



Children and Adolescents with Disabilities and Exposure to Disasters, Terrorism, and the COVID-19 Pandemic: a Scoping Review

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Abstract

Purpose of Review This paper reviews the empirical literature on exposures to disaster or terrorism and their impacts on the health and well-being of children with disabilities and their families since the last published update in 2017. We also review the literature on studies examining the mental health and functioning of children with disabilities during the COVID-19 pandemic.

Recent Findings Few studies have examined the effects of disaster or terrorism on children with disabilities. Research shows that children with disabilities and their families have higher levels of disaster exposure, lower levels of disaster preparedness, and less recovery support due to longstanding discriminatory practices. Similarly, many reports of the COVID-19 pandemic have documented its negative and disproportionate impacts on children with disabilities and their families.

Summary In the setting of climate change, environmental disasters are expected to increase in frequency and severity. Future studies identifying mitigating factors to disasters, including COVID-19; increasing preparedness on an individual, community, and global level; and evaluating post-disaster trauma-informed treatment practices are imperative to support the health and well-being of children with disabilities and their families.

Keywords Disaster · COVID-19 · Pandemic · Children · Disabilities · Terrorism · Trauma · Mental health

Introduction

Disability, as an umbrella term, affects an individual's participation in activities of daily living due to multiple factors, including differences in motor, sensory, cognitive, language, emotion, or health and usually requires therapeutic services [1, 2]. Globally, the World Health Organization's report on

disability showed that over one billion of the world's population (15%) live with some form of disability, of whom 2 to 4% experience significant difficulties in functioning [3]. Approximately 10% of children (200 million children) live with a disability [4] and individuals with disabilities make up 20% of the poorest people in the world [5]. In the USA, the prevalence of developmental disability among children has increased over the past decade. In comparison to data from 2009 to 2011, the prevalence rates of any developmental disability, attention-deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD), and intellectual disability have increased in 2015–2017 [6].

Disasters have biological, behavioral, social, and environmental consequences that may interact and influence the health and well-being of children with disabilities. Natural disasters are significant adverse events resulting from natural processes of the earth, including floods, volcanic eruptions, earthquakes, hurricanes, tsunamis, monsoons, avalanches, blizzards, cyclones, heat waves, tornados, wildfires, mudslides, and epidemics. Manmade disasters are defined as major adverse events created by humans, including war, chemical spills, radiation disasters, shootings, and terrorism.

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Both natural and manmade disasters result in displacement of children and families. From 2008 to 2012, about 143.9 million individuals around the world were displaced by natural disasters [7]. Globally, almost 33 million children were forcibly displaced at the end of 2019, including child refugees, asylum-seeking children, and children displaced within their own country by violence and conflict. Another 2.1 million more children lived in internal displacement due to natural disasters [8].

The COVID-19 pandemic, one type of disaster, spread worldwide in late December 2019 leading the World Health Organization (WHO) to list the COVID-19 pandemic as a “Public Health Emergency of International Concern” on January 30, 2020 [9]. As of the time this is being written, globally the number of confirmed cases and deaths attributed to COVID-19 has reached over 200 million and 4 million individuals, respectively [10]. To limit the COVID-19 outbreak and decrease the rapid spread of the virus in communities, governments instituted stay at home orders and social distancing measures and enacted nationwide and/or localized lockdowns, travel restrictions, and limitations on transportation and industry. In addition to the economic consequences, this resulted in significant disruptions to daily life for children and families, including shifting to remote and home-based learning and disruption of medical care [11].

Despite the complex problems of children with disabilities and the concern of rapid changes in climate around the world leading to increases in frequency and magnitude of global disasters [12], few studies have characterized their needs during and after disasters. In contrast, many reports have documented the impacts of the COVID-19 pandemic on children with disabilities and their families. In this paper, we present a scoping review of the literature on the effects of natural disasters and terrorism since 2015 as well as the effects of the COVID-19 pandemic on children with disabilities and their families. The primary outcomes of interest include child mental health, behavior, and functioning, and the secondary outcomes include vulnerability, physical health, parenting stress, and disaster preparedness. We also identify knowledge gaps to inform planning and interventions for children with disabilities in the context of disasters and terrorism.

Methods

We reviewed articles in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) guidelines [13] and included experimental, observational, and qualitative studies as well as reviews published since 2015. We excluded case reports, case studies, opinions, editorials, commentaries, letters, and conference abstracts. We searched

PubMed, APA PsycInfo, and Google Scholar and restricted the search to studies among children 0–17 years with disabilities that were published in English from 1/01/2015 to 7/6/2021 using MeSH/Index terms and included those terms in a Title/Abstract search to capture the most recently published articles (see [Supplement](#) for search strategy.) The search of disaster- and terrorism-related terms identified 163 results; we removed 12 duplicates, which left 151 unique citations. We excluded articles, based on title/abstract screening ($n = 102$), pertaining to adults, non-English articles, book references, and editorial reply articles. We retrieved 49 full-text articles, 15 of which met the inclusion criteria. Three themes were identified: vulnerability to disasters ($n = 3$), children’s well-being ($n = 1$), and disaster preparedness ($n = 11$). We did not identify any reports of terrorism that discussed children with disabilities.

A separate search for the effects of the COVID-19 pandemic among children with disabilities was conducted (described in [Supplement](#)). The search identified 347 results; we removed 21 duplicates, which left 326 unique citations. We again excluded articles based on title/abstract screening ($n = 138$) pertaining to adults, COVID-related disabilities, non-English articles, book references, case reports, commentaries, and editorial articles ($n = 138$). We retrieved 188 full-text articles, 67 of which met the inclusion criteria. Five themes were identified: (1) vulnerability to COVID-19 ($n = 8$), (2) child mental health, behavior and functioning ($n = 33$), parental mental health ($n = 11$), and (4) interventions ($n = 15$).

Natural Disasters and Terrorism

Vulnerability Among Children with Disabilities

Children and adolescents with disabilities are uniquely vulnerable to exposure to disasters and are at heightened risk for negative health outcomes during and after disasters because of mobility challenges, language impairment, executive functioning difficulties (such as planning, initiating and carrying out goal directed behavior), sensory difficulties, medical conditions, and other trauma exposure and/or difficulties with intellectual functioning and adaptive behavior [14••]. Children with ASD, for example, have sensory processing challenges, including heightened sensitivity to light, sounds, odors, tastes, and touch, that predispose them to more difficulty with coping during disasters [14••, 15•]. Cognitive rigidity and difficulties with shifting focus, which are common features of ASD, may also impair how children with ASD adapt to traumatic events [16••]. Approximately 40% of children with ASD have co-existing anxiety disorders, in addition to difficulties with emotional regulation and coping skills, and thus are vulnerable to the effects of elevated

levels of stress after exposures to traumatic events [17]. In addition, children with chronic illnesses, who use medical equipment and services that require a functioning electrical power grid, are at significantly higher risk for poor outcomes after disasters. For example, children with asthma, diabetes, or chronic kidney disease require nebulizer treatments, blood sugar monitoring, and dialysis, respectively, and may have worsening of their illnesses after disasters due to infrastructure destruction.

Children with disabilities frequently have other underlying medical conditions, such as seizures, obesity, lung disease, hematological disorders, and prematurity, which were shown to increase risk for illness during the 2009 novel influenza A (H1N1) pandemic. A retrospective electronic medical record review of 696 children who presented to Texas Children's Hospital's emergency department from 2009 to 2010 showed that the H1N1 pandemic virus disproportionately affected children, especially those with pre-existing health conditions [18]. Additional research shows that children with seizure disorders have increased vulnerability to poor outcomes because of disaster-related disruption to health systems, including access to medication [19].

A prior history of chronic stress also affects children's ability to cope with traumatic events such as disasters, resulting in adverse health outcomes [20]. Children with disabilities experience more intra- and extra-familial abuse and neglect than typically developing children because of their dependence on others, social isolation, and family stress [14••]. Studies report that youth with intellectual and developmental disabilities are 1.5 to over 3 times more likely to be maltreated than their peers [21–23]. Kerns et al. showed that children with ASD experience more adverse childhood events (ACEs) than children without ASD, which was even higher among low-income families [17]. In addition, as children with disabilities rely on parents before, during, and after disasters, parental exposure to disasters and their response influence the effects of the disaster on the child. Studies have found that parents of children with disabilities report greater parenting stress than parents of other children and may feel overwhelmed by meeting the needs of their children post-disaster [14••].

In addition to individual factors, disability prevalence is estimated to be higher in impoverished communities. Families of children with disabilities living in these communities experience increased financial burden due to the high costs of care (for therapies and specialized equipment, home adaptation, and medical care) [24] and are at higher risk of poverty, material hardship (including food insecurity, housing instability and poor quality, healthcare access), lower levels of educational attainment, and lower levels of maternal employment in the USA across the child's lifespan [24–27]. Preexisting structural and racism factors also create and widen disparities in terms of children with disabilities'

health and functioning after disasters [28, 29]. For example, communities of color have higher risk of flooding because homes are frequently built on cheaper land in historically segregated areas and flood risk has been systematically underestimated by the Federal Emergency Management Agency in these communities [30–32]. Limited resources can substantially compromise families' ability to evacuate during floods and other types of disasters, especially when little notice is provided.

Children's Mental Health

The mental health of children with disabilities is reported to be negatively impacted after disasters, but it has not been well-studied [14••]. Two years after the 2010 earthquake in Haiti, Danquah et al. examined the prevalence of disability and service needs in the Port-au-Prince region in Haiti [33]. Children with disabilities were less likely to be currently enrolled at school compared to other children and more likely to report activity limitations and participation restrictions [33]. The study also found that children with disabilities had significantly lower quality of life across factors such as emotional and social functioning, physical health, and school functioning, and they experienced more prejudice or discrimination than other children [33]. However, one notable limitation of this study is that it did not identify if disabilities among children existed before the earthquake and if there was a differential impact on these children.

Disaster Preparedness

Disaster planning mitigates some of the negative effects of disasters, but studies have found that households with individuals with disabilities are less likely to be prepared [14••]. Toor et al. studied 52 children with chronic illnesses who relied on home parenteral nutrition (requiring electrically powered infusion pumps and refrigeration) for hydration and nutrition [34]. They found that over 60% of families did not have a disaster emergency plan in place and over 40% lacked a basic emergency supply kit. By providing individualized disaster plans and survival toolkits, these investigators showed improvement in disaster preparedness and confidence level of families with children who were dependent on parenteral feeds [34]. Similarly, Chin et al. surveyed families of children with behavioral and sensory impairments and found that 85% of families did not have a written communication plan, 40% did not have a three-day emergency kit, and 65% did not have a copy of their child's medical emergency plan [35]. Families reported barriers to planning, including coping with disability, poor communication, difficulty with knowledge acquisition, social-cognitive factors, and external factors. A study that surveyed 161 children and adults with developmental disabilities and epilepsy 10 months after the 2011 Great East Japan Earthquake

found that 68% of participants had 7 days or less of stockpiled medication when the earthquake initially struck, and 29% had no or almost no medication during the acute phase after the disaster [19]. Twenty months after the earthquake, 77% of participants reported stockpiling medication for more than 7 days [19]. Wolf-Fordham et al. conducted an online survey of 314 caregivers of children with developmental disabilities (birth to 21 years of age) to assess their emergency preparedness knowledge and barriers. Parents were surveyed regarding the following: making plans, stockpiling and/or gathering information, holding a family emergency preparedness discussion, developing and practicing a written emergency plan, developing an emergency medical information sheet, knowledge of a public emergency shelter location and accessibility, familiarity and previous interaction with local emergency resources, and disaster planning with schools. They reported that while most participants reported “somewhat” to “moderate” levels of being well prepared, they had taken fewer than half of the recommended 11 action steps and expressed a need for training in preparedness support [36••].

Studies have found that sociodemographic backgrounds influence disaster preparedness, with people of color having higher likelihood of discussing alternative meeting locations in case of disaster, but lower likelihood to store resource-based items [37–39]. Lower rates of disaster preparedness (42.7%) were identified among lower-income Latino populations compared to non-Latino Whites (56.6%) [37]. Structural factors and societal stigma also lead to limited access to critical resources and psycho-social supports [40••, 41]. In the US, studies on distribution of recovery assistance post-disaster showed that households with individuals with disabilities and lower-socioeconomic status receive less assistance from government agencies, non-governmental organizations, social networks, and private businesses [42, 43].

Few studies have described optimal methods of disaster communication tailored for families with children with disabilities [44]. Studies have found, however, that interventions both in intensive care units and medical home settings increase family disaster knowledge and preparedness [45–47]. The medical home, in particular, has been described as key in championing disaster preparedness by providing emergency planning support and customizing communication plans, evacuation plans, and other important preparedness activities and collaborating with emergency response organizations [44].

COVID-19 Pandemic

Vulnerability Among Children with Disabilities

The pandemic has widened long-established structural inequities that have been affecting some groups more than others,

including persons of color, from low-income households, and with disabilities [48•]. Children in the poorest areas and with underlying vulnerabilities have experienced the worst effects of the COVID-19 pandemic due to food scarcity, housing insecurity, and lack of access to healthcare [49, 50]. As children with disabilities are more likely to be of color and from low-income households, they are at higher risk for experiencing loss of caregivers and family members during the pandemic and trauma-related conditions subsequently.

In addition to the aforementioned vulnerabilities during disaster situations, children with disabilities, who already experience poorer health and well-being, have been shown to be at higher risk for COVID-19 infections and subsequent poor outcomes [51••, 52••]. Using data from a global network of electronic medical records from 42 healthcare organizations representing hospitals, primary care, and specialty treatment providers, Turk et al. found that individuals with intellectual and developmental disabilities had higher prevalence of comorbidities (endocrine, respiratory, and pulmonary) associated with poorer COVID-19 outcomes, including higher case fatality rates at younger ages [51••].

The COVID-19 pandemic-related disruptions to all aspects of life have created additional barriers for children with disabilities including their ability to access usual medical care (e.g., Botox injections for spasticity among children with cerebral palsy), therapies, medical supplies or assistive technologies for activities of daily living, and mental health screening and treatment. For example, Gordon et al. found that among 45 children (mean age 7.7 years) with cochlear implants, the pandemic lockdowns and the resulting closures of schools and nonessential businesses were associated with an approximately 10% decrease in access to speech in their environments as they did not attend in-person school [53]. Children at risk for and with hearing loss who experience a prolonged wait for screening and treatment are likely to have significant delays in language acquisition, leading specialists to advocate that hearing screens and cochlear implants be considered an essential service during the pandemic [54, 55].

Social distancing and isolation measures that were implemented have affected both adult and child mental health [56•, 57]. This additional burden was greater for children with disabilities, such as intellectual disabilities and ASD, due to difficulties related to understanding, communicating, and coping with such changes [58]. School closures and social distancing resulted in many children with disabilities stopping crucial services and therapies, decreasing class attendance, and interrupting social relationships, academic, and work routines [59, 60••, 61–65, 66•, 67•, 68••]. Additionally, studies reported alterations of sleep patterns [61, 66•, 67•, 69–74], eating habits [66•, 67•, 75], and decreased physical activity [67•, 76] among children with disabilities during this time. Child welfare agencies also

described decreases in reports of child abuse/neglect, likely due to fewer opportunities for identification posed by school closures, lockdowns, and social distancing [77].

As raising children with disabilities is stressful under routine conditions, the additional responsibilities of remote learning, including creating structure and organization, coordinating with teachers and school personnel, home and work demands, and supporting children's emotions and behaviors, contributed to significant additional burden for these families [63, 66•, 67•, 68••, 73, 78–89]. Studies have shown that stress is buffered by social support [90, 91] (including professional support, respite, assistance from family or friends), and as a result of the social distancing and isolation measures implemented during pandemic, many families of children with disabilities experienced heightened stress with minimal aid [68••, 81, 83, 84, 86, 87, 92–96].

Child Mental Health, Behavior, and Functioning

Existing COVID-19 research generally supports the negative effects of pandemic-related restrictions on both typically developing children and on children with disabilities and their family members. A nationally representative study in the US found that 14% of parents reported worsening mental health for their children and 27% of parents reported worsening mental health for themselves [97••]. The majority of studies examining the mental health of children with disabilities during the pandemic identified deleterious outcomes among children with ADHD [65, 67•, 98, 99, 100••], ASD [66•, 67•, 79, 80], intellectual disability [101], physical disabilities [82, 89], Tourette's syndrome [67•, 72], hearing loss [102], anxiety and obsessive-compulsive disorder (OCD) [67•, 103], specific learning difficulties [74], and with two or more disabilities [104]. A few reports noted improvement in mental health and behavior among some children with disabilities, likely due to the removal of demands and external stressors [64, 66•, 105]. Melegari et al. found differences in emotional/mood symptoms and behaviors among children with ADHD with different severity symptoms; children with mild symptoms of ADHD before the pandemic significantly worsened in emotional/mood symptoms during the lockdown while participants with moderate and severe symptoms of ADHD showed some improvement during the lockdown [99]. Graziola et al. reported decreases in tics among study participants with Tourette's syndrome and chronic tic disorder but noted an increase in anxiety symptoms [72]. In a large cross-sectional study of 241 children with ADHD in China, Zhang et al. found that 54–67% of parents reported worsening of children's focus, anger, and ability to maintain routines during the COVID-19 pandemic [98]. Masi et al., who surveyed 302 caregivers of children with developmental disabilities or mental health conditions (mean age 9.7 years), found that overall 64.5% of respondents reported worsening

of symptoms related to their condition and 76.9% reported child health and well-being was impacted by COVID-19 [67•].

Children with disabilities were reported to have declines in their behavior, sleep, and functioning during the pandemic [66•, 79, 80, 106–109]. Of note, Colizzi et al., who investigated the impact of the COVID-19 pandemic on 527 children with ASD, reported that 94% of families felt it was a challenging time and approximately 41% and 35% of the children were reported to have increases in the frequency and intensity of behavioral problems, respectively [79]. Only 1.5% of participants required a visit to emergency care, but 19% of parents needed to contact their child neuropsychiatrist [79]. Nuñez et al. surveyed 152 parents of children with ASD between August and October 2020 and found that of the 118 parents of children and adolescents with ASD (median age 6 years) followed at a health network in Santiago, Chile, 45% of parents reported that their children's behavioral difficulties increased in intensity or frequency; children with a family member hospitalized with COVID-19 or parental mental health problems had a higher risk for behavioral challenges [110]. Latzer et al. conducted a qualitative assessment of 31 parents of 25 children with ASD in April 2020 in Israel and found that parents reported both worsened and improved behaviors in their children. Parents also noted that children with high severity levels of ASD did not fully comprehend the situation they were in and reacted to the physical changes that occurred; in contrast, those with lower severity levels showed interest in the pandemic [66•].

Children with epilepsy and neurocognitive comorbidities [106, 109] and Prader-Willi syndrome [107] were more likely to exhibit behavioral problems, especially externalizing problems. Children with Prader-Willi syndrome had increased temper outbursts (51.7%), sadness (43.8%), anxiety (38.2%), irritability (55%), and more food seeking behavior (38.2%) [107].

Studies also found worsening sleep problems among children with ASD, ADHD, Fragile X, epilepsy, and cerebral palsy [61, 66•, 68••, 69–71, 79, 82, 106, 110]. Among children with ASD, worsening sleep behaviors were associated with greater ASD symptom severity scores and living in single parent households [69]. Mothers of children with Fragile X reported a worsening of sleep difficulties, with increases in time to fall asleep and frequency of night awakenings [61]. Trivisano et al. conducted an online survey of 3,321 parents of children with epilepsy in Italy and found that sleep problems worsened in 17.0% of children [106].

In terms of functioning, Becker et al. highlighted disparities in remote learning among 238 adolescents aged 15–17 years in 9th through 11th grades with and without ADHD recruited from local schools across two sites in the Southeastern and Midwestern United States in May to June 2020 [60••]. Adolescents with ADHD have experienced

significantly more challenges with remote learning than adolescents without ADHD [60••] and also have had higher levels of problematic media use [111–114]. Of note, parents of adolescents with ADHD have had less confidence in managing remote learning and more challenges supporting remote learning and home–school communication [60••]. Adolescents with ADHD also maintained fewer routines than adolescents without ADHD during the COVID-19 pandemic [60••]. In addition, Becker et al. found that adolescents from low-income families were significantly more likely than adolescents from high-income families to not receive any remote/online learning and to not engage in class meetings online [60••]. Only 59% of school services received before COVID-19 were continued during remote learning [60••]. They also observed that approximately 25% of families reported incurring a financial burden to support remote learning, with families with incomes below the US median more likely than families with incomes above the US median [60••]. Parents also have described concerns with the quality of therapeutic services for their children during the pandemic, with 44% of parents surveyed by Murphy et al. reporting low satisfaction [114].

Among children with ASD, Colizzi et al. found that 75%, 78%, 23%, and 31% of parents reported facing difficulties managing structured activities, free time, child's meals, and autonomies, respectively [79]. Around 30% of parents felt the need for in-home healthcare support [79]. Parents of children with ASD also shared concerns over the absence of social interaction due to the lockdown and lack of participation by their children in socializing remotely [66•]. These parents described concerns regarding children's missing "special education time" and the possible developmental repercussions. Parents also felt that they did not have the skills to support their children's developmental and behavioral needs. A frequently mentioned challenge in this study was the lack of means and space for children to expend energy, leading to various levels of agitation among their children. One study in Spain, however, found that some families with children with ASD saw improvement in children's communication and participation in routines [115].

Among children with physical disabilities, Cacioppo et al. showed that 44% stopped physical activities, 22% continued medical follow-up, and 48% and 27% continued physiotherapy and occupational therapy, respectively. Parents conducted therapy for more than 60% of children [89]. Biyik et al. found that among children with cerebral palsy, 34% reported an increased level of pain, and 25% reported sleep problems. Sixty-seven percent had increased tone, decreased range of motion (60%), decreased physical activity level (55%), and the majority reported decreased levels of rehabilitation services (83%) [82].

Parental Mental Health

Studies show that parents raising children with disabilities experience more parenting stress than parents of neurotypical children or physically healthy children [116, 117, 118••]. During COVID-19, many studies highlighted elevated levels of stress among parents of children under 18 years of age, especially those with children with disabilities [85, 88]. The average reported stress level in April to May due to the COVID-19 pandemic for parents of children under 18 years was 6.7, compared with 5.5 for adults without children, with 46% of parents saying their stress level is high (between 8 and 10 on a 10-point scale where 1 means "little or no stress" and 10 means "a great deal of stress"), compared with 28% of adults without children who said the same, according to a national survey [88]. Quarantine has added additional burdens to parents with children with disabilities, including acting as their teacher, special educator, social skills coach, speech–language pathologist and/or behavioral/mental health therapist, and sometimes with little professional support [62, 66•, 68••, 119]. Parental stress was reported to be related to protracted closure of schools and lack of access to child's therapies, remote learning, stay-at-home orders, concern of infection with COVID-19, loss of family and friends due to COVID-19, working remotely while caring for children, limited job flexibility, economic hardship, lack of social support, their own mental well-being, and managing worsening of their children's behaviors and sleep among many other stressors [63, 66•, 67•, 68••, 73, 78–84, 86, 87, 89, 120]. In addition to elevated levels of stress, parents of children with disabilities endorsed significantly higher levels of mental health symptoms overall during the COVID-19 pandemic, with some studies correlating elevated stress scores and poor mental health outcomes [81, 83, 84, 86, 92–95].

Few studies have characterized factors associated with resilience and coping among families with children with disabilities. Latzer et al. hypothesized that the way the parents coped during the COVID-19 pandemic was an important factor to their children's well-being [66•]. Ueda et al. found that despite stressors, families who maintained quality of life also endorsed less parental stress, less parental depression and anxiety, and less challenging behaviors in their children [73]. Some parents discussed silver linings to the pandemic, including spending time with family, getting to know their children and their needs better, watching their children make developmental gains while at home, and more family cohesion [66•]. Other parents reported enjoying a slower pace of life, with some saying that they were able to sleep more, go outside more and meditate and reflect [93]. Some parents noted they were happy to see communities supporting each other during the pandemic, and some noted that they were surprised how well their child had adjusted to being at home.

A small number of parents also mentioned that they were thankful for receiving more government financial assistance, that they had not contracted COVID-19, and that they had learned to be more patient [93].

Interventions

The majority of interventions studied during the COVID-19 pandemic relate to the use of telehealth for diagnosis and treatment in the clinical domain, as well as using video technology to mitigate COVID-19-related factors. Reports have studied the use of telehealth by physicians [121–123] and for providing treatment for children with disabilities during COVID-19, including those with learning disabilities [124], parent training [125, 126], treatment for communication disorders [127], screening and assessing for ASD among children [128], behavioral telehealth [129], multidisciplinary Trisomy 21 clinic [130], applied behavior analysis treatment [131], distance support and online treatment for blind and visually impaired [132], assessing language samples [133], assessments by neuropsychologists [134], parent–child educational sessions, parental support sessions, and direct telehealth rehabilitation [135].

Conclusion and Future Directions

Children with disabilities and their families are especially vulnerable to the effects of disasters, which are now more frequent and intense due to climate change. However, few studies have examined the effects of climate-related events and adaptation strategies on children with disabilities and their families, findings that are critical to supporting disaster planning. And unlike previous disasters in the past few decades, COVID-19 has presented with vague starting points, multiple waves and uneven impacts on regions and communities across the globe, revealing stark disparities across race, income, gender, health status, and disability. As the COVID-19 pandemic continues, fueled by highly transmissible variants, vaccine hesitancy, and poor access to health-care and vaccines in certain regions globally, the ripples of its effects may last years.

Some of the methodological limitations of the reports discussed in this article include cross-sectional design, use of convenience samples, lack of comparison groups, use of parent report to ascertain child diagnosis of disability and child mental health outcomes with no direct assessments, variable outcome measures that are not comparable, and lack of measurements of preexisting trauma and stressors and of COVID-19 specific factors. As many studies rely on parent memory, recall bias may be a factor in their responses as well as recruitment bias if the modality is primarily web-based and questions are in English and

require a certain reading level. In addition, few studies were conducted of children who are non-verbal, in young children, among populations including indigenous, culturally, and linguistically diverse or in low- to middle-income countries.

While there have been numerous and heterogenous studies documenting the deleterious effects of the COVID-19 pandemic on children with disabilities and their families, further work examining both the short-term and long-term health, educational, and developmental effects on children is imperative to identifying mitigating factors, as well as addressing preexisting and worsening inequities. For example, studying the impact of remote learning on all students, including those with disabilities, and developing evidence-based educational, therapeutic, and psychological interventions to address disparities are important considerations. In addition, future research using larger populations with different medical health and disability types and multi-informant measurements using a controlled design would be informative in assessing the generalizability of telehealth interventions [126]. More broadly, additional research examining and promoting disaster preparedness among children with disabilities and their families on the individual, family, community, regional, national, and global levels as well as optimizing disaster communication informed by individuals with disabilities and their families is needed [136]. Furthermore, best practices on providing trauma-informed treatments for children with disabilities after disasters require further study. Researching the long-term effects of the pandemic on children with disabilities and their families, including risk and mitigating factors, may help inform future medical, social, and public health monitoring, programming, and interventions.

Supplement

MeSH/Index Terms:

Disaster Search Terms:

“Disasters,” “Natural Disasters,” “Terrorism” “mass casualties” “Avalanche” “Landslide” “Tornado” “Cyclone” “Wildfires,” “Volcanic eruption,” “Floods,” “Hurricanes,” “Tsunamis,” “Drought,” “monsoon” “blizzard” “heat wave” and “Disabilities,” “Developmental Disabilities,” “Learning Disabilities,” “Intellectual Disability,” “Autism Spectrum Disorder,” “Asperger Syndrome,” “Child Developmental Disorders, Pervasive,” “Attention Deficit Hyperactivity Disorder,” “Cerebral Palsy,” “Intellectual Disability,” “Language Disorder,” “Down Syndrome,” “Quadriplegia,” “Hearing Loss,” or “Vision Disorders”

COVID-19 Search Terms:

“Pandemics,” or “COVID-19,” “SARS-CoV-2” and “Disabilities,” “Developmental Disabilities,” “Learning Disabilities,” “Intellectual Disability,” “Autism Spectrum Disorder,” “Asperger Syndrome,” “Child Developmental Disorders, Pervasive,” “Attention Deficit Hyperactivity Disorder,” “Cerebral Palsy,” “Intellectual Disability,” “Language Disorder,” “Down Syndrome,” “Quadriplegia,” “Hearing Loss,” or “Vision Disorders”

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

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