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DEVELOPMENTAL SCIENCE SHEDS LIGHT ON WHAT HAS AND HAS NOT CHANGED OVER TIME

LONG-TERM IMPACTS OF THE COVID-19 PANDEMIC ON CHILD DEVELOPMENT

by Rachel Foster, Ph.D.

The COVID-19 pandemic has had widespread impacts on families across the world. A national survey conducted by the U.S. Census shows that in the first several weeks of lockdown from March to May 2020, 47% of households experienced loss of income and 26.5% reported difficulty paying for housing (U.S. Census Bureau). As the youngest and perhaps most vulnerable members of our society, special focus has been given to the impact of the pandemic on children's development and well-being. Not only have children experienced the ripple effects of these larger societal changes, but they also experienced direct changes to their daily lives. Children worried about whether they or someone they cared about would get sick. Children's social interactions were limited as schools incorporated virtual learning and families enforced social distancing practices. Some believe that the long-term impacts of the pandemic on children's development will be so pervasive that they have deemed our world's youth "Generation Covid," or "Gen C" (Stoichet, 2021).

But what do we actually know about any long-term, enduring shifts in children's development as the result of the pandemic? This article aims to shine light on this important question by reviewing two complementary bodies of research. The first body of literature references how developmental scientists predict children might be impacted by the pandemic based on theories of human development and how children have responded to previous societal setbacks. The second body of literature draws upon empirical research collected and published since the onset of the pandemic.

Theoretical Perspectives

How children have been negatively impacted by large-scale societal events is unfortunately not a new question. Previous research has examined how children have fared after economic downturns (e.g., Great Depression, Great Recession of 2008), war and terrorism (e.g., 9/11 attacks), natural disasters (e.g.,

Hurricane Katrina), and other pandemics (e.g., SARS, H1N1). Scientists are drawing upon this research to predict how children might be impacted by the COVID-19 pandemic.

Benner and Mistry (2020) propose looking at the COVID-19 pandemic through the lens of life course theory. Life course theory largely stemmed from research following the Great Depression in the 1930s. Although many people understandably struggled for many years following this devastating time in American history, not everyone was impacted in equal ways. For example, individuals who experienced the Great Depression as young children had worse life outcomes compared to those in later childhood or adolescence at the time (Benner & Mistry, 2020). As such, life course theory proposes that chronological age, relationships, common life transitions, life events, social change, and human agency all interact with each other to impact development.

According to the life course perspective, the pandemic can be thought of as a turning or transition point. Turning points are not inherently bad; school entry and marriage are normative, predictable turning points that alter people's lives. The pandemic would serve as an unexpected turning point in a person's development, permanently shifting the person's trajectory depending on a number of factors. As suggested earlier, one factor that will likely influence how the pandemic will change trajectories is age. Benner and Mistry (2020) hypothesize that children in early childhood (ages 0-8 years) and adolescence (puberty through early 20s) might be especially sensitive or susceptible to the impacts of the pandemic due to rapid neurobiological changes during these developmental stages.

Life course theory also highlights the importance of interpersonal relationships as sources of risk and support throughout life. One major way that the pandemic might impact child development is through reduced support and complications in linked social systems (e.g., families, friends, teachers). When parents experience economic-related stress, this often worsens their mental health and subsequently impacts family functioning through marital, parent–child, and sibling relationships. However, positive social support and positive coping strategies can be sources of resilience for many children. Thus, for better or worse, social relationships will influence how children are impacted long-term by the pandemic. Children who were able to maintain connections with extended family, peers, and positive adult figures throughout the pandemic might fare better than those who were cut off from their support systems.

Liu and Fisher (2022) use a neurobiological lens to predict the impacts of the COVID-19 pandemic on child development. Children experienced many changes within a relatively short period of time. At the sociocultural level, there were ever-changing public health guidelines due to multiple virus variants, spread of (mis)information, and federal policy changes. At the community level, there were local policy changes, school plan uncertainty, and childcare uncertainty. Finally, at the family level, children might have experienced disrupted routines, food insecurity, financial instability, unpredictable caregiving, and caregiver mood instability. Liu and Fisher (2022) thus conceptualize the pandemic as a period of early unpredictability. Previous research suggests that several biological systems are negatively impacted by early unpredictability and adversity, including altered neural circuitry leading to learning/memory deficits and emotion dysregulation, altered stress responses, and systemic inflammation. Liu and Fisher propose that the pandemic might have induced

long-term changes in these biological systems, which would lead to divergent outcomes in children's physical health, mental health, cognitive functioning, academic achievement, and other social-emotional and behavioral outcomes.

Like the life course theory perspective, Liu and Fisher (2022) emphasize that not all children are alike, and many other factors will influence how each child is impacted by the pandemic. For example, the intensity and duration or chronicity of the adversity experienced will undoubtedly shape outcomes. Demographic variables such as age and gender will also play a role. Additionally, resilience factors might buffer against the negative impacts of the pandemic. Resilience can be defined as "the capacity of a dynamic system to adapt successfully to challenges that threaten the function, survival, or development of the system" (Masten & Motti-Stefanidi, 2020, p. 98). The "systems" can refer to individual children, families, schools, and communities. The COVID-19 pandemic can certainly be classified as a "challenge" that threatened the function and development of those systems. As such, resilience factors are things that promote successful adaptation to the challenges of the pandemic. Previous research has unearthed several resilience factors that appear to consistently predict positive outcomes in the context of adversity and disaster. These include nurturing caregiving (by family, school community, and community organizations), close relationships (sense of belonging, trust, and cohesion), self-regulation (as well as skilled family management, school leadership, and governance), active coping, problem-solving and planning, hope and optimism, sense of purpose and meaning, positive views of self/family/group, and positive habits and routines (Masten & Motti-Stefanidi, 2020).

Overall, developmental scientists suggest that the COVID-19 pandemic instigated widespread and unpredictable changes in the lives of children at the individual-, family-, school-, and community-level. What we know about research following previous disasters and life stress is that early adversity impacts individuals through changes in biological systems and connections with others. But not everyone's paths are changed in the same way; age, gender, socioeconomic status (SES), and positive resilience factors all impact how much children will stay on course as we continue to navigate the pandemic.

Empirical Findings Across Areas of Development

Developmental science helps us to predict how child development might be impacted by the pandemic. However, the only way that we will know the true impact is through empirical research, or data collected from real children around the world.

Many research studies that have already been published offer snapshots into the short-term impacts of the pandemic on child and family well-being. One meta-analysis—a type of study that combines previous research findings to describe overall trends in the data—showed that within the first year of the pandemic, approximately 25% of global youth experienced clinical levels of depression and approximately 20% experienced clinical levels of anxiety (Racine et al, 2021). Although this is concerning, short-term changes in mental health may also disappear over time. For example, a review of research conducted in the wake of 9/11 suggests that declines in children's mental health were mild and transitory (Eisenberg & Silver, 2011). Additionally, research conducted with youth directed impacted by Hurricane Katrina showed that

there were declining rates of PTSD and depressive symptoms 3 years later (Kronenberg et al., 2010). Studies such as these emphasize the need to study child outcomes over time, or longitudinally, after significant world events. The increases in rates of youth mental health symptoms induced by the pandemic will likely return to baseline.

As we are only in the fourth year after the onset of the COVID-19 pandemic, researchers have simply not had enough time to study long-term impacts of the pandemic on child functioning more broadly. However, there is a small yet growing body of research that assesses how children's developmental milestones have been impacted by the pandemic. It would be beyond the scope of this article to review every single study, but what follows is a sampling of what we know so far. There is a specific emphasis on studies that compare performance or functioning over time, either before and after the pandemic onset, or at the beginning versus later. Special attention is also given to studies that collected data from large samples (i.e., hundreds or thousands) of diverse children. Although much of the research has been conducted in the United States, research from other countries is also helpful to shed light on developmental outcomes and will be included here.

Early Developmental Milestones (Infancy and Toddlerhood)

The largest body of research thus far has looked at early developmental milestones within infants and toddlers (approximately birth to 36 months). Many researchers are using available epidemiological data where the same standardized measures have been given to large groups of children over the past several years. This gives them the opportunity to compare performance on these measures between children born near the pandemic versus before. Many of these studies use the Ages and Stages Questionnaire, a measure that uses parent report to assess children's development in five areas (communication, gross motor, fine motor, problem solving, and personal-social) compared to other same-age children. The measure has been validated and standardized in many countries.

Studies looking at the impact of the pandemic on infant development are very mixed, as results tend to vary by age of the child and geographical location. For example, one U.S. study found small decreases only in communication and problem-solving skills for 6-month-olds (Imboden et al., 2022), and another found decreases only in motor and personal-social skills (Shuffrey et al., 2022). For 1-year-olds, two studies from Canada (Gielsbricht et al., 2022) and China (Huang et al., 2021) both found decreased motor and communications skills with no differences in problem-solving. A U.S. study (Imboden et al., 2022) corroborated some of these findings (for example, decreased communication skills) but not all (for example, no differences in motor skills). It is not entirely clear at this point why these findings vary as much as they do. More data will be helpful to shine light on this. It should be noted that across these studies, any significant differences found in pre- versus post-pandemic infants were relatively small in magnitude. Additionally, several protective factors were identified, including higher maternal education (Deoni et al., 2021), higher birth weight (Deoni et al., 2021), time of gestation (Shuffrey et al., 2022), having an older sibling (Huang et al., 2021), male sex (Gielsbrecht et al., 2022), and lower parent stress (Dillman et al., 2022). Overall, research in this area suggests that most infants born during the pandemic continue to develop typically without risks for developmental delay.

Some of the research involving infants and toddlers focuses specifically on cognitive development. A

primary concern has been how decreased access to early childhood education and care might impact early cognitive skills. One U.K. study found that children who regularly accessed one day of formal care (I.e., nursery, childcare setting, or nanny) per week from spring to winter 2020 were expected to understand 24 more new words compared with their peers (Davies et al., 2021). This effect was especially pronounced for children from low-SES backgrounds. Regardless of SES, increased access to early childhood education and care was also associated with parent reports of increased attentional, behavioral, and emotional control (Davies et al., 2021).

However, formal early childhood education and care is not the only thing found to influence cognitive skills. A study of over 1700 children from 13 countries showed that several at-home activities were associated with gains in language development (Kartushina et al., 2022). Decreased passive screen exposure (i.e., without screen interaction, like watching a video) was linked to greater gains in expressive vocabulary skills. Increased caregiver-child book reading was linked to greater gains in receptive vocabulary skills. Many other activities (including structured games, free play with other children) were not correlated with differences in vocabulary gains. Perhaps the most fascinating finding from this study was that on average, regardless of activities like screen time or book reading, children gained more vocabulary skills than they were expected to gain over the same period based on normative pre-pandemic data. Authors suggested that children might have benefited from increased caregiver awareness of their child's development and/or more intense and frequent caregiver-child interactions during the lockdown (Kartushina et al., 2022).

Academic Achievement

Since the beginning of the pandemic, education systems around the world have responded in varying ways to meet the needs of students while ensuring physical safety, often using a mixture of synchronous versus asynchronous and in-person versus virtual teaching. Understandably, we are now concerned about the impact of these alternative learning approaches on students' academic learning.

A fascinating study from Uruguay (Gonzalez et al., 2022) sheds light on how children transitioning from preschool to kindergarten might have been impacted. In Uruguay, preschool beginning at age 4 is mandatory. Before and after entering kindergarten at age 5, students in public schools are routinely given a school readiness instrument that assesses four areas: cognitive development (e.g., language, logical-mathematical skills), motor development (fine and gross motor skills), socioemotional development (internalizing, externalizing, and prosocial), and attitudes toward learning (e.g., school adaptation, motivation). Researchers used this school readiness data to compare two groups of students: a control group who entered preschool in 2018 and kindergarten in 2019, and a COVID group who entered preschool in 2019 and kindergarten in 2020. Data from over 30,000 students was available for each group. The COVID group, who started kindergarten in March 2020 two weeks before national lockdown, experienced approximately 1/3 of the school year distance learning, hybrid, and in-person learning, respectively. Analyses showed that compared to the control group from the year prior, the COVID group had decreased scores in cognitive development, motor development, and attitudes toward learning. The COVID group also showed increased internalizing behaviors, decreased externalizing behaviors, and no changes in prosocial

behaviors. However, many of these differences were small in magnitude, and often not significant for schools with the highest SES. At this point, not enough time has passed to determine whether these potential education gaps in kindergarten will remain, widen, or disappear over time.

The NWEA, the organization responsible for the Measures of Academic Progress (MAP) tests that many U.S. students take every year, has produced a lot of research on the observed and projected impacts of COVID on learning. Research from the group initially predicted that students starting school in fall 2020 would have approximately 63 to 68% of the learning gains in reading and 37 to 50% of the learning gains in mathematics relative to a typical school year (Kuhfeld et al., 2020). In fall 2021, students grades 3 through 8 received lower math (9 to 11 percentile points) and reading (3 to 7 percentile points) MAP Growth test scores compared to students in fall 2019 (Lewis & Kuhfeld, 2021). There is already evidence that average reading and math scores are rebounding, or getting closer to pre-pandemic levels over time, but it may take several more years for scores to recover completely (Kuhfeld & Lewis, 2022). Additionally, not all students have been impacted equally. Students from historically marginalized groups and socioeconomically disadvantaged schools tend to obtain lower scores and gains in achievement, especially in elementary school (Lewis & Kuhfeld, 2021), with the education gap widening over time for students with the lowest scores (Kuhfeld & Lewis, 2022).

Overall, research using actual test data is both promising and worrisome. It is important to remember that these are general trends; many students received comparable or higher scores than would have been predicted by general pre-pandemic trends. We will need to continue to help all students impacted by the pandemic, but especially those disproportionately affected, reach their full potential.

Social Development

Peer interaction is crucial for a child's social development. Time with peers, independent from adult supervision, is important for strengthening emotion regulation skills, understanding group dynamics (e.g., understanding group norms and the consequences of deviating from them), and building friendships outside of across many groups, thereby reducing prejudice (Cameron & Tenenbaum, 2021). After a long period of social distancing and isolation, many teachers and parents have anecdotally reported widespread changes in children's social skills across age groups (e.g., struggling to share with others, anxious in group settings). However, relatively few studies have quantified these changes through empirical research.

In one study, parents reported that on average, their child's social skills had not changed over a period of time since the beginning of the pandemic (Hernandez & Jabbari, 2022). This means while some parents reported decreases in their child's social skills over time, many reported developmentally appropriate increases. Improvements in social skills were associated with increased time spent outdoors, on schoolwork, with friends, and doing extracurricular activities (Hernandez & Jabbari, 2022). Interestingly, increased screen time was correlated with increased social skills for Black and Hispanic children only. Higher parental education, being part of a formal school system versus homeschooling, and parents living with a partner were all also correlated with increased social skills. While these results are valuable in trying to understand the impacts of the pandemic on social development, studies like this that rely solely on parent reports

should be interpreted with some caution. Additional research using alternative methods (for example, reports from teachers or peers) would be helpful in comparing children's average social skills now versus pre-pandemic.

One social skill that can be studied using objective measures is emotion recognition. Researchers have been intrigued to know whether the widespread use of masks during the pandemic might have hindered children's ability to read facial expressions and recognize emotions. Indeed, emotion recognition accuracy tends to be higher for photographs of unmasked versus masked faces (Chester et al., 2023). Overall though, research tends to show that across age groups, children are still able to accurately recognize basic facial expressions at least 75% of the time, indicating strong skills in this area despite the use of masking over the pandemic (e.g., Chester et al., 2023).

Physical Development

While one could argue that most of the focus of the consequences of the pandemic has been on cognitive and social-emotional development, it is important to also consider any impacts on physical development. Decreased access to healthcare due to loss of health insurance or cancelled appointments could have led to delays in routine well-child visits with subsequent health impacts (Irwin et al., 2022). Decreased family financial stability and access to school lunch programs could have contributed to food insecurity for some families. It was also predicted that child obesity rates would rise due to decreased physical activity and less access to fruits and vegetables (Irwin et al., 2022).

Research on impacts of the pandemic on child physical development (excluding the impacts of COVID-19 infection itself on health outcomes) is somewhat limited but existent. As already mentioned, many infants (e.g., Gielsbricht et al., 2022; Huang et al., 2021; Shuffrey et al., 2022) and school-age children (e.g., Gonzalez et al., 2022) have demonstrated slightly lower average fine and gross motor skills. A meta-analysis across several studies indicated increases in weight (3.6 lbs), BMI (.13 points), and obesity rates (2% higher) in children during versus before the pandemic (Anderson et al., 2023). Although these differences are small and could return to pre-pandemic levels, researchers argued that sustained increases could serve as a risk factor for negative health outcomes later in life.

Because schedules and routines were upended for many families, many wondered how children's sleep patterns changed during the pandemic. Researchers were able to use the longitudinal Environmental influences on Child Health Outcomes study to gain insights. Data from over 500 4- to 12-year-olds around the country indicated that compared to before the pandemic, children tended to get 30 fewer minutes of sleep due to later bedtimes (Lucchini et al., 2022). Researchers on this study argued that the later shift might have advantages for older children, who have naturally later circadian rhythms, while also recognizing that later sleep times are correlated with less physical activity, poorer diet, and increased mental health symptoms (Lucchini et al., 2022). As such, additional research is needed to better understand the long-term effects of shifts in sleep patterns on health.

A fascinating study from China highlights the impact of home confinement (including less outdoor activity, increased screen time) on children's visual capabilities. In China, school-aged children ages 6 through 13 years are given annual photoscreening for visual problems. Researchers found that rates of myopia (I.e., nearsightedness) significantly increased

in 2020 compared to 2015-2019, but already returned to pre-pandemic levels by 2021 (Wang et al., 2023). These results suggest that children's vision was susceptible to environmental changes brought on by the pandemic, but also capable of recovery.

Main Takeaways

So the question remains: have children been permanently impacted by the COVID-19 pandemic? The answer: it might be too early to tell, and it depends. Dr. Jonathan Comer, Professor of Psychology and Psychiatry at Florida International University, who studies the impacts of disasters and trauma on child mental health, summarized it well: "It's too early to tell, of course, what the overall character of this generation will look like and how the mental health of this generation will be affected in the long-term...but it seems that there's not going to be a universal character or personality impact, because the burdens of these times are not shared equally" (Stoichet, 2021).

Empirical research thus far indicates that children in the U.S. and around the world are a few points behind on some standardized measures of developmental milestones, academic achievement, and markers of health. Only time will tell if these differences persist or subside over time.

A key thing for parents to remember is that these results are on average. General trends do not always reflect an individual child's performance or functioning. Developmental theory suggests that we think about the pandemic as a turning point or period of added unpredictability in the lives of children. Turning points and early unpredictability do not necessarily equate to bad outcomes; rather, they are just another part of an infinitely complex equation. Equally important parts of the equation are resilience factors that can protect against negative outcomes and developmental delays, including close relationships, coping and problem-solving skills, hope, sense of purpose, and positive habits and routines. Rather than assume negative outcomes, parents are encouraged to think carefully about the specific risk and resilience factors that might differentially alter their child's developmental path given their family's circumstances. Mental health providers are well-equipped to help families think through these complexities.

Research on developmental outcomes for children impacted by the pandemic will carry on for decades to come, continuing to shed light on shifts in the developmental trajectories of children around the globe. In the meantime, resilience is all around us. May our communities rally to support our society's most precious and vulnerable members as we return to the new normal.

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Clinically, Dr. Foster has worked primarily with children, teens, and their families to treat a wide variety of internalizing and externalizing concerns. She has experience with numerous evidence-based interventions, including cognitive behavioral therapy (CBT), trauma-focused cognitive behavioral therapy (TF-CBT), and dialectical behavioral therapy (DBT). Dr. Foster strives to use a warm, empathetic, and collaborative approach to help her clients achieve their goals and live a life worth living.

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