>Widowed</td>
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<td>Retired</td>
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<tr>
<td>Disabled</td>
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<td>Disabled</td>
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<td>Prefer not to answer</td>
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*Note.* * indicates multiple responses possible.
Procedures

IRB approval was granted from the Eastern Michigan University Human Subjects Review Board on April 10, 2020. See Appendix A. Recruitment was conducted via Facebook and Twitter with specific targeted messaging (e.g., by “tagging” food allergy and asthma professionals and through use of hashtags such as #foodallergy or #kidswithasthma). Choo et al. (2015) discussed how Twitter can be used to assist in recruiting participants who are involved in particular communities and allow for previously unreachable individuals to be involved in research. Facebook has also been used for similar reasons and typically reaches a larger audience than Twitter (Oltulu et al., 2018). Posts concluded with encouragement to share with other parents (i.e., snowball sampling) to increase the recruitment of participants. Recruitment began on April 21, 2020. Data for the current study were collected between April 21, 2020, through June 22, 2020.

The survey was conducted through Qualtrics, an online survey platform. Individuals were able to access the survey from any electronic device (e.g., smart phone, laptop, tablet) after clicking on the survey link. If participants were eligible, they were directed to an electronic informed consent form and had to agree prior to completing the survey items. Participation in the survey was estimated to last between 15 to 30 minutes, dependent on the child’s conditions. All responses were anonymous with no identifying information collected. Due to the brief nature of the survey, no incentive or reward was offered. At the conclusion of the survey, all individuals were provided information about mental health resources.
Measures

**Parent Demographic Characteristics**

All parent participants (i.e., with or without a child with food allergy or asthma) reported their age, gender, race/ethnicity, level of education, marital status, pre-COVID-19 employment status, current employment status, pre-COVID-19 household income, number of individuals living in the home, and the ages of each child in the home.

**Child Demographic and Disease Characteristics**

Parents of children with food allergies or asthma reported on demographic information of the child with a food allergy or asthma. This included the relationship to the child (e.g., biological mother), current age of the child, gender of the child, and age of food allergy or asthma diagnosis. Parents of children with asthma were asked how many asthma attacks the child had that required nebulizer or emergency treatment in the past 6 months. Parents of children with food allergies were asked to indicate the child’s food allergens or triggers and number of allergic reactions in the past 6 months. Parents of children with non-IgE-mediated food allergies were asked to indicate the type of food allergy and known triggers.

**COVID-19 Variables**

All parent participants were asked to describe the impact of the COVID-19 pandemic on their community using a 10-item checklist created by the authors. The checklist included items such as “I have tested positive for COVID-19 and am in quarantine/isolation” and “Our community is under a ‘Stay home’/’Shelter in place’ order.” Participants also completed a stressor checklist and endorsed experiences that occurred in the past two weeks due to the COVID-19 pandemic. Parents of children without food allergies or asthma (i.e., healthy controls) completed a 15-item checklist. The checklist included items such as “Stress about
homeschooling children” and “Difficulty accessing medical care for myself.” Parents of children with food allergies or asthma completed a 21-item checklist that included six additional items that may have been stressors specific to these families. The food allergy and asthma specific stressor checklist included items such as “Difficulty finding safe foods for my child’s food allergy due to availability in our community” or “Fear of reaction (e.g., allergy or asthma) sending my child to the emergency department.” See Appendix B.

**Psychological Outcomes**

**Screen for Adult Anxiety-Related Disorders (SCAARED; Angulo et al., 2017).** The SCAARED is a 44-item self-report measure that screens for anxiety disorders. The directions were modified to ask about symptoms of anxiety occurring “now or in the past week” instead of “now or within the past 3 months” to capture acute COVID-19 specific distress. The SCAARED was administered to all participants. Participants reported on a scale of 0 to 2, with a score of 0 meaning not true or hardly ever true and a score of 2 meaning very true or often true. A total score and subscale scores including Somatic/Panic (17 items), Generalized Anxiety (13 items), Separation Anxiety (7 items), and Social Anxiety (7 items) were computed and compared to clinical cutoff scores to indicate the likelihood of a diagnosable anxiety disorder. The SCAARED has demonstrated high internal consistency both overall (Cronbach’s α = 0.97) and on all four subscales, with coefficient values ranging from 0.86 to 0.94. See Appendix C.

**Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001).** The PHQ-9 is a 10-item assessment to screen for the presence of DSM-5 symptoms of MDD. The PHQ-9 was administered to all participants. Participants are asked how often each of the nine symptom items has impacted them over the past two weeks. Items are completed on a scale of 0 to 3, with a score of 0 meaning not at all and a score of 3 meaning nearly every day. The last question asks
how difficult the reported symptoms have made their daily living. This question is scored on a scale of 0 to 3, with a score of 0 meaning not difficult at all and a score of 3 meaning extremely difficult. The PHQ-9 has demonstrated high internal consistency (Cronbach’s α = 0.89). Scores of 5, 10, 15, or 20 represent the clinical cutoffs for mild, moderate, moderately severe, and severe depression, respectively. See Appendix D.

Short PTSD Rating Interview (SPRINT; Connor & Davidson, 2001). The SPRINT is a 10-item screening assessment of PTSD, consisting of items asking about the impact of a traumatic event on daily functioning in the past week. The SPRINT was administered to all participants. The SPRINT includes items that address each of the DSM-5 PTSD symptom clusters (i.e., intrusion, avoidance, numbing, and hyperarousal). The measure also includes four items that address physical distress, interference with daily activities, interference with relationships with others, and feelings of distress when events classified as upsetting occur. Participants responded on a scale of 0 to 4, with a score of 0 meaning not at all and a score of 4 meaning very much. The directions were modified with author permission to define the traumatic event as the COVID-19 pandemic. The SPRINT has demonstrated strong internal consistency (Cronbach’s α = 0.77). Clinical cutoffs are calculated based on the sample used to develop the measure, with a score between 14 and 17 indicating individuals who meet diagnostic criteria for PTSD. See Appendix E.

Perceived Stress Scale (PSS-10; Cohen et al., 1983). The PSS-10 is a 10-item questionnaire that measures an individual’s thoughts and feelings about potentially stressful situations that occurred in the past month. The PSS-10 was administered to all participants. Participants respond on a scale from 0 to 4, with a score of 0 meaning never and a score of 4 meaning very often. Items are summed to generate a total score, with high scores indicating
greater perceived stress. The PSS-10 has demonstrated good internal consistency reliability (Lee, 2012). See Appendix F.

**Worry About Food Allergy Parent-Report (WAFA-P; Poehacker et al., 2020).** The WAFA is a questionnaire that measures food allergy-specific anxiety and worry in parents in the past month. The WAFA was administered to parents of children with IgE-mediated food allergies only. Three parent versions exist including WAFA-preschool (22 items), WAFA-Child (24 items), and WAFA-Teen (27 items). Participants respond on a scale from 0 to 4, with a score of 0 meaning *never* and a score of 4 meaning *every day*. An additional response option was added to the current study to allow participants to endorse *not applicable right now*. The WAFA has demonstrated a single factor structure, as well as good internal consistency (Cronbach’s $\alpha = 0.89$). See Appendix G.

**Parent Asthma-Related Anxiety Scale (PAAS; Bruzzese et al., 2011).** The PAAS is a 12-item questionnaire that measures asthma-specific anxiety and worry in the past two weeks. The PAAS was administered to parents of children with asthma only. Participants respond on a scale from 0 to 5, with a score of 0 meaning *never* and a score of 5 meaning *always*. An additional response option was added to the current study to allow participants to endorse “Not applicable right now.” Preliminary research on the PAAS suggests good internal consistency (Cronbach’s $\alpha = 0.82$-$0.90$). See Appendix H.

**Data Analyses**

Data analyses were completed in R Studio (RStudio Team, 2020). Data were downloaded from Qualtrics and cleaned to remove participants who did not consent to the survey or pass the validity checks (e.g., ReCaptcha item). Missingness and normality of distributions were assessed
prior to multiple imputation. Descriptive statistics were used to assess sample demographic characteristics and key study variables.

For Hypotheses 1a and 1c, parents were grouped by disease type (e.g., food allergy, asthma, food allergy and asthma, and healthy control) and group differences in each outcome measure were compared using multiple regression analyses. For Hypothesis 1b, parents were grouped by disease type and group means were compared to normative clinical cut-off scores for each outcome measure. For Hypotheses 2a-c and 3a, bivariate correlations were used to assess relationships among variables of interest. For Hypotheses 4a-c, moderator variables including parent age, child age, perceived stress, and parent group (i.e., food allergy, asthma, food allergy and asthma, and healthy control) were examined through hierarchical regression analyses.
Results

Data Screening

Data screening procedures were first conducted prior to the main analyses. A Mardia’s test was conducted to examine the skewness and kurtosis of the multivariate data structure that included the measures of anxiety, depression, PTSD, and perceived stress across all of the participant groups. Results indicated the assumption of multivariate normality was not met, with results for skewness = 49.67, \( p < .001 \), indicating a significant difference from a normal distribution, and results for kurtosis = 0.48, \( p = .63 \), indicating a non-significant difference from a normal distribution. In addition, Mahalanobis distances were calculated. This analysis revealed that there were twelve multivariate outliers, but the rest of the data were multivariate normal (\( n = 253 \)).

Assessment of the univariate normality revealed that skewness and kurtosis for anxiety, depression, PTSD, and perceived stress met the assumption for normality for skewness and kurtosis with all values falling below the critical value of 1. Although the Shapiro-Wilks test was significant for all key variables suggesting the distribution is significantly different from a normal distribution, this test is sensitive to large sample sizes. Due to the large sample size used in this study, it was determined that data met the assumptions of univariate normality and transformations were not indicated for the analyses used. Further, estimation procedures that are sensitive to non-normal data were used, as outlined below.

Missing Data

Data were reviewed for completeness and missing data patterns were explored. Participants who did not complete parent demographic characteristics and who did not complete the survey through the SCAARED measure were removed from the dataset. Two hundred and
sixty-five participants were retained in the final dataset used for analyses. Little’s (1988) Missing Completely at Random (MCAR) test was conducted to examine potential patterns of missingness. Due to the structure of the dataset, missingness was assessed separately across participant groups including asthma, IgE-mediated food allergy, non-IgE-mediated food allergy, and healthy control for key psychological outcome and demographic variables. Results suggested that the MCAR assumption had been met across all groups, indicating that the data were not significantly different from a missing completely at random pattern. Multiple imputation using predictive means matching (PMM) was used to account for missing data and is robust to non-normality. PMM is the gold standard estimator when quantitative variables are not normally distributed (Kleinke, 2017). Twenty datasets were imputed using PMM and the average of all datasets was reported in the results below.

**Descriptive Statistics**

**Demographic Information**

**Child Demographic and Disease Information.** Parents of children with a food allergy and/or asthma (n = 161) reported on their child’s demographic and disease information. Results are reported in Table 2. The majority of parents were the child’s biological mother (96.89%), though others identified as the child’s biological father (1.24%), the child’s adoptive mother (1.24%), and the child’s foster mother (0.62%). Child age ranged from 0 to 18 years (M = 6.37, SD = 4.63). The sample was 54.66% male and 45.34% female.

Fifty-seven percent of children were diagnosed with an IgE-mediated-food allergy, 39.75% were diagnosed with a non-IgE-mediated food allergy, and 54.04% were diagnosed with asthma. For children with food allergy, the age at diagnosis ranged from 0 to 17 years (M = 1.71, SD = 2.41). Parents of children with food allergy reported an average of 1.44 (SD = 2.32) allergic
reactions in the past 6 months. Children with IgE-mediated food allergies had on average 3.39 
(SD = 1.89) allergens with the most common being peanuts (73.91%), tree nuts (71.74%), and 
eggs (44.57%). Children with non-IgE-mediated food allergies had on average 2.16 (SD = 1.37) 
triggers with the most common being milk (50.91%), soy (36.36%), and oats (30.91%). For 
children with asthma, the age at diagnosis ranged from 0 to 17 years (M = 2.88, SD = 2.73). 
Parents of children with asthma reported on average 2.79 (SD = 4.79) asthma attacks in the past 
6 months.
Table 2

**Demographic Characteristics of Children with a Food Allergy or Asthma (n = 161)**

<table>
<thead>
<tr>
<th>Description</th>
<th>n</th>
<th>M (SD)</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current age (range = 0-18)</td>
<td>161</td>
<td>6.37 (4.63)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Age at food allergy diagnosis (range = 0-17)</td>
<td>127</td>
<td>1.71 (2.41)</td>
<td>3</td>
<td>2.31</td>
</tr>
<tr>
<td>Age at asthma diagnosis (range = 0-17)</td>
<td>83</td>
<td>2.88 (2.73)</td>
<td>4</td>
<td>4.60</td>
</tr>
<tr>
<td>Number of allergic reactions in the past 6 months (range = 0-15)</td>
<td>127</td>
<td>1.44 (2.32)</td>
<td>3</td>
<td>2.31</td>
</tr>
<tr>
<td>Number of asthma attacks in the past 6 months (range = 0-21)</td>
<td>84</td>
<td>2.79 (4.79)</td>
<td>3</td>
<td>3.45</td>
</tr>
<tr>
<td>Number of IgE-allergens (range = 1-8)</td>
<td>91</td>
<td>3.39 (1.89)</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Number of non-IgE-triggers (range = 1-6)</td>
<td>55</td>
<td>2.16 (1.37)</td>
<td>9</td>
<td>14.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
<th>n</th>
<th>Percent</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent relationship to child</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological mother</td>
<td>156</td>
<td>96.89</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Biological father</td>
<td>2</td>
<td>1.24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Adoptive mother</td>
<td>2</td>
<td>1.24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Foster mother</td>
<td>1</td>
<td>0.62</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>88</td>
<td>54.66</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Female</td>
<td>73</td>
<td>45.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Asthma diagnosis</td>
<td>87</td>
<td>54.04</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Food allergy diagnosis*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IgE-mediated food allergy</td>
<td>92</td>
<td>57.14</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Non-IgE-mediated food allergy</td>
<td>64</td>
<td>39.75</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>FPIES</td>
<td>44</td>
<td>27.33</td>
<td>6</td>
<td>9.38</td>
</tr>
</tbody>
</table>
Table 2 continued

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Percent</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>FPIAP</td>
<td>4</td>
<td>2.48</td>
<td>6</td>
<td>9.38</td>
</tr>
<tr>
<td>EoE</td>
<td>8</td>
<td>4.97</td>
<td>6</td>
<td>9.38</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>8.07</td>
<td>6</td>
<td>9.38</td>
</tr>
</tbody>
</table>

IgE-mediated food allergens*

<table>
<thead>
<tr>
<th>Food</th>
<th>n</th>
<th>Percent</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>37</td>
<td>40.22</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Soy</td>
<td>10</td>
<td>10.87</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Egg</td>
<td>41</td>
<td>44.57</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Wheat</td>
<td>9</td>
<td>9.78</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Peanut</td>
<td>68</td>
<td>73.91</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Tree nuts</td>
<td>66</td>
<td>71.74</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Fish</td>
<td>10</td>
<td>10.87</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Shellfish</td>
<td>19</td>
<td>20.65</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Sesame</td>
<td>22</td>
<td>23.91</td>
<td>1</td>
<td>1.09</td>
</tr>
<tr>
<td>Other</td>
<td>30</td>
<td>32.61</td>
<td>1</td>
<td>1.09</td>
</tr>
</tbody>
</table>

Non-IgE-mediated food triggers*

<table>
<thead>
<tr>
<th>Food</th>
<th>n</th>
<th>Percent</th>
<th>Count</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oats</td>
<td>17</td>
<td>30.91</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Rice</td>
<td>12</td>
<td>21.82</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Milk</td>
<td>28</td>
<td>50.91</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Wheat</td>
<td>11</td>
<td>20.00</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Egg</td>
<td>15</td>
<td>27.27</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Soy</td>
<td>20</td>
<td>36.36</td>
<td>9</td>
<td>14.06</td>
</tr>
<tr>
<td>Other</td>
<td>29</td>
<td>52.73</td>
<td>9</td>
<td>14.06</td>
</tr>
</tbody>
</table>

Note. * indicates multiple responses possible. FPIES = Food Protein-Induced Enterocolitis Syndrome, FPIAP = Food Protein-Induced Allergic Proctocolitis, EoE = Eosinophilic Esophagitis.
COVID-19 Variables

**Impact Checklist.** Results of the COVID-19 impact checklist are presented in Table 3. COVID-19 impact was similar across groups, with the vast majority of participants endorsing living in a community that was under a “Stay home”/”Shelter in place” order (90.56%) and having confirmed cases in their community (87.92%). Parents of children with food allergy and asthma endorsed being a frontline/essential worker at a higher rate (17.86%) than parents with food allergy only (6.76%), asthma only (9.68%), or parents of healthy children (8.65%). Additionally, parents of children with food allergy endorsed having another adult in the home that is a frontline/essential worker at a higher rate (16.22%) than parents of children with asthma only (9.68%), food allergy and asthma (12.50%), and parents of healthy children (11.54%).
**Table 3**

*Percentage of Participants Endorsing COVID-19 Impact Items*

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy n (%)</th>
<th>Asthma n (%)</th>
<th>Food Allergy and Asthma n (%)</th>
<th>Healthy Control n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have tested positive for COVID-19 and am in quarantine/isolation</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Someone in my family has tested positive for COVID-19, so our family is in quarantine/isolation</td>
<td>1 (1.35)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Someone in our home is suspected of having COVID-19, so our family is in quarantine/isolation as a precaution</td>
<td>1 (1.35)</td>
<td>0 (0.00)</td>
<td>1 (1.79)</td>
<td>1 (0.96)</td>
</tr>
<tr>
<td>I am a frontline/essential worker at high risk of exposure, so our family is in quarantine/isolation</td>
<td>5 (6.76)</td>
<td>3 (9.68)</td>
<td>10 (17.86)</td>
<td>9 (8.65)</td>
</tr>
<tr>
<td>Another adult in our home is a frontline/essential worker at high risk of exposure, so our family is in quarantine/isolation</td>
<td>12 (16.22)</td>
<td>3 (9.68)</td>
<td>7 (12.50)</td>
<td>12 (11.54)</td>
</tr>
<tr>
<td>Our community is under a “Stay home”/“Shelter in place” order</td>
<td>67 (90.54)</td>
<td>25 (80.65)</td>
<td>52 (92.86)</td>
<td>96 (92.31)</td>
</tr>
<tr>
<td>There have been confirmed cases in our community</td>
<td>68 (91.89)</td>
<td>28 (90.32)</td>
<td>53 (94.64)</td>
<td>84 (80.77)</td>
</tr>
<tr>
<td>There have not been any confirmed cases in our community, but confirmed in our state</td>
<td>0 (0.00)</td>
<td>1 (3.23)</td>
<td>0 (0.00)</td>
<td>12 (11.54)</td>
</tr>
<tr>
<td>Don’t know/Not sure how to answer</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
<td>0 (0.00)</td>
</tr>
<tr>
<td>Other</td>
<td>5 (6.76)</td>
<td>0 (0.00)</td>
<td>2 (3.57)</td>
<td>3 (2.88)</td>
</tr>
</tbody>
</table>

*Note.* Multiple responses possible.
**Stressor Checklist.** Results of the stressor checklist for each participant group are presented in Table 4. Across all groups, the majority of participants reported stress related to working remotely and worry about extended family members and friends. Further, across all groups, parents were more concerned about accessing mental health resources for themselves than for their family members or children. In contrast, across all groups, parents were more concerned about accessing medical care for their family members and children than for themselves. The majority of parents of children with a food allergy or food allergy and asthma endorsed difficulty finding safe food due to availability in the community and safe food not lasting. The majority of parents across disease groups endorsed fear of a reaction that would send their child to the emergency room.
### Table 4

**Percentage of Participants Endorsing COVID-19 Related Stressors**

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy</th>
<th>Asthma</th>
<th>Food Allergy and Asthma</th>
<th>Healthy Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td><strong>Employment/Income</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Furloughed/Loss of employment</td>
<td>19 (25.68)</td>
<td>5 (16.13)</td>
<td>11 (19.64)</td>
<td>18 (17.31)</td>
</tr>
<tr>
<td>Reduced hours/income</td>
<td>28 (37.84)</td>
<td>8 (25.81)</td>
<td>15 (26.79)</td>
<td>36 (34.62)</td>
</tr>
<tr>
<td>Difficulty filing for unemployment</td>
<td>6 (8.11)</td>
<td>4 (12.90)</td>
<td>6 (10.71)</td>
<td>10 (9.62)</td>
</tr>
<tr>
<td>Not knowing if I can pay my bills/rent</td>
<td>13 (17.57)</td>
<td>3 (6.78)</td>
<td>5 (8.93)</td>
<td>10 (9.62)</td>
</tr>
<tr>
<td>Trying to work remotely/from home</td>
<td><strong>43 (58.11)</strong></td>
<td><strong>19 (61.29)</strong></td>
<td><strong>38 (67.86)</strong></td>
<td><strong>62 (59.62)</strong></td>
</tr>
<tr>
<td><strong>Child/Family</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress about homeschooling children</td>
<td><strong>37 (50.00)</strong></td>
<td><strong>25 (80.65)</strong></td>
<td><strong>51 (91.07)</strong></td>
<td><strong>48 (46.15)</strong></td>
</tr>
<tr>
<td>Loss of childcare</td>
<td>20 (27.03)</td>
<td>7 (22.58)</td>
<td>21 (37.50)</td>
<td>36 (34.62)</td>
</tr>
<tr>
<td>Worry about extended family members/friends that we cannot see</td>
<td><strong>58 (78.38)</strong></td>
<td><strong>19 (61.29)</strong></td>
<td><strong>51 (91.07)</strong></td>
<td><strong>81 (77.88)</strong></td>
</tr>
<tr>
<td><strong>Insurance/Healthcare</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss of health insurance</td>
<td>1 (1.35)</td>
<td>0 (0.00)</td>
<td>1 (1.79)</td>
<td>2 (1.92)</td>
</tr>
<tr>
<td>Difficulty accessing mental health resources for myself</td>
<td>11 (14.86)</td>
<td>8 (25.81)</td>
<td>13 (23.21)</td>
<td>10 (9.62)</td>
</tr>
<tr>
<td>Difficulty accessing mental health resources for my family members</td>
<td>5 (6.76)</td>
<td>2 (6.45)</td>
<td>10 (17.86)</td>
<td>6 (5.77)</td>
</tr>
<tr>
<td>Difficulty accessing medical care for myself</td>
<td>12 (16.22)</td>
<td>7 (22.58)</td>
<td>13 (23.21)</td>
<td>15 (14.42)</td>
</tr>
<tr>
<td>Difficulty accessing my child’s/family member’s medical providers</td>
<td>25 (33.78)</td>
<td>7 (22.58)</td>
<td>19 (33.93)</td>
<td>18 (17.31)</td>
</tr>
<tr>
<td>Difficulty affording food for my family (including my child with allergies or asthma)</td>
<td>11 (14.86)</td>
<td>2 (6.45)</td>
<td>7 (12.5)</td>
<td>5 (4.81)</td>
</tr>
<tr>
<td>Difficulty finding safe foods for my child's food allergy due to availability in our community</td>
<td><strong>48 (64.86)</strong></td>
<td>NA</td>
<td><strong>36 (64.29)</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>
Table 4 continued

<table>
<thead>
<tr>
<th>Safe foods for my child's food allergy not lasting</th>
<th>Food Allergy</th>
<th>Asthma</th>
<th>Food Allergy and Asthma</th>
<th>Healthy Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td></td>
<td>38 (51.35)</td>
<td>NA</td>
<td>28 (50.00)</td>
<td>N/A</td>
</tr>
<tr>
<td>Not having money to buy more safe foods for my child's food allergy</td>
<td>9 (12.16)</td>
<td>NA</td>
<td>4 (7.14)</td>
<td>N/A</td>
</tr>
<tr>
<td>Difficulty finding medications (e.g., inhalers, injectable epinephrine) due to availability in our community</td>
<td>17 (22.98)</td>
<td>5 (16.13)</td>
<td>21 (37.50)</td>
<td>N/A</td>
</tr>
<tr>
<td>Fear of a reaction (e.g., allergy or asthma) sending my child to the emergency department</td>
<td>56 (75.68)</td>
<td>17 (54.84)</td>
<td>44 (78.57)</td>
<td>N/A</td>
</tr>
<tr>
<td>Confusion about illness management guidelines (e.g., confusion about how to treat an asthma attack or allergic reaction)</td>
<td>16 (21.62)</td>
<td>2 (6.45)</td>
<td>10 (17.86)</td>
<td>N/A</td>
</tr>
<tr>
<td>Other</td>
<td>11 (14.86)</td>
<td>0 (0.00)</td>
<td>7 (12.5)</td>
<td>11 (10.58)</td>
</tr>
</tbody>
</table>

Note. Multiple responses possible. Percentages ≥ 50 are bolded.

**Psychological Outcome Variables**

**Anxiety.** Parent-reported anxiety scores are reported in Table 5. Averages across all four groups met or exceeded the clinical cutoff for total score, Panic/Somatic, and Separation Anxiety. The group averages for parents of children with food allergies, asthma, and food allergies and asthma met or exceeded the clinical cutoff for Generalized Anxiety. No group average met the clinical cutoff for Social Anxiety. Overall, parents of children with food allergies, asthma, and food allergies and asthma exceeded the clinical cutoff scores at a higher percentage across all subscales than parents of healthy children.
Table 5

*Descriptive Statistics of SCAARED by Group*

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy</th>
<th>Asthma</th>
<th>Food Allergy and Asthma</th>
<th>Healthy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>% Meeting Clinical Cut-Off</td>
<td>M (SD)</td>
<td>% Meeting Clinical Cut-Off</td>
</tr>
<tr>
<td>Total</td>
<td>31.03 (15.74)</td>
<td>71.62</td>
<td>32.68 (18.06)</td>
<td>67.74</td>
</tr>
<tr>
<td>Panic/Somatic</td>
<td>8.19 (5.54)</td>
<td>70.27</td>
<td>9.52 (6.76)</td>
<td>77.42</td>
</tr>
<tr>
<td>Generalized Anxiety</td>
<td>12.74 (5.92)</td>
<td>58.11</td>
<td>13.35 (7.03)</td>
<td>61.29</td>
</tr>
<tr>
<td>Separation Anxiety</td>
<td>4.81 (3.01)</td>
<td>74.32</td>
<td>4.74 (2.58)</td>
<td>77.42</td>
</tr>
<tr>
<td>Social Anxiety</td>
<td>5.28 (3.96)</td>
<td>39.19</td>
<td>5.06 (4.22)</td>
<td>32.26</td>
</tr>
</tbody>
</table>

*Note.* Clinical cutoff for total score $\geq 23$, Panic/Somatic $\geq 5$, Generalized Anxiety $\geq 12$, Separation Anxiety $\geq 3$, and Social Anxiety $\geq 7$.

**Depression.** Depression scores were highest for parents of children with asthma, indicating moderate levels of depression. Average depression scores were similar between parents of children with food allergies, parents of children with asthma and food allergies, and parents of healthy children, indicating mild levels of depression. Depression severity scores were similar across groups (Table 6). Twenty-nine percent of parents of children with food allergies, 55% of parents of children with asthma, 32% of parents of children with food allergies and asthma, and 32% of parents of healthy children met or exceeded the clinical cutoff of moderate depression (i.e., PHQ-9 total score of 10 or greater).
Table 6

PHQ-9 Severity Scores by Group

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy</th>
<th>Asthma</th>
<th>Food Allergy and Asthma</th>
<th>Healthy Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
<td>7.66 (5.45)</td>
<td>10.19 (6.89)</td>
<td>8.12 (6.33)</td>
<td>7.08 (5.55)</td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Minimal (1-4)</td>
<td>22.3 (30.14)</td>
<td>6 (19.35)</td>
<td>19 (33.93)</td>
<td>31 (29.81)</td>
</tr>
<tr>
<td>Mild (5-9)</td>
<td>28.05 (37.91)</td>
<td>6 (19.35)</td>
<td>15 (26.79)</td>
<td>31 (29.81)</td>
</tr>
<tr>
<td>Moderate (10-14)</td>
<td>12 (16.22)</td>
<td>9 (29.03)</td>
<td>8 (14.29)</td>
<td>21 (20.19)</td>
</tr>
<tr>
<td>Moderately Severe (15-19)</td>
<td>6 (8.11)</td>
<td>5 (16.13)</td>
<td>5 (8.93)</td>
<td>9 (8.65)</td>
</tr>
<tr>
<td>Severe (20-27)</td>
<td>3.35 (4.53)</td>
<td>3 (9.68)</td>
<td>5 (8.93)</td>
<td>3 (2.88)</td>
</tr>
</tbody>
</table>

Post-Traumatic Stress Disorder. Total SPRINT scores were slightly higher but not significantly different for parents of children with food allergies, parents of children with asthma, and food allergies and asthma compared to parents of healthy children. Forty-seven percent of parents of children with food allergies, 45% of parents of children with asthma, 35% of parents of children with food allergies and asthma, and 32% of parents of healthy children met or exceeded the clinical cutoff for post-traumatic stress disorder (see Table 7).
Table 7

*Descriptive Statistics of SPRINT by Group*

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy (n = 74)</th>
<th>Asthma (n = 31)</th>
<th>Food Allergy and Asthma (n = 56)</th>
<th>Healthy (n = 104)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>% Meeting Clinical Cut-Off</td>
<td>M (SD)</td>
<td>% Meeting Clinical Cut-Off</td>
</tr>
<tr>
<td>Total</td>
<td>12.20 (6.40)</td>
<td>47.30</td>
<td>12.71 (7.66)</td>
<td>45.16</td>
</tr>
</tbody>
</table>

*Note.* Clinical cutoff for total score ≥ 14.

**Perceived Stress.** Average perceived stress scores across groups indicated moderate perceived stress, with parents of children with asthma reporting the highest levels of stress, followed by parents of children with food allergies and asthma, parents of children with food allergy, and parents of healthy children. Perceived stress scores are reported in Table 8. Seventy-seven percent of parents of children with food allergies, 77% of parents of children with asthma, 82% of parents of children with food allergies and asthma, and 76% of parents of healthy children met the cutoff for moderate to high levels of perceived stress.
### Table 8

**PSS-10 Severity Scores by Group**

<table>
<thead>
<tr>
<th></th>
<th>Food Allergy</th>
<th>Asthma</th>
<th>Food Allergy and Asthma</th>
<th>Healthy Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td>19.51 (6.67)</td>
<td>21.13 (7.66)</td>
<td>19.96 (6.34)</td>
<td>18.67 (6.29)</td>
</tr>
<tr>
<td>n (%)</td>
<td>17 (22.97)</td>
<td>7 (22.58)</td>
<td>10 (17.86)</td>
<td>25 (24.04)</td>
</tr>
<tr>
<td>Low</td>
<td>17 (22.97)</td>
<td>7 (22.58)</td>
<td>10 (17.86)</td>
<td>25 (24.04)</td>
</tr>
<tr>
<td>Moderate</td>
<td>43 (58.11)</td>
<td>18 (58.06)</td>
<td>38 (67.86)</td>
<td>69 (66.35)</td>
</tr>
<tr>
<td>High</td>
<td>14 (18.92)</td>
<td>6 (19.35)</td>
<td>8 (14.29)</td>
<td>10 (9.62)</td>
</tr>
</tbody>
</table>

*Note.* Low perceived stress is considered scores 0-13, moderate perceived stress is considered 14-26, high perceived stress is considered 27-40.

**Disease-Specific Worry.** Parent food allergy-related anxiety scores ranged from 0.08 to 3.50 on a scale from 0 to 4. On average, parents of children with an IgE-mediated food allergy endorsed items from *once a month to once a week* (*M* = 1.70, *SD* = 1.32), indicating worry about food allergy occurring at a mild to moderate frequency. Parent asthma-related anxiety total score, Severity and Treatment subscale, and the Disease-Related Restrictions subscale ranged from 0 to 5 on a scale from 0 to 5. On average, parents of children with asthma reported worrying about asthma from *hardly ever to sometimes* (*M* = 1.22, *SD* = 1.17), reported worrying about severity and treatment from *hardly ever to sometimes* (*M* = 1.09, *SD* = 1.18) and reported worrying about disease-related restrictions from *hardly ever to sometimes* (*M* = 1.52, *SD* = 1.43).

**Multiple Regression**

Multiple linear regressions were used to assess differences in psychological distress measures (i.e., anxiety, depression, PTSD, and perceived stress) across parent groups (i.e., food
allergy, asthma, food allergy and asthma, and healthy control). It was hypothesized that parents of children with food allergies or asthma would score higher on psychological distress measures compared to the healthy control group. Further, it was hypothesized that parents of children with food allergies with or without asthma would report higher distress than parents of children with asthma only. Significant group differences were found between groups for Separation Anxiety and depression. For Separation Anxiety, parents of children with food allergy had significantly higher scores compared to parents of healthy children \( (b = 1.00, p < .05) \). For depression, parents of children with asthma had significantly higher scores than parents of healthy children \( (b = -3.11, p < .01) \) and parents of children with food allergy \( (b = -2.51, p < .05) \).

Additional multiple regression analyses were conducted to compare disease groups collapsed into one group (i.e., food allergy, asthma, food allergy and asthma) to the healthy control group. Significant group differences were found between the disease and healthy groups for Panic/Somatic and Separation Anxiety. For Panic/Somatic anxiety, the disease groups had significantly higher scores than the healthy group \( (b = -1.68, p < .05) \). For Separation Anxiety, the disease group had significantly higher scores than the healthy group \( (b = -0.96, p < .05) \).

**Bivariate Correlations**

Bivariate correlations for key psychological outcome variables (anxiety, depression, PTSD, and perceived stress), disease-specific anxiety measures, and child disease characteristics (i.e., number of food allergy reactions in the past 6 months, number of asthma attacks in the past 6 months, and number of IgE-mediated food allergens) are reported in Table 9. It was hypothesized that scores on the disease-specific anxiety measures would be positively correlated with food allergy and asthma disease characteristics and anxiety, depression, PTSD, and perceived stress. Psychological outcome variables were significantly highly correlated with each
other \((r\) range \(.67 - .79\)). However, disease-specific anxiety measures were very weakly correlated with psychological outcome variables and disease characteristics \((rs < .20, p > .05)\).

**Table 9**

*Means, Standard Deviations, and Correlations of Key Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. SCAARED Total</td>
<td>30.03</td>
<td>17.59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. PHQ-9 Total</td>
<td>7.83</td>
<td>5.95</td>
<td>.69**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. SPRINT Total</td>
<td>11.92</td>
<td>6.78</td>
<td>.71***</td>
<td>.79***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. PSS-10 Total</td>
<td>19.47</td>
<td>6.63</td>
<td>.67***</td>
<td>.72***</td>
<td>.78***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. WAFA Total</td>
<td>1.16</td>
<td>0.91</td>
<td>.09</td>
<td>.07</td>
<td>.06</td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. PAAS Total</td>
<td>1.21</td>
<td>0.98</td>
<td>.06</td>
<td>.11</td>
<td>.11</td>
<td>.08</td>
<td>.16</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7. Number of food allergy</td>
<td>3.74</td>
<td>3.99</td>
<td>-.03</td>
<td>-.01</td>
<td>-.05</td>
<td>-.06</td>
<td>.01</td>
<td>.08</td>
<td></td>
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</tr>
<tr>
<td>reactions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Number of asthma attacks</td>
<td>7.27</td>
<td>7.11</td>
<td>.06</td>
<td>.04</td>
<td>.02</td>
<td>-.00</td>
<td>.08</td>
<td>.18</td>
<td>.08</td>
<td></td>
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<tr>
<td>9. Number of IgE-mediated</td>
<td>4.41</td>
<td>1.52</td>
<td>-.04</td>
<td>-.06</td>
<td>-.04</td>
<td>-.06</td>
<td>.06</td>
<td>.04</td>
<td>.17</td>
<td>.04</td>
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<td>allergens</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** indicates \(p < .001\).

**Hierarchical Regression**

Hierarchical regression analyses were conducted to examine the moderating effect of parent age, child age, perceived stress, and group (i.e., healthy vs. disease) on the relationship between parent-reported COVID-19 stressors and symptoms of anxiety, depression, and PTSD. It was hypothesized that COVID-19 stressors would be more strongly associated with
psychological outcomes in parents who are younger, children who are younger, parents with higher perceived stress, and parents of a child with food allergies or asthma. Analyses were conducted with the entire dataset, including parents of children with asthma, food allergy, and healthy children. Continuous predictor variables were standardized as z-scores. Group was a dichotomous variable coded as healthy group and disease group (i.e., parents of children with food allergies and/or asthma). The predictors were entered in Step 1 and the interaction term in Step 2.

Results of the main effects of COVID-19 stressors and the predictor variables on the dependent variables are presented in Table 10. Across all of the models including parent age, child age, and group as predictors, COVID-19 stressors were a significant predictor of anxiety, depression, and PTSD, such that high reported COVID-19 stressors predicted higher symptomatology when controlling for parent age, child age, and group status. In addition, parent age was a significant predictor of anxiety, such that older parent age predicted lower levels of anxiety when controlling for COVID-19 stressors. Across all of the models including perceived stress as a predictor variable, COVID-19 stressors did not significantly predict symptomatology. Rather, perceived stress was a significant predictor of anxiety, depression, and PTSD, such that higher perceived stress predicted higher symptomatology when controlling for COVID-19 stressors.
Table 10

Regression of Associations Between COVID-19 Stressors, Parent Age, Child Age, and Perceived Stress on Anxiety, Depression, and PTSD

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$</td>
<td>$SE$</td>
<td>$t$</td>
<td>$p$</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>3.95</td>
<td>1.04</td>
<td>3.78</td>
<td>.00**</td>
</tr>
<tr>
<td>Parent Age</td>
<td>-3.08</td>
<td>1.04</td>
<td>-2.95</td>
<td>.00**</td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td></td>
<td>.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>11.65</td>
<td>0.86</td>
<td>13.61</td>
<td>.00**</td>
</tr>
<tr>
<td>Model 4</td>
<td></td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group (Healthy vs. Disease)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Regression</td>
<td></td>
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<tr>
<td>Depression</td>
<td>.08</td>
<td></td>
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</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>1.55</td>
<td>0.36</td>
<td>4.36</td>
<td>.00**</td>
</tr>
<tr>
<td>Parent Age</td>
<td>-0.61</td>
<td>0.36</td>
<td>-1.71</td>
<td>.08</td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td></td>
<td>.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>4.19</td>
<td>0.27</td>
<td>15.41</td>
<td>.00**</td>
</tr>
<tr>
<td>Model 4</td>
<td></td>
<td>.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>1.54</td>
<td>0.36</td>
<td>4.33</td>
<td>.00**</td>
</tr>
<tr>
<td>Variable</td>
<td>$b$</td>
<td>$SE$</td>
<td>$t$</td>
<td>$p$</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Group (Healthy vs. Disease)</td>
<td>-1.24</td>
<td>0.73</td>
<td>-1.71</td>
<td>.09</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Model 1</td>
<td></td>
<td></td>
<td></td>
<td>.08</td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>1.90</td>
<td>0.40</td>
<td>4.72</td>
<td>.00**</td>
</tr>
<tr>
<td>Parent Age</td>
<td>-0.09</td>
<td>0.40</td>
<td>-0.22</td>
<td>.83</td>
</tr>
<tr>
<td>Model 2</td>
<td></td>
<td></td>
<td></td>
<td>.08</td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>1.98</td>
<td>0.41</td>
<td>4.77</td>
<td>.00**</td>
</tr>
<tr>
<td>Child Age</td>
<td>0.27</td>
<td>0.41</td>
<td>0.62</td>
<td>.53</td>
</tr>
<tr>
<td>Model 3</td>
<td></td>
<td></td>
<td></td>
<td>.61</td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>0.25</td>
<td>0.29</td>
<td>0.90</td>
<td>.37</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>5.19</td>
<td>0.28</td>
<td>18.71</td>
<td>.00**</td>
</tr>
<tr>
<td>Model 4</td>
<td></td>
<td></td>
<td></td>
<td>.09</td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>1.90</td>
<td>0.40</td>
<td>4.75</td>
<td>.00**</td>
</tr>
<tr>
<td>Group (Healthy vs. Disease)</td>
<td>-1.50</td>
<td>0.82</td>
<td>-1.83</td>
<td>.07</td>
</tr>
</tbody>
</table>

*Note. $b$ represents unstandardized regression weights.*

** $p < .001.$

Contrary to what was hypothesized, there were no significant findings to support a moderating effect of parent age, child age, or group on the relationship between COVID-19 stressors and anxiety, depression, or PTSD. However, there was a significant moderating effect of perceived stress on the relationship between COVID-19 stressors and depression (Table 11). The addition of the interaction term in Step 2 resulted in a significant change in variance explained ($\Delta R^2 = .01, p < .05$). To further examine the interaction term, a line-graph was plotted depicting predicted depression as a function of high (one standard deviation above the mean)
versus low (one standard deviation below the mean) COVID-19 stressors and perceived stress (see Figure 1). Figure 1 suggests that COVID-19 stressors had a stronger positive association with parent depression for parents with high perceived stress \((b = 0.65, SE = 0.32, p < .05)\) compared to parents with low perceived stress \((b = -0.52, SE = 0.38, p = .19)\). Specifically, on average, parents with high perceived stress had higher depression scores compared to parents with average or low perceived stress. For parents with high perceived stress, more COVID-19 stressors significantly predicted higher depression scores. For parents with average or low levels of perceived stress, depression scores were not significantly different as a function of low, average, or high levels of COVID-19 stressors.

**Table 11**

*Hierarchical Regression Results for Depression*

<table>
<thead>
<tr>
<th>Variable</th>
<th>(b)</th>
<th>(SE\ (b))</th>
<th>(R^2)</th>
<th>(\Delta R^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td>.52**</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>7.83**</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>0.21</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>4.19**</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td>.53*</td>
<td>.01*</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>7.64**</td>
<td>0.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 Stressors</td>
<td>0.07*</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>4.26**</td>
<td>0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COVID-19 Stressors *Perceived Stress</td>
<td>0.58*</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* \(b\) represents unstandardized regression weights.

\* \(p < .05\). ** \(p < .001\).
Figure 1
*Interaction Between COVID-19 Stressors and Perceived Stress Predicting Depression*

Note. PSS = Perceived Stress Scale.
Discussion

Previous research is clear that public health disasters impact mental health and can lead to psychological detriments including increased anxiety, depression, PTSD, and stress. During the COVID-19 pandemic, parents have faced numerous psychological and socioeconomic stressors such as changes in income, employment, and childcare, which are associated with adverse psychosocial outcomes (Cameron et al., 2020). Recently published research on the COVID-19 pandemic has suggested that parents managing a child with a chronic illness may be at increased risk for poor psychological outcomes (van Tilburg et al., 2020). However, to date, it is largely unknown how the COVID-19 pandemic has impacted parents of children with allergic diseases including food allergies and asthma. In addition to this lack of knowledge, few studies have examined the extent to which disease-specific distress impacts broad psychological functioning, and none have done so during a time of heightened global distress. The current study aimed to fill these gaps in the literature by examining the psychological impact of the COVID-19 pandemic on parents of children with food allergies and asthma compared to parents of healthy children, exploring the association between disease-specific measures and broad measures of psychological distress, and examining moderating factors that may affect the associations between parent-reported impact of the COVID-19 pandemic and psychological outcomes.

Hypothesis 1a

*It was hypothesized that parents of children with food allergies and asthma would report higher levels of anxiety, depression, PTSD, and perceived stress compared to parents of children without food allergies or asthma (i.e., healthy controls).*

This hypothesis was partially supported by the data. When comparing average SCAARED total and subscale scores by group, parents of children with food allergy, asthma,
and food allergy and asthma reported higher scores than parents of healthy children for the following SCAARED scores: total, Panic/Somatic, Generalized Anxiety, and Separation Anxiety. Although differences were nonsignificant, the Social Anxiety subscale was the only subscale where parents of healthy children reported higher scores than parents of children with food allergy and parents of children with asthma. Further, significant group differences were found between Panic/Somatic anxiety and Separation Anxiety, where parents of children with food allergy and/or asthma reported significantly higher scores than parents of healthy children.

As predicted, these results suggest that parents of children with food allergies and/or asthma are reporting higher levels of anxiety compared to parents of healthy children, specifically in domains of Panic/Somatic and Separation Anxiety. Numerous studies have suggested the heightened prevalence of anxiety in parents of children with food allergy (Polloni & Muraro, 2020) and asthma (Easter et al., 2015); however, few have differentiated between anxiety symptom subtypes. Results from the current study allow us to differentiate between anxiety symptom clusters. Although total SCAARED scores were not significantly different across groups, Panic/Somatic and Separation Anxiety appear to be notably affected by the COVID-19 pandemic in parents of children with food allergies or asthma.

It is possible that the nature of the COVID-19 pandemic may have caused parents of children with food allergies and asthma who are prone to increased anxiety to be hypervigilant of physical symptoms (e.g., shortness of breath) that may resemble symptoms of COVID-19. As asthma has a hereditary component, parents of children with asthma may also have asthma themselves, and normally experience respiratory symptoms that may resemble COVID-19, causing increased concern. In addition, separation anxiety may have been more prominent in parents of children with food allergies and asthma due to immense risk of interacting with
entities outside of one’s household. Parents may have been reluctant to separate from their children and families, specifically where the threat to a child with a chronic medical condition was amplified. Notably, the only subscale that did not indicate a difference between the disease and healthy group was the Social Anxiety subscale. Due to the nature of the COVID-19 infection control precautions, with most families under state-mandated lockdown, it could have been that social anxiety was decreased during the initial months of the COVID-19 pandemic because parents had little to no social interaction outside of one’s household.

When comparing average depression scores, parents of children with food allergy, asthma, and food allergy and asthma, reported higher scores than parents of healthy children. Significant group differences were found between parents of children with asthma and parents of healthy children, where parents of children with asthma reported significantly higher scores than parents of healthy children. This is consistent with similar research that has reported that mothers of asthmatic children have a higher prevalence of depression than mothers of non-asthmatic children (Leão et al., 2009). However, there may be additional factors that contribute to heightened depression symptoms in parents of children with asthma during the COVID-19 pandemic, such as sociodemographic factors.

The COVID-19 pandemic has disproportionately affected racial and ethnic minority and low socioeconomic groups, leaving these individuals more susceptible to adverse outcomes than others (Rolland, 2020). Relatedly, asthma disproportionately affects children of lower socioeconomic status (Neidell, 2004). Clawson et al. (2021) reported that parents of non-Hispanic White children with asthma and Black, Indigenous, People of Color (BIPOC) families with or without asthma experienced greater amounts of COVID-19 burdens relative to non-Hispanic White parents of healthy children. Although the homogenous sample in the current
study did not allow for examination of factors related to race and socioeconomic status that might have contributed to the results, it is notable and important to consider that COVID-19 and asthma disproportionately impact disenfranchised communities. Additionally, racial and ethnic minority children with asthma are less likely to have access to an asthma specialist (Flores et al., 2009), thus, are less likely to receive targeted psychosocial support. Although the current sample is not representative of BIPOC communities, factors related to race and socioeconomic status could have impacted the high degree of depressive symptoms in parents of asthmatic children in the current study.

When comparing average PTSD scores, parents of children with food allergy, asthma, and food allergy and asthma, reported higher scores than parents of healthy children. However, no statistically significant group differences were found. Contrary to what was predicted, these findings suggest that traumatic symptoms in response to the COVID-19 pandemic are not differentially experienced between parents with or without a child with food allergies or asthma. Notably, parents of children with food allergies and asthma reported the highest average PTSD scores and also reported the highest percentage of frontline/essential workers. It may be that these parents are reporting higher PTSD symptomatology due to high risk of work-related exposure and not by nature of child disease status. The impact and uncertainty of the COVID-19 is impacting all parents, and factors beyond distress related to having a child with food allergies and asthma are likely more salient.

Lastly, when comparing average perceived stress scores, parents of children with food allergy, asthma, and food allergy and asthma, reported higher scores than healthy children, though no statistically significant group differences were found. Although contrary to what was expected, it is probable that parents across all groups are experiencing heightened stress and
uncertainty due to the COVID-19 pandemic, which is not necessarily attributable to parenting a child with food allergies or asthma. The higher scores in parents of children with food allergies and asthma could have been related to increased burden of caring for a child with a chronic medical condition but differences were perhaps not statistically significant because parent stress was high across all groups.

**Hypothesis 1b**

*It was hypothesized that parents of children with food allergies and asthma would report levels of anxiety, depression, PTSD, and perceived stress that exceed normative clinical cut-off scores.*

This hypothesis was supported by the data; however, percentage of participants exceeding the clinical cutoff varied across groups and outcome measure. The majority (≥ 50%) of parents of children with food allergies and/or asthma exceeded the clinical cutoff on the SCAARED for total score, Panic/Somatic, and Separation Anxiety. For Generalized Anxiety, the majority of parents of children with food allergy and parents of children with asthma exceeded the clinical cutoff compared to a minority (48.21%) of parents of children with both food allergy and asthma. The minority (≤ 50%; range 32.36%-42.86%) of parents exceeded the clinical cutoff for Social Anxiety across all groups.

As anticipated, the majority of parents in the disease groups reported high levels of anxiety that exceeded clinical cutoffs, suggesting a critical need for intervention. Notably, fewer parents of children with food allergies and asthma met the clinical cut-off for Generalized Anxiety. It is possible that parents caring for children with multiple chronic diseases are conditioned to deal with high levels of stress and anxiety due to the nature of the child’s condition and, therefore, have a protective response in the face of global stressors, such as the
COVID-19 pandemic. Interestingly, the minority of parents across all groups met the clinical cutoff for Social Anxiety. As mentioned above, the limited social interactions inherent to COVID-19 infection control guidelines may cause less distress in this domain. However, future research should monitor social anxiety in parents as restrictions are removed and social gatherings are permitted.

For depression, the majority of parents of children with asthma met or exceeded the clinical cutoff for moderate depression (55%), compared to approximately 30% of parents of children with food allergies, parents of children with food allergies and asthma, and parents of healthy children. As noted earlier, parents of children with asthma have unique factors that may have related to elevated depression scores. It is pertinent that psychologists and allied healthcare professional address the strikingly high rate of depression in parents of asthmatic children, as such symptomology can lead to poor childhood health outcomes (Pak & Allen, 2012).

For PTSD, approximately 46% of parents of children with food allergy and parents of children with asthma exceeded the clinical cutoff, compared to parents of children with both food allergy and asthma (35%) and parents of healthy children (32%). The prevalence of PTSD symptoms in this sample is comparable to other studies sampling adults in the U.S. during the COVID-19 pandemic (Liu et al., 2020). As noted above, parents of children with multiple chronic medical conditions may have protective factors that lend themselves to better outcomes in response to a global health disaster, such as PTSD symptoms. However, high rates across all groups relative to community samples warrant immediate and targeted intervention to support parents in response to the COVID-19 pandemic.

For perceived stress, approximately 77% of parents of children with food allergies, parents of children with asthma, and parents of healthy children exceeded the clinical cutoff for
moderate stress, compared to 82% of parents of children with both food allergies and asthma. These percentages are strikingly high, suggesting parents are experiencing a low perception of their ability to adequately cope and handle stress during the COVID-19 pandemic. Interestingly, parents of children with food allergies and asthma reported higher perceived stress than parents of food allergies or asthma alone. Conversely, as previously noted, these parents met the clinical cutoff for generalized anxiety and PTSD at lower rates than parents of food allergies or asthma alone. It is possible that perceived stress is related to psychological outcomes in indirect ways, such that high levels of perceived stress may lead to higher symptomatology of some outcomes and not others. Additional research including longitudinal study designs are needed to better examine the relationships among these constructs.

Overall, the percentage of participants exceeding a clinical cutoff was variable across groups. Parents of children with both food allergies and asthma exceeded the clinical cutoff scores at a lower rate for generalized anxiety, depression, and PTSD, compared to parents of children with food allergies or asthma alone. However, parents of children with both food allergies and asthma exceeded the clinical cutoff for perceived stress at a higher rate. These data suggest that parents of children with multiple chronic conditions are experiencing the highest levels of stress, but are not reporting as impaired psychological functioning in domains of anxiety, depression, and PTSD. Although the differences observed between groups are notable, results from the current study indicate that all parents are experiencing a high level of symptomatology across domains that suggests urgent need for clinical intervention.
Hypothesis 1c

It was hypothesized that parents of children with food allergies with or without asthma would have higher distress than parents of children with asthma only (i.e., without food allergies).

This was not supported by the data. Parents of children with food allergies with or without asthma did not have significantly higher distress across outcomes. Contrary to what was hypothesized, parents of children with asthma had significantly higher depression scores than parents of healthy children and parents of children with food allergy. It is possible that parents of children with asthma were more concerned about the threat of COVID-19, due to the potentially exacerbated illness in individuals with asthma. Further, because children with asthma are more likely to have lower socioeconomic status, it is possible that these families were impacted in disproportionate ways. A recent study by Clawson et al. (2021) reported that families of children with asthma have experienced differential impacts during the COVID-19 pandemic, including greater worry about resource losses due to COVID-19 and greater child psychological distress than parents of healthy children, specifically for families that identified as BIPOC.

Hypothesis 2a

It was hypothesized that scores on the WAFA and PAAS would be significantly positively associated with the SCAARED.

This hypothesis was not supported by the data. WAFA and PAAS scores were weakly correlated ($rs .06-.09$) with the SCAARED and associations were non-significant. These results suggest that the measures used to capture symptoms related to disease-specific anxiety and broad anxiety were unrelated and likely represent separate constructs. Previous literature is mixed in regard to how disease-anxiety converges with other anxiety measures. Poehacker et al. (2020)
reported that the WAFA showed a significant moderate positive correlation with the GAD-7 ($r = .55$) and the PECI-Guilt and Worry scale ($r = .72$). In contrast, Klinnert et al. (2015) reported that food allergy-specific anxiety was not related to self-report of general anxiety in parents of children with food allergy. Bruzzese et al. (2020) did not examine correlations between the PAAS and a parent-report anxiety measure; however, the authors reported that the PAAS showed a significant moderate negative correlation with QOL.

Contrary to what was anticipated, it is possible that the heightened global anxiety that is experienced by parents during the COVID-19 pandemic takes precedence over worry related to their child’s medical condition. Further, with families spending more time at home, the anxiety associated with disease management may be decreased temporarily as parents are in more direct control of their child’s environment. It is clinically relevant that disease-specific measures were not sensitive to variation in parents’ overall global distress during the COVID-19 pandemic; thus, they should be interpreted with caution when used in clinical practice at present. Disease-specific measures may not capture distress that might interfere with adaptive disease functioning when parents are experiencing high levels of stress. It is possible that comprehensive screening of parent mental health in pediatric populations involves both disease-specific and broad measures of distress during the COVID-19 pandemic or when parents are highly distressed.

**Hypothesis 2b**

*It was hypothesized that number of food allergens and number of allergic reactions in the last 6 months would be more strongly associated with the WAFA than with the SCAARED.*

This hypothesis was not supported by the data. Associations between number of food allergens and number of allergic reactions in the last 6 months were weak, non-significant, and similar between the WAFA ($rs = .01$ to $.06$) and the SCAARED ($rs = -.03$ to $-.04$). Although
previous literature suggests that disease severity is associated with parent anxiety, disease severity is often difficult to measure and operationalize. The current study conceptualized disease severity as number of food allergens and number of allergic reactions, hypothesizing that the more food allergens and the more frequent reactions, the greater the disease burden and subsequent associated distress. It is possible that alternative disease indicators such as severity of reactions or variables such as perceived control of the child’s food allergy would be more highly associated with disease-specific anxiety measures. Alternative variables that address disease severity should be explored in future research.

**Hypothesis 2c**

*It was hypothesized that number of asthma attacks in the last 6 months would be more strongly associated with the WAFA than with the SCAARED.*

This hypothesis was supported by the data. Although the associations between number of asthma attacks in the last 6 months were weak and non-significant for both measures of anxiety, the PAAS ($r = .18$) was higher than the SCAARED ($r = .06$). Previous literature has suggested that parent-reported asthma symptom severity was significantly positively moderately correlated with scores on the PAAS (Bruzesse et al., 2011). The findings from the current study affirm the suggestion that disease characteristics are more strongly associated with disease-related anxiety than broad anxiety. However, due to the relatively weak association found in the current study, disease characteristics do not seem to be a robust predictor of parent distress. Similarly, it is possible that alternative variables better conceptualize disease severity than number of reactions, such as burden of management or parent-perceived control of asthma symptomatology.
Hypothesis 3a

*It was hypothesized that disease-specific anxiety on the WAFA and PAAS would be positively correlated with depression, PTSD, and perceived stress.*

This hypothesis was supported by the data; however, WAFA and PAAS scores were weakly, positively associated with the PHQ-9, SPRINT, and PSS-10, and associations were non-significant. It is notable that associations between disease-specific measures and broad measures of distress were weaker than expected. As noted, it could be that measures of disease-specific anxiety are not sensitive to the heightened global distress experienced by parents during the COVID-19 pandemic. That is, parents may be experiencing average to low-average levels of disease-specific distress and a moderate to high degree of global distress such as depression, PTSD, and perceived stress. This disparity may explain the relatively weak association between these constructs in the current study.

Hypothesis 4a

*It was hypothesized that parent-reported impact of the COVID-19 pandemic would be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents who are younger versus parents who are older.*

This hypothesis was not supported by the data. Hierarchical regression results revealed that parent age had a significant main effect on anxiety when controlling for COVID-19 stressors, such that older parent age predicted decreased anxiety symptoms; however, parent age did not significantly impact the association between COVID-19 stressors and anxiety. There were no significant findings for the main or interaction effect of parent age for depression or PTSD. These results suggest that parent age may play a role in parent anxiety, though the pathway to which this occurs is not by parent age moderating COVID-19 stress in this sample. It
is likely that parents who are older have more experience with the stressors related to parenting and can manage high levels of uncertainty more effectively than younger parents, leading to decreased symptoms of anxiety. Such findings suggest young parents could be vulnerable to stress and poor psychological outcomes, and they should be monitored and provided with coping resources.

**Hypothesis 4b**

*It was hypothesized that parent-reported impact of the COVID-19 pandemic would be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents of children who are younger versus older.*

This hypothesis was not supported by the data. Previous research suggests that the demands of caring for a chronically ill child vary with age, where parents have a higher burden when children are younger, which gradually declines as they age and gain more autonomy in their disease management. It was expected that parents of children who were younger would experience higher stress and demands of parenting, leading to higher symptomatology of anxiety, depression, and PTSD. The lack of results to support these findings in the current study could be due to the way we conceptualized child age. Due to the limited demographic information collected in the current study for healthy control families, the child age variable was measured as the youngest child within the home for healthy controls, or the child identified with a food allergy or asthma. This is likely a rudimentary way to operationalize and empirically test the impact of child age on parent psychopathology. Alternatively, future research should consider all children within the home, including the child or children with a chronic medical condition, to holistically conceptualize the impact of children’s ages and parent functioning.
Hypothesis 4c

It was hypothesized that parent-reported impact of the COVID-19 pandemic would be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents who report higher levels of perceived stress versus lower levels of perceived stress.

This hypothesis was partially supported by the data. Hierarchical regression results suggested a moderating effect of perceived stress on the relationship between COVID-19 stressors and depression, such that parents with high perceived stress had higher depression scores compared to parents with average or low perceived stress, and in parents with high perceived stress, more COVID-19 stressors significantly predicted higher depression scores. In contrast, depression scores were not significantly predicted by level of COVID-19 stressors in parents with average or low perceived stress.

These results suggest that perceived stress is a meaningful variable to consider in understanding the relationship between stressors and depression. It appears that regardless of the degree of COVID-19 stressors, individuals who report an average or low degree of perceived stress, indicating ability to cope well, do not seem as vulnerable to depression. Rather, participants who are reporting a high degree of perceived stress, indicating a lack of self-efficacy, are depressed and experiencing a compounding effect, such that the more stressors experienced, the more depressed they are.

Because parents who were categorized in the high perceived stress group were reporting symptoms of moderate depression, it is likely that there is a relationship between depression and one’s sense of being able to manage life stressors effectively. Further, this group may have been depressed prior to the COVID-19 pandemic, with increased stressors during the pandemic leading to worse depression. These findings suggest that during the COVID-19 pandemic,
parents with depression are an important group to monitor for depression symptomatology as well as COVID-19 stressors. Providing coping mechanisms and improving self-efficacy could be an important target to improve depression in parents of children with or without a chronic medical condition.

**Hypothesis 4d**

*It was hypothesized that parent-reported impact of the COVID-19 pandemic would be more strongly associated with increased anxiety, depression, and PTSD symptoms in parents of children with food allergies or asthma compared to parents of children without food allergies or asthma (i.e., healthy controls).*

These results were not supported by the data. Contrary to what was expected, there was no significant moderating effect of parents of healthy children compared to parents of children with food allergies and asthma on the association between COVID-19 stressors and psychological outcomes. Previous research has suggested that parents of children with chronic medical conditions may experience burden and burnout due to caring for a child with a life-threatening condition. Therefore, we expected that parents of children with food allergies and asthma would experience more anxiety, depression, and PTSD in response to the additional burden of COVID-19 stress compared to parents of healthy children. However, the results of the current study suggest that parents of children with food allergies and asthma are not significantly different from parents of healthy children in the relationship between COVID-19 stressors and psychological outcomes.

These results could be due to the nature of the variables used in the current study. Parents completed a COVID-19 stressor checklist that was created by the authors and may not have captured all stressors experienced by all groups. Further, stressor checklists were standardized
between the disease and healthy groups to allow for statistical analyses to be completed with the entire dataset. It is possible that rather than group membership moderating the relationship between COVID-19 stressors and psychological symptoms, parents of children with food allergies and asthma experience differential stressors than parents of healthy children, and these relate to psychological functioning in unique ways that are beyond the scope of this preliminary survey study.

**Limitations**

Although the current study addressed several important gaps in the literature, several limitations should be noted. Specifically, limitations related to recruitment, study design, and sample representation should be considered in interpreting and disseminating the findings of the current study. It is important to note that the data for the current study were collected via an online survey through Qualtrics. Although screening questions and validity checks were embedded into the survey content, it is impossible to ensure that participants who completed the survey met all inclusion and exclusion criteria. Specifically, participants self-identified themselves as a parent of a child with clinically diagnosed food allergy (IgE-mediated or non-IgE mediated) and asthma. Although the study could have been strengthened by recruiting samples within a medical or specialty setting where clinical diagnoses could be confirmed, the authors prioritized reaching parents in a timely and targeted fashion. Further, all non-essential research initiatives were shut down across medical centers during the early months of the COVID-19 pandemic, leaving these families largely unreachable.

Relatedly, the current sample was collected via snowball sampling on social media. Procedures included posting a brief description of the study and link to the Qualtrics survey on personal and professional social media pages (i.e., Facebook and Twitter), Eastern Michigan
University Psychology Department Facebook page, and Facebook parenting groups. Although this method allowed for the targeted sampling of specific disease populations, participant selection may be biased due to the nature of dissemination and by selecting individuals who have active social media accounts. It is inherent in snowball sampling that information is spread to friends and family who identify similarly demographically or geographically. Although the current study included a national sample of parents of children across the U.S., results should be interpreted with this in mind. Further, in an effort to capture a national sample, there was likely heterogeneity across geographic regions of the community spread of COVID-19 and mandated lockdown procedures. Although the majority of the sample reported being in a “Stay home”/“Shelter in place” order, it is likely that participants were affected by the pandemic to varying degrees.

With regard to study design, the survey was designed so that parents reported only on one child with a food allergy and/or asthma. Our data collection procedures did not allow us to differentiate families of multiple children with food allergies or asthma. This may be an important factor to consider in future research as parents of one or multiple children with chronic medical conditions may represent discrete groups. In addition, some measures used in the current study were modified by the authors to capture the acute nature of the COVID-19 pandemic and to allow for participants to select a not applicable option when survey items were not relevant during the early months of the pandemic. In practice, measure modification is not ideal as it limits external validity and comparison across studies. Although COVID-19 specific measures were not available at the time of data collection for the current study, there have since been several measures developed that are specific to the impact of COVID-19. It is encouraged that such measures are used in future research.
Lastly, the external validity of the current study is limited by the homogeneity of the sample with regard to demographic characteristics. The sample consisted of predominantly females (96.98%) who identified as White (93.21%), with a college or professional/graduate degree (87.16%), married (92.83%), and with a pre-COVID-19 household income of above $75,000 (72.45%). It is clear that the sample included in the current study is not representative of parents in the U.S. In addition, current research suggests that African American children have significantly higher rates of asthma compared to non-Hispanic White Children (AAAI, 2016). Further, disparities exist in access to care and food allergy diagnoses, such that Black and Asian children have significantly higher odds of food allergy compared to White children but significantly lower odds of having an allergy diagnosed (Gupta, 2011). The lack of representation within our sample and within the pediatric food allergy literature highlights the health disparities that exist in access to specialty care for BIPOC children and families. It is critical that future research initiatives invest in research design and recruitment strategies that represent the families for which these diseases are impacting.

**Clinical Implications and Future Directions**

This study has several implications for understanding the psychological impact of the COVID-19 pandemic on parents of children with and without food allergies and asthma. First, the study adds valuable insight into the degree of parent-reported symptoms of anxiety, depression, PTSD, and stress in a national sample of parents in the early months of the COVID-19 pandemic. It is clear that parents, regardless of their child’s health, reported elevated symptoms across standardized measures of psychopathology and were in critical need of clinical intervention. Further, parents of children with food allergies and asthma reported higher degrees of distress than parents of healthy children. Due to the ongoing nature of the pandemic, and
continued threat and burden of COVID-19, these symptoms are likely continuing, if not worsened. Parents play an integral role in promoting and maintaining child mental health, especially in response to a disaster, and parental psychopathology and distress post-disaster predict children’s distress (Cobham et al., 2016). Parents should continue to be monitored closely and population level strategies to support caregivers is critical as the pandemic continues to support child, parent, and family mental health. Further, medical clinics that treat children with food allergies and asthma should monitor symptoms of parent distress closely, have procedures to screen for COVID-19 related stressors, and processes to refer parents for clinical interventions.

The current study also provides valuable insight into the potential lack of sensitivity of disease-specific measures to capture global parent distress. It has been suggested that disease-specific measures of anxiety are more sensitive to the experiences of particular disease groups; however, findings are mixed in how these measures relate to overall global outcomes. The results of the current study shed light on the potential lack of association between disease-specific and global levels of distress among parents of children with food allergies and asthma during the COVID-19 pandemic. Future research must continue to explore the disease-specific and global constructs of anxiety to determine if this lack of association is specific to the conditions of the COVID-19 pandemic. These findings will influence the development and effectiveness of clinical interventions in pediatric populations. It is possible that best practice in screening for parental distress involves both disease-specific and broad measure of psychosocial functioning if the parent is experiencing high levels of distress outside of their child’s disease management. Further, the disease indicators in the current study were weakly correlated with disease-specific
anxiety, suggesting that the way we currently conceptualize disease severity is not a robust predictor of distress and other variables should be considered.

Lastly, the current study adds insight into the role of perceived stress in the association between parent-reported stressors and depression. The current study reveals that one’s perceived ability to effectively manage life stressors may play a meaningful role in their experience of symptoms of depression. Interventions addressing self-efficacy and teaching of coping skills may benefit individuals who are experiencing depression in the context of multiple stressors to improve overall mental health. The findings of the current study also suggest that parents of children with asthma are at greater risk for depression during the COVID-19 pandemic and should be monitored closely.
Conclusions

The current study represents a national sample of parents of children with and without food allergies and asthma during the early months of the COVID-19 pandemic in the U.S. Parents of children with asthma and food allergies are experiencing heightened anxiety, depression, PTSD, and perceived stress compared to parents of healthy children. Specifically, parents of children with food allergies and asthma reported significantly higher Panic/Somatic and Separation Anxiety, and parents of children with asthma reported significantly higher depression compared to a control group of parents of healthy children. Additionally, contrary to what was hypothesized, disease-specific anxiety did not relate to broad measures of anxiety, suggesting that disease-specific anxiety may not be as salient during the COVID-19 pandemic and represents a discrete construct compared to global anxiety. Further, a moderation effect of perceived stress was found between COVID-19 stressors and depression such that more COVID-19 stressors worsen depression symptoms in parents who report high levels of perceived stress, but does not worsen depression in those who report average or low levels of perceived stress. These results suggest a critical need for distress screening and clinical intervention for parents of children with food allergies and asthma and ongoing monitoring of parent distress during and following the COVID-19 pandemic.
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APPENDICES
Appendix A: IRB Approval

Eastern Michigan University

University Human Subjects Review Committee

Apr 10, 2020 5:09 PM EDT

Catherine Peterson
Psychology

Re: Exempt - Initial - UHSRC-FY19-20-255 Psychosocial impact of COVID-19 on parents managing pediatric food allergies and asthma

Dear Dr. Catherine Peterson:

The Eastern Michigan University Human Subjects Review Committee has rendered the decision below for Psychosocial impact of COVID-19 on parents managing pediatric food allergies and asthma. You may begin your research.

Decision: Exempt

Selected Category: Category 2.b) Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording). The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

Renewals: Exempt studies do not need to be renewed. When the project is completed, please contact human.subjects@emich.edu.

Modifications: Any plan to alter the study design or any study documents must be reviewed to determine if the Exempt decision changes. You must submit a modification request application in Cayuse IRB and await a decision prior to implementation.

Problems: Any deviations from the study protocol, unanticipated problems, adverse events, subject complaints, or other problems that may affect the risk to human subjects must be reported to the UHSRC. Complete an incident report in Cayuse IRB.

Follow-up: Please contact the UHSRC when your project is complete.

Please contact human.subjects@emich.edu with any questions or concerns.

Sincerely,

Eastern Michigan University Human Subjects Review Committee
Appendix B: COVID-19 Impact and Stressor Checklists

Which of the following best describes the impact of COVID-19 on you and your community (check all that apply):
- I have tested positive for COVID-19 and am in quarantine/isolation
- Someone in my family has tested positive for COVID-19, so our family is in quarantine/isolation
- Someone in our home is suspected of having COVID-19, so our family is in quarantine/isolation as a precaution
- I am a frontline/essential worker at high risk of exposure, so our family is in quarantine/isolation
- Another adult in our home is a frontline/essential worker at high risk of exposure, so our family is in quarantine/isolation
- Our community is under a “Stay home”/”Shelter in place” order
- There have been confirmed cases in our community
- There have not been any confirmed cases in our community, but confirmed in our state
- Don’t know/Not sure how to answer
- Other (please specify)

We hope to learn more about what may be stressful for families at this time. Please think about stressors you may have experienced in the last 2 weeks due to COVID-19. Please check all that apply to you.
- Furloughed/Loss of employment
- Reduced hours/income
- Loss of health insurance
- Difficulty filing for unemployment
- Not knowing if I can pay my bills/rent
- Trying to work remotely/from home
- Stress about homeschooling children
- Loss of childcare
- Worry about extended family members/friends that we cannot see
- Difficulty accessing mental health resources for myself
- Difficulty accessing mental health resources for my family members
- Difficulty accessing medical care for myself
- Difficulty accessing medical care for my family members (healthy group only)
- Difficulty accessing my child’s medical providers (food allergy and asthma group only)
- Difficulty affording food for my family (healthy group only)
- Difficulty affording food for my family, including my child with allergies or asthma (food allergy and asthma group only)
- Difficulty finding safe foods for my child’s food allergy due to availability in our community (food allergy and asthma group only)
- Safe foods for my child’s food allergy not lasting (food allergy and asthma group only)
- Not having money to buy more safe foods for my child’s food allergy (food allergy and asthma group only)
- Difficulty finding medications (e.g., inhalers, injectable epinephrine) due to availability in our community (food allergy and asthma group only)
- Fear of a reaction (e.g., allergy or asthma) sending my child to the emergency department (food allergy and asthma group only)
- Confusion about illness management guidelines (e.g., confusion about how to treat an asthma attack or allergic reaction) (food allergy and asthma group only)
- Other (please specify)
Appendix C: Screen for Adult Anxiety Related Disorders (SCAARED)

Directions: Below is a list of sentences that describe how people feel. Read each phrase and decide if it is “Not True or Hardly Ever True” or “Somewhat True or Sometimes True” or “Very True or Often True” for you. Then, for each sentence, check the box that corresponds to the response that seems to describe you now or in the past week.

0 = Not true of hardly ever true
1 = Somewhat true or sometimes true
2 = Very true or often true

1. When I feel nervous, it is hard for me to breathe.
2. I get headaches when I am at school, at work or in public places.
3. I don’t like to be with people I don’t know well.
4. I get nervous if I sleep away from home.
5. I worry about people liking me.
6. When I get anxious, I feel like passing out.
7. I am nervous.
8. It is hard for me to stop worrying.
9. People tell me that I look nervous.
10. I feel nervous with people I don’t know well.
11. I get stomach aches at school, at work, or in public places.
12. When I get anxious, I feel like I’m going crazy.
13. I worry about sleeping alone.
14. I worry about being as good as other people.
15. When I get anxious, I feel like things are not real.
16. I have nightmares about something bad happening to my family.
17. I worry about going to work or school, or to public places.
18. When I get anxious, my heart beats fast.
19. I get shaky.
20. I have nightmares about something bad happening to me.
21. I worry about things working out for me.
22. When I get anxious, I sweat a lot.
23. I am a worrier.
24. When I worry a lot, I have trouble sleeping.
25. I get really frightened for no reason at all.
26. I am afraid to be alone in the house.
27. It is hard for me to talk with people I don’t know well.
28. When I get anxious, I feel like I’m choking.
29. People tell me that I worry too much.
30. I don’t like to be away from my family.
31. When I worry a lot, I feel restless.
32. I am afraid of having anxiety (or panic) attacks.
33. I worry that something bad might happen to my family.
34. I feel shy with people I don’t know well.
35. I worry about what is going to happen in the future.
36. When I get anxious, I feel like throwing up.
37. I worry about how well I do things.
38. I am afraid to go outside or to crowded places by myself.
39. I worry about things that have already happened.
40. When I get anxious, I feel dizzy.
41. I feel nervous when I am with other people and I have to do something while they watch me (for example: speak, play a sport).
42. I feel nervous when I go to parties, dances, or any place where there will be people that I don’t know well.
43. I am shy.
44. When I worry a lot, I feel irritable.
Appendix D: Patient Health Questionnaire (PHQ-9)

Directions: Over the last 2 weeks, how often have you been bothered by any of the following problems?

0 = Not at all  
1 = Several days  
2 = More than half the days  
3 = Nearly every day

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless
3. Trouble falling or staying asleep, or sleeping too much
4. Feeling tired or having little energy
5. Poor appetite or overeating
6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down
7. Trouble concentrating on things, such as reading the newspaper or watching television
8. Moving or speaking so slowly that other people could have noticed. Or, the opposite - being so fidgety or restless that you have been moving around a lot more than usual
9. Thoughts that you would be better off dead or of hurting yourself
10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?
Appendix E: Short PTSD Rating Instrument Self Rated (SPRINT-SR)

Directions: Please think about the COVID-19 pandemic and the shutdown/quarantine, or any other consequences that you’ve experienced as a result of COVID-19. Some people might consider this a stressful or even traumatic experience. For each item, please select the one response that best describes how you have felt in the past week.

0 = Not at all
1 = A little bit
2 = Moderately
3 = Quite a lot
4 = Very much

1. How much have you been bothered by unwanted memories, nightmares, or reminders of the event?
2. How much effort have you made to avoid thinking or talking about the event, or doing things which remind you of what happened?
3. To what extent have you lost enjoyment for things, kept your distance from people, or found it difficult to experience feelings?
4. How much have you been bothered by poor sleep, poor concentration, jumpiness, irritability, or feeling watchful around you?
5. How much have you been bothered by pain, aches, or tiredness?
6. How much would you get upset when stressful events or setbacks happen to you?
7. How much have the above symptoms interfered with your ability to work or carry out daily activities?
8. How much have the above symptoms interfered with your relationships with family or friends?
Appendix F: Perceived Stress Scale (PSS-10)

Directions: Please respond to each question or statement by marking one circle per row. In the past month...

1 = Never
2 = Almost never
3 = Sometimes
4 = Fairly often
5 = Often

1. How often have you been upset because of something that happened unexpectedly?
2. How often have you felt that you were unable to control the important things in your life?
3. How often have you felt nervous and “stressed”?
4. How often have you felt confident about your ability to handle your personal problems?
5. How often have you felt that things were going your way?
6. How often have you found that you could not cope with all the things that you had to do?
7. How often have you been able to control irritations in your life?
8. How often have you felt that you were on top of things?
9. How often have you been angered because of things that happened that were outside of your control?
10. How often have you felt difficulties were piling up so high that you could not overcome them?
Appendix G: Worry About Food Allergy Parent-Report (WAFA-P)

**WAFA-P-Preschool (ages 0-5)**
Directions: Thinking about the past month, please select from the following options to indicate how often you have worried or become nervous about each item.

0 = Never
1 = Once a month
2 = Once a week
3 = A few times a week
4 = Every day
5 = Not applicable right now

In the last month, how often did you become nervous or worried about:
1. the possibility of your child having a food allergy reaction?
2. carrying your child’s emergency medication?
3. your child not receiving emergency medicine to treat a food allergy reaction when needed?
4. your child dying because of a food allergy reaction?
5. what others will think of your child when they have a food allergy reaction?
6. pain your child might experience from using an epinephrine auto-injector?
7. possible side effects of your child’s epinephrine auto-injector?
8. your child experiencing the administration of self-injectable epinephrine as traumatic?
9. your family having to miss out on social activities because of your child’s food allergy?
10. your child having to miss out on social activities because of their food allergy?
11. your child feeling different from other kids because of their food allergy?
12. other adults/caregivers (e.g., sitters, family members, teachers, etc.) helping your child when they have a food allergy reaction?
13. having only safe food offered by other adults/caregivers?
14. your child becoming allergic to additional foods?
15. your child trying new foods?
16. your child’s food allergy symptoms or reactions getting worse?
17. others understanding when you explain your child’s food allergy?
18. your child being bullied or teased about their food allergy?
19. your child having a food allergy reaction while traveling?
20. your child having to undergo medical procedures (e.g., skin prick testing, oral food challenges)?
21. the financial cost of allergy management (e.g., cost of epinephrine auto-injector, safe foods, medical testing, etc.)?
22. recognizing if your child is having a food allergy reaction?

**WAFA-P-Child (ages 6-11)**
Directions: Thinking about the past month, please select from the following options indicate how often you have worried or become nervous about each item.

0 = Never
1 = Once a month
In the last month, how often did you become nervous or worried about:

1. ...the possibility of your child having a food allergy reaction?
2. ...carrying or having your child carry their emergency medication?
3. ...your child not receiving emergency medicine to treat a food allergy reaction when needed?
4. ...your child dying because of a food allergy reaction?
5. ...what others will think of your child when they have a food allergy reaction?
6. ...pain your child might experience from using an epinephrine auto-injector?
7. ...possible side effects of your child’s epinephrine auto-injector?
8. ...your child experiencing the administration of self-injectable epinephrine as traumatic?
9. ...your child missing school activities because of their food allergy?
10. ...your family having to miss out on social activities because of your child’s food allergy?
11. ...your child having to miss out on social activities because of their food allergy?
12. ...your child feeling different from other kids because of their food allergy?
13. ...your child being able to manage a food allergy reaction independently (e.g., self-administer epinephrine auto-injector or seek help from others to manage a food allergy reaction)?
14. ...your child making safe food choices without your help (e.g., if they were with friends or at school and you weren’t there)?
15. ...your child becoming allergic to additional foods?
16. ...your child trying new foods?
17. ...your child’s food allergy symptoms or reactions getting worse?
18. ...your child needing to explain food allergy to other people without your help?
19. ...others understanding when you explain your child’s food allergy?
20. ...your child being bullied or teased about their food allergy?
21. ...your child having a food allergy reaction while traveling?
22. ...your child having to undergo medical procedures (e.g., skin prick testing, oral food challenges)?
23. ...the financial cost of allergy management (e.g., cost of epinephrine auto-injector, safe foods, medical testing, etc.)?
24. ...your child being able to accurately assess their risk of food allergy on their own?

**WAFA-P-Teen (ages 12-17)**

Directions: Thinking about the past month, please select from the following options to indicate how often you have worried or become nervous about each item.

0 = Never
1 = Once a month
2 = Once a week
3 = A few times a week
4 = Every day
5 = Not applicable right now
In the last month, how often did you become nervous or worried about:
1. …the possibility of your teen having a food allergy reaction?
2. …your teen carrying their emergency medication?
3. …your teen not receiving emergency medicine to treat a food allergy reaction when needed?
4. …your teen dying because of a food allergy reaction?
5. …what others will think of your teen when they have a food allergy reaction?
6. …pain your teen might experience from using an epinephrine auto-injector?
7. …possible side effects of your teen’s epinephrine auto-injector?
8. …your teen experiencing the administration of self-injectable epinephrine as traumatic?
9. …your teen missing school activities because of their food allergy?
10. …your family having to miss out on social activities because of your teen’s food allergy?
11. …your teen having to miss out on social activities because of their food allergy?
12. …your teen feeling different from other teens because of their food allergy?
13. …your teen being able to manage a food allergy reaction independently (e.g., self-administer epinephrine auto-injector or seek help from others to manage an allergic reaction)?
14. …your teen making safe food choices without your help (e.g., if they were with friends or at school and you weren’t there)?
15. …your teen becoming allergic to additional foods?
16. …your teen trying new foods?
17. …your teen’s food allergy symptoms or reactions getting worse?
18. …your teen needing to explain food allergy to other people without your help?
19. …others understanding when you explain your teen’s food allergy?
20. …your teen being bullied or teased about their food allergy?
21. …your teen having a food allergy reaction while traveling?
22. …your teen having to undergo medical procedures (e.g., skin prick testing, oral food challenges)?
23. …the financial cost of allergy management (e.g., cost of epinephrine auto-injector, safe foods, medical testing, etc.)?
24. …your teen’s risk of a food allergy reaction if they experiment with alcohol or drugs?
25. …your teen’s risk of a food allergy reaction from kissing someone or other intimate physical contact?
26. …your teen missing extracurricular activities or sports because of their food allergy?
27. …your teen being able to accurately assess their risk of food allergy on their own?
Appendix H: Parent Asthma-Related Anxiety Scale (PAAS)

Directions: Below is a list of sentences that describe how some parents feel. Read each phrase and decide how often it happened to you over the last 2 weeks. Check never, hardly ever, sometimes, often, most of the time, always, or not applicable right now.

In the last 2 weeks, how often did you become nervous or worried about:

0 = Never
1 = Hardly ever
2 = Sometimes
3 = Often
4 = Most of the time
5 = Always
6 = Not applicable right now

1. Your child having an asthma attack out of the blue and without warning?
2. Your child having an asthma attack and not having his/her asthma medicine?
3. Your child having an asthma attack when you are not there?
4. Your child knowing how to manage an asthma attack without you?
5. Your child dying because of asthma?
6. What your child’s friends think if your child has asthma symptoms in front of them?
7. The side effects of asthma medicine (side effects are problems the asthma medicine might cause)?
8. Your child missing school because of asthma?
9. Your child keeping up with other kids because of asthma?
10. Your child having an asthma attack when doing physical activity like sports, dancing, or exercise?
11. Your child not doing well in sports or dancing because of asthma?