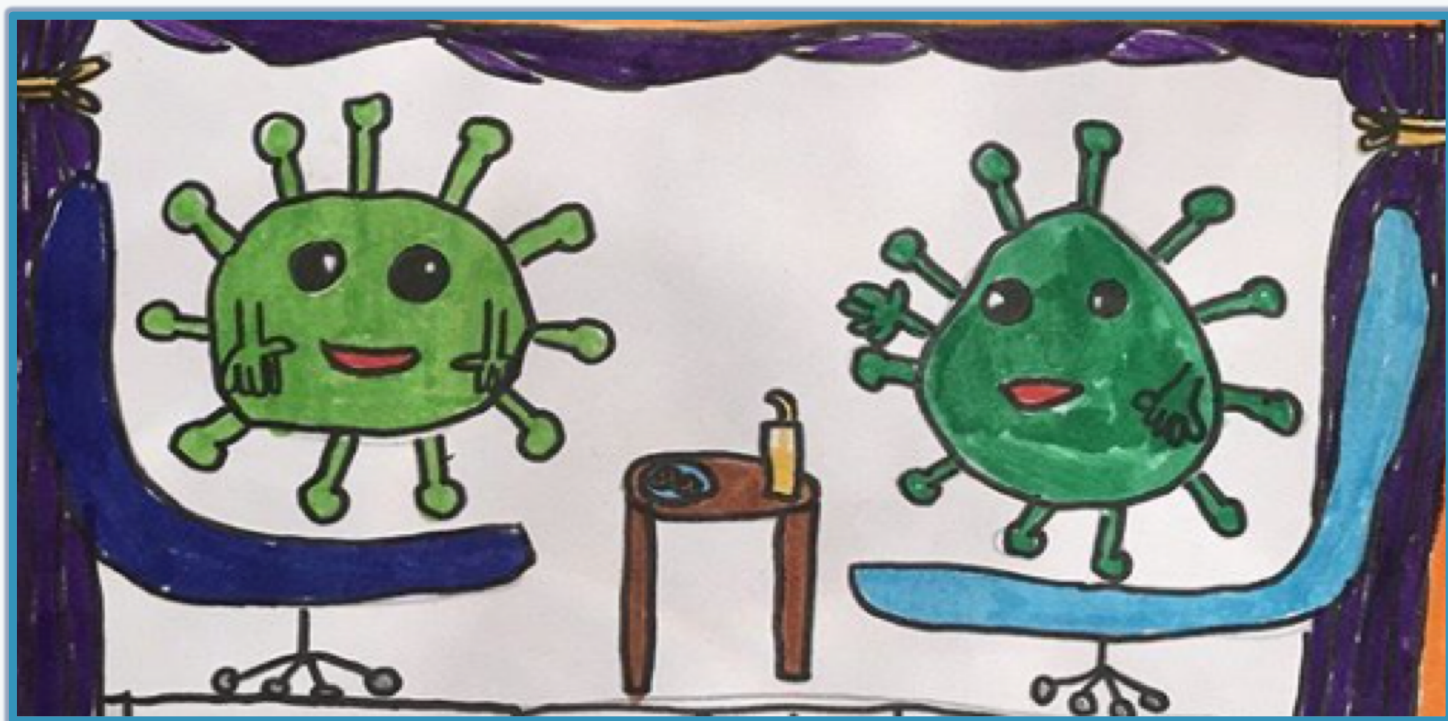


Children's Questions, Worries, and Information Needs During the COVID-19 Pandemic

A study based on listeners of the children's science podcast


brains on!



Drawing submitted by Brains On! child listener

FULL REPORT

Amy Grack Nelson, Marjorie Bequette, Zdanna King, Choua Her,
Scott Van Cleave, Evelyn Christian Ronning, Juan Dominguez



September 2020





This material is based upon collaborative work supported by the National Science Foundation under Grant No. 2029209 titled *RAPID: Addressing Families' Covid-19 Information and Education Needs Through Podcast Media*. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

TABLE OF CONTENTS

OVERVIEW	4
METHODOLOGY	4
Online Survey.....	4
Recruitment.....	5
Think-aloud Interviews.....	5
Survey Sample.....	5
Analyzing Kids' Coronavirus Questions.....	7
Question Sample.....	8
RESULTS AND DISCUSSION	10
Child-Caregiver Conversations Related to the COVID-19 Pandemic.....	10
Comfort Talking and Answering Questions About the Coronavirus	10
Topics of Conversation	10
Children's Worries About the Coronavirus.....	11
What Children Have Been Worrying About.....	11
Supporting Caregivers' COVID-19 Pandemic-Related Information Needs.....	19
Where Caregivers Find Information to Help Children Understand COVID-related Topics	19
Topics Caregivers Want Help Discussing With Their Child	22
Children's Questions Related to the COVID-19 Pandemic	39
SUMMARY OF FINDINGS.....	48
Main Findings	48
Children's Questions Related to the COVID-19 Pandemic.....	48
Child-Caregiver Conversations Related to the COVID-19 Pandemic.....	48
Children's Worries About the Coronavirus.....	48
Supporting Caregivers' COVID-19 Pandemic-Related Information Needs.....	49
Cross-Cutting Themes Across the Research.....	49
Dealing with Uncertainty.....	49
Understanding the Nature of Science.....	50
Changes in Children's Lives Because of Preventative Measures	50
Children's Mental and Emotional Health.....	51
REFERENCES	52
APPENDIX A: SURVEY SAMPLE DEMOGRAPHICS.....	53
APPENDIX B: OTHER PODCASTS USED AS A RESOURCE.....	58
APPENDIX C: WHAT WOULD HELP CAREGIVERS FEEL MORE COMFORTABLE DISCUSSING THE CORONAVIRUS....	59

OVERVIEW

With the world in the midst of the COVID-19 pandemic, families are seeking trusted and engaging sources of scientific information to help their children understand prevention, transmission, treatment, and many other topics related to COVID-19 in an effort to ease children's fears. The goal of our NSF-funded RAPID research study is to understand how children's science podcasts, as well as other educational products, can provide families with information to help ease children's fears and worries during a pandemic by increasing children's understanding of pandemic-related science concepts, empowering children to ask more pandemic-related questions, and supporting pandemic-related family conversations. The following questions guide our research:

1. How and to what extent do Brains On!'s coronavirus-based episodes help children and their families understand and talk about science-related pandemic topics? What kind of conversations are sparked by these episodes?
2. What kinds of worries and questions do Brains On! listeners have about coronavirus and related aspects of the pandemic? How do children's worries and questions change over the course of the pandemic?
3. What resources do caregivers need to answer children's questions and help them understand science topics related to the pandemic?

This research builds on previous studies we have done of the children's science podcast Brains On! (see <http://bit.ly/BrainsOnResearch> for previous studies). We drew on listeners of Brains On!'s coronavirus episodes as our research sample for this study. Brains On! has a global listening audience and primarily reaches children ages 5 to 12 (Grack Nelson, Dominguez, Van Cleave, 2019). The findings in this report are focused on Research Questions 2 and 3.

We as researchers are living through the virus too, and we acknowledge that our findings may be influenced by our own experiences, even as we have used many strategies to check interpretations, with others beyond the immediate research team. However, taken together, we believe that these findings provide a snapshot of children and families' experiences and questions during the early months of the pandemic. We hope these findings and future results of our research can inform the development of coronavirus-related educational resources responsive to the information and education needs of families over the course of the pandemic.

METHODOLOGY

Online Survey

An online survey was conducted with caregivers of children ages 5 to 12 years old who listen to the children's podcast Brains On!. (Note: We use the terms "adult" and "caregiver" throughout this report to refer to the parents and/or guardians of Brains On! listeners). Caregivers were asked questions specific to the Brains On! coronavirus-related episodes (those findings will be shared in a different report), as well as general questions about the coronavirus. This report is focused on the results of survey questions related to children's general conversations and worries about the coronavirus as well as the resources caregivers are using and additional supports they need for talking to their children about coronavirus-related topics (Research Questions 2 and 3). The online survey was administered June 7 to 21, 2020.

Recruitment

A challenge faced when gathering data from podcast audiences is that we don't know who composes the population of podcast listeners, so we don't have a list of listeners we can recruit survey respondents from. Since we don't know who listens to Brains On!, we used multiple methods to try to recruit as many listeners as possible. We started to recruit listeners around a month before the survey was administered. A webpage, www.brainson.org/research, was created where adults (ages 18 and above) with children ages 5 to 12 in the household who listened to one of the Brains On! coronavirus episodes could sign up to participate in the survey. Invitations to sign up were added to current and past Brains On! episodes, posted on Brains On! social media (Twitter, Facebook, Instagram), included in the Brains On! newsletter, and posted on the Brains On! website. Adults who signed up were later sent an invitation to take the survey. Additionally, adults who had signed up to participate in our prior Brains On! research studies were invited to participate in the research and later sent the survey link directly in an effort to increase survey responses. Upon completion of the survey, people could download free Brains On! activity pages that were only available to survey respondents.

Think-aloud Interviews

The survey was tested with groups of adult and child listeners before it was widely administered to ensure the questions gathered reliable and valid data. We tested the survey using think-aloud interviews. Think-aloud interviews allowed us to ascertain how well people understood the survey questions and if they were interpreting the questions as intended. During a think-aloud interview, the person reads the survey out loud and verbalizes how they are thinking through their response to the question. During the interview, one of the caregivers completed the survey out loud while asking for input from family members. Interviews were conducted over the video-conferencing software, Zoom. Think-aloud results were used to revise question wording and inform response options. The sample for the think-aloud interviews were families in the United States with 5 to 12-year-old children who had listened to at least one of the Brains On! coronavirus-related episodes. We had 53 families interested, which allowed us to sample in a way that ensured we tested the survey with families that had children of different ages and may have had varying experiences with the pandemic in different areas of the country. A total of 10 families participated in think-aloud interviews. They were provided with a \$25 pre-paid Visa card in appreciation for their time.

Survey Sample

A total of 401 caregivers of 5 to 12-year-old Brains On! listeners responded to the survey. We used various techniques to reach our sample size. We emailed the survey directly to the 791 people that signed up to participate in the research through our www.brainson.org/research webpage. We also emailed the survey link to the 1,160 people who had signed up to participate in prior Brains On research studies to invite them to complete the survey if their child had listened to one of the coronavirus-related episodes.

Caregivers were asked to complete the survey based on only one child listener in their household between the age of 5 to 12. If they had multiple 5 to 12-year-olds in their household that had listened to a Brains On! coronavirus episode, they were told to answer the survey questions based on the child whose birth day and month was closest to the date they were taking the survey. This was done in an effort to decrease bias in the survey sample.

It is important to understand who the sample is for this study and keep this in mind when looking at these survey results, as well as pay attention to who is not adequately represented in this sample. As previously mentioned, the sample are children and their families who listen to the Brains On! podcast, specifically those who had listened to at least one Brains On! coronavirus episode. This sample of listeners has the following characteristics (see Appendix A for full demographic details about the sample).

- The children represented in the sample are mostly 5 to 10-year-olds (90%).
- The sample is composed of more male children (57%) than female children (42%) or children who preferred to self-describe their gender (1%).
- The sample lacks racial/ethnic diversity with 75% of 5 to 12-year-old listeners identifying (by their caregiver) as white only.
- Most children in the sample (86%) are from the United States. The survey was open to all Brains On! listeners, which includes listeners from around the world.
- Over two-thirds (70%) of children in the sample come from highly-educated households with at least one person in the household holding a graduate or professional degree.
- A majority of households (63%) in the sample have a pre-pandemic annual household income of \$100,000 or more (which is more affluent than the average U.S. household) (Fontenot, Semega, & Kollar, 2018).
- A majority of households in the sample (59%) had at least one adult with a job in a science, technology, engineering, math, and/or medical/health sciences field.
- The adult filling out the survey tended to be female (89%), between the ages of 30 and 49 (95%), and identify as white only (84%). It is important to note that the survey was sent to the email address of the adult who signed up for the study. We didn't ask respondents to randomly choose an adult from the household to complete the survey.

Sample limitations

Even though we have an adequate sample size, one thing to keep in mind is we don't know if this sample is representative of all Brains On! listening households since we don't have a list of the population of listeners we can randomly sample from. Instead, the sample is based on people who saw or heard the recruitment information, had listened to one of the Brains On! coronavirus episodes, chose to sign up to participate in the survey, or had signed up to participate in prior Brains On! research. We recognize this type of sampling brings with it some coverage error because the sample will be people who feel compelled to reach out to participate in the study and complete the survey.

This sample is also not representative of all children or adults ages 5 to 12 in the United States or globally, nor was it meant to be. This RAPID study took advantage of a large, pre-existing audience of children and families already seeking out coronavirus information from a particular informal science education resource in an effort to not only learn more about Brains On! and similar kinds of children's science podcasts, but to use it as an opportunity to gain some insight into children and caregivers' pandemic experiences and education needs. However, even with the general insights we gained, we recognize this sample tends to be reflective of the experiences of white identifying, high income, and highly educated families which means the experiences and voices from populations of children and families that have been most affected by the pandemic in terms of economic and racial disparities are not adequately represented in our study. This is a major limitation of our survey sample and we hope that other researchers will build on these findings and work to fill in the gaps of our sample and knowledge.

Analyzing Kids' Coronavirus Questions

A unique feature of Brains On!, compared to other children's science podcasts, is that the content of each episode is based on questions children submit to the show. Brains On! receives an average of 100 questions from child listeners each week. Children who submit questions to the show have their name read on the Brains On! Honor Roll, a feature of each episode. We decided to capitalize on Brains On!'s pre-existing audience engagement and question submission process to answer Research Question 2. Since winter 2020, a majority of the questions submitted to Brains On! have been about the coronavirus or other aspects of the pandemic.

For the purpose of studying children's questions, we used an embedded data collection method. Brains On! already had a contact-us form on their website where caregivers could submit questions, drawings, or other messages to Brains On! on behalf of their child (see Figure 1). As part of this form, they indicate their child's question(s) and then have the option of filling in their child's name, age, and location (see Figure 2). In some cases, caregivers may submit a question on behalf of multiple children in their household. The Brains On! staff removed the names from these question submissions and sent a file of the de-identified questions to the research team for analysis. Only questions related to the pandemic were included in the study. To help encourage the submission of coronavirus questions, the final page of the survey research sign-up page had a reminder for caregivers to submit their children's coronavirus questions and instructions on where to do so. In addition to coronavirus questions caregivers submitted to Brains On!, we also included coronavirus questions that had been publicly posted by caregivers to the Brains On! Facebook page. If a caregiver shared a child's age and location, that information was also noted as part of our data. The research team then analyzed children's questions in the qualitative analysis software Dedoose using a coding framework they developed based on topical codes that emerged from the data.

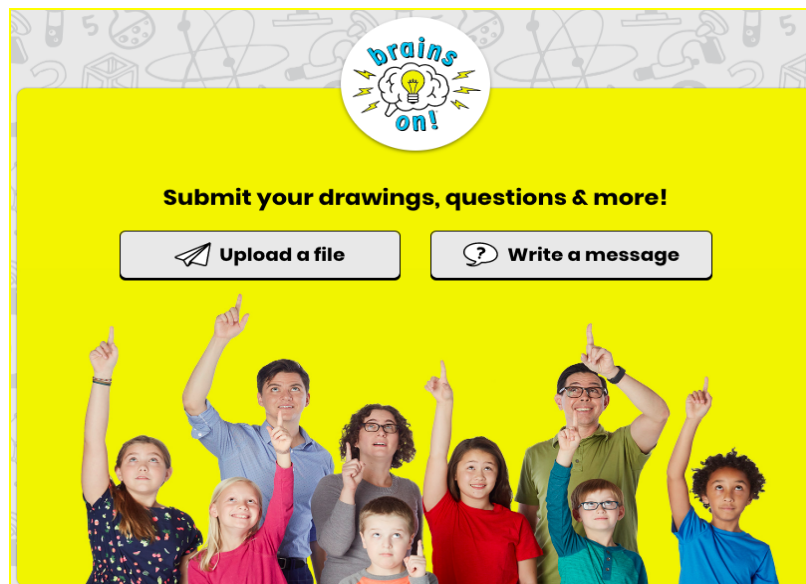


Figure 1: Brains On! contact-us form where caregivers submit their child's questions to Brains On!.

brains on!

Put your child on the Brains Honor Roll!

Who will be on the Brains Honor Roll?
First name(s) of child or children

How old are they?
Age of child or ages of children

Where in the world are they?

City	State	Country
<input type="text" value="Optional"/>	<input type="text" value="Optional"/>	<input type="text" value="Optional"/>

I'm not a robot

reCAPTCHA
Privacy - Terms

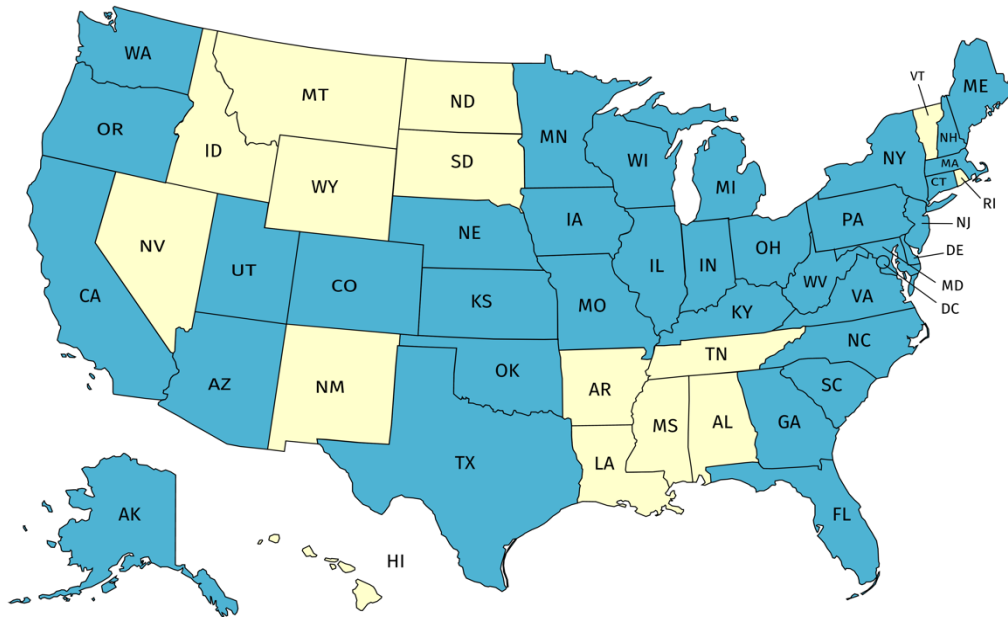
reCAPTCHA helps prevent automated form spam.
The submit button will be disabled until you complete the CAPTCHA.

Figure 2: Part of submission form where caregivers fill out demographic information about their child.

Question Sample

Our question sample for this report includes all coronavirus-related questions submitted to Brains On! or posted organically to the Brains On! Facebook page from February 1st to June 3rd, 2020. There were 177 coronavirus question submissions included in our analysis (some submissions included multiple questions). Our sample includes questions submitted from children all over the world. Most questions were submitted from children across the United States, with questions representing children from 35 states (and Washington DC) as illustrated in Figure 3. A small number of questions also came from children outside of the United States, including Australia, Canada, India, Kazakhstan, Norway, Scotland, Singapore, Taiwan, Turkey, and the United Kingdom.

Questions were submitted by children ages 3 to 13. Since age was optional on the form, some submissions did not include ages, so this sample could have also included questions from kids outside of this age range and some submissions listed multiple ages (for example, a question submitted by a family with multiple children’s ages listed). This makes it difficult to attribute particular questions to particular ages so we did not analyze questions by age for this report. It is also important to remember that caregivers are typically the ones typing in the questions, so the way the question is worded may be more reflective of the adult than how a child might ask the question. We also lack demographic information about the child submitting the questions (gender identity, race/ethnicity, etc.) so we don’t know whose voices these questions best represent and whose voices are missing from these questions. However, given these limitations, we still find value in these findings as they present insights that might otherwise not be available into the types of questions children ages 3 to 13 (who listen to a children’s science podcast) have about the coronavirus during the first part of the COVID-19 pandemic.



Created with mapchart.net

Figure 3: Locations in the United States where caregivers submitted children’s coronavirus questions to Brains On! or posted them on Facebook between February 1 and June 3, 2020. Note: States in blue had at least one question submission, while the other states had no submissions.

RESULTS AND DISCUSSION

Child-Caregiver Conversations Related to the COVID-19 Pandemic

Comfort Talking and Answering Questions About the Coronavirus

Most caregivers (97%) indicated that their child had asked them a question about the coronavirus. As illustrated in Table 1, caregivers were overall comfortable answering their child’s questions and talking to them about the coronavirus, with more caregivers feeling “very comfortable” talking to their child than answering their questions.

Children have questions about the coronavirus and are looking to their caregivers for answers. Almost all caregivers in our study (97%) said their child had asked them a question about the coronavirus.

Table 1: Caregivers’ comfort level talking to child or answering questions about the coronavirus.

	Talking to your child about the coronavirus (n = 401)	Answering questions your child has about the coronavirus (n = 400)
Very uncomfortable	0%	0%
Uncomfortable	0%	0%
Somewhat uncomfortable	<1%	<1%
Somewhat comfortable	3%	9%
Comfortable	22%	28%
Very comfortable	74%	62%

Caregivers who said they were “very uncomfortable” to “somewhat comfortable” were asked what would help them feel more comfortable talking to their child about the coronavirus and/or answering their questions. A total of 26 caregivers responded. Things these caregivers mentioned would help them feel more comfortable include being more informed themselves, knowing how to talk about the uncertainties of the pandemic (unknowns of the virus, vaccine timeline, what the future will be like), finding information that is from a trusted source, how to talk about some of the scary topics (e.g. death), how to talk about why people aren’t following guidelines, how to talk about the pandemic in age appropriate ways, and how to talk about hard topics that are also emotional/scary for them as an adult (see Appendix C for a complete list of these responses).

Topics of Conversation

Caregivers were asked if they had talked to their child about a variety of specific topics related to the coronavirus. All families responding to the survey had had a conversation about at least one of the topics listed in Figure 4. Most families talked about many of the topics listed below including what the virus is, prevention, and how their families’ lives had changed. Around 1 in 10 families have not had a conversation with their child about how scientists are working on ways to treat the coronavirus or how

the pandemic may change their families' plans for the future. Both of these topics are ones that have more uncertainty associated with them.

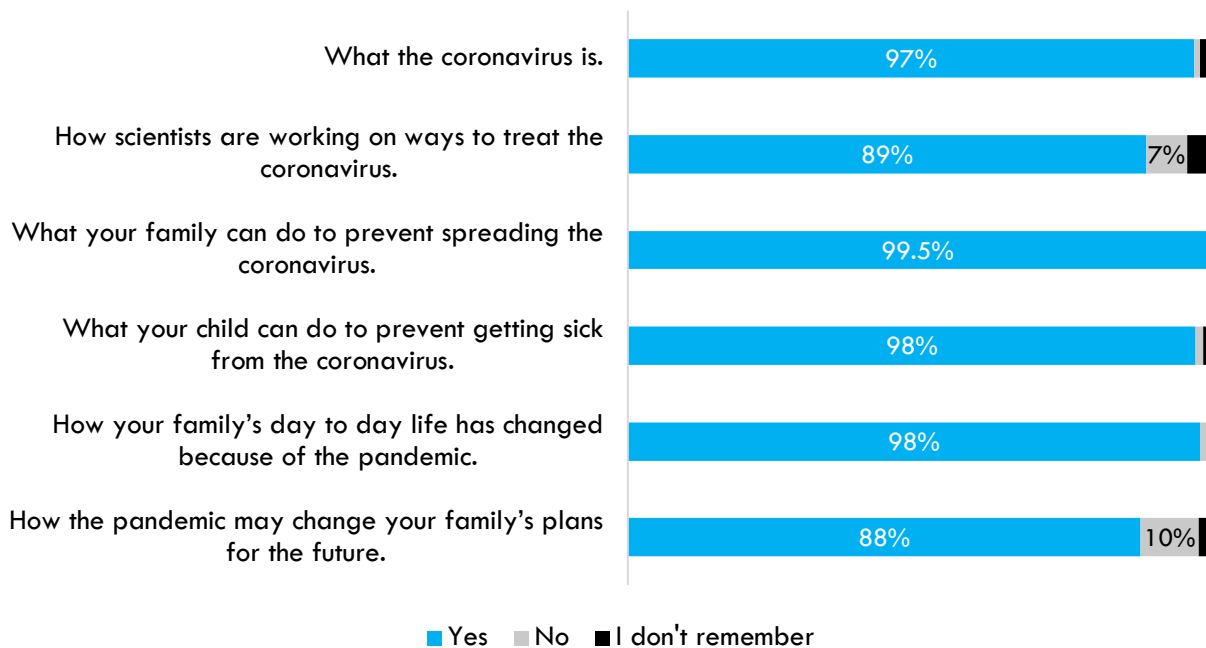


Figure 4: Percentage of caregivers who talked to their child about these particular topics related to the coronavirus.

Children's Worries About the Coronavirus

Over two-thirds of children (68%) had expressed worry or fear about the coronavirus. When looking at worry by gender identity, there is no difference (67% of female and 66% of male children have expressed worry or fear). There are also no significant differences across the 5 to 12 age ranges in expressing worry or fear.

Worry and fear are common emotions among children during the pandemic. Over two-thirds (68%) of children in our study expressed worries or fears about the coronavirus.

What Children Have Been Worrying About

Children were worrying about a wide range of things in relation to the coronavirus during the first part of the pandemic. This survey includes worries that children may have expressed anytime between the start of the pandemic in December 2019 to early June 2020. The most frequent worry during this time period was around people getting sick from the coronavirus, often talking about an immediate family member, grandparent, or themselves. A smaller percentage of children were worried about death.

Many of children’s worries were related to changes in their lives because of preventative guidelines (such as stay at home orders and social distancing) to stop the spread of the coronavirus – missing family and friends, not being in school, changes in plans, and preventative measures they needed to take themselves. The uncertainty surrounding the pandemic was also worrisome to children as they didn’t know how long their life would be changed because of these preventative measures, and some children were worried their life would never go back to “normal.” A small percent of children had worries related to transmission and infection – they were worried about the various ways they could potentially contract the virus as well as worries that they might infect someone else. Seeing people who were not following preventative measures was also something a few children expressed worry about.

On the following pages are the results of thematic analysis of responses to the survey question, “What has your child been worrying about in relation to the coronavirus?” Sample responses are included under each theme to exemplify children’s worries. Figure 5 outlines the general frequency each topic of worry was mentioned in the data.

Most frequently mentioned	Sometimes mentioned	Rarely mentioned
<ul style="list-style-type: none"> • Worries about others and/or themselves getting sick • Worries related to not being able to see others 	<ul style="list-style-type: none"> • Worries related to an uncertain future • Worries related to school • Worries about people dying • Worries about changes in activities, plans, and routines 	<ul style="list-style-type: none"> • Worries related to the ways people can contract the virus • Worries related to preventative measures • Worries about passing the virus on to others • Worries about people not following guidelines • Other worries

Figure 5: Coronavirus-related worries expressed by children (n = 263).

Worries about others and/or themselves getting sick

Over half of the caregivers said their child has been worried about people getting sick, most frequently citing worries about people close to them such as parents and grandparents.

- *Lots of questions about her grandparents and all of us getting sick.*
- *She was worried whether it was dangerous for her mother or father, and she was worried about her grandparents.*
- *She was worried about us getting sick, but both she and myself had mild cases so that fear has gone away.*
- *He’s mostly scared that people he knows and cares about will get sick.*
- *His friends or family getting sick.*
- *This child has many worries about COVID - acquiring it, others acquiring it (including family members or even strangers we see not taking precautions).*

A few children had a worry about who would take care of them if their parents were sick.

- *That both of her parents would get sick, and then who would take care of her.*

- *What would happen if her parents needed to go to the hospital, who would take care of her if they need to be kept away from her grandparents.*

Some of the worries were specific to groups that are high risk such as older grandparents or family members who have medical conditions that make them more vulnerable.

- *Elderly family members getting sick.*
- *I think at first he was very worried about his grandparents. He was worried about older people.*
- *Worry for high risk members of our extended family.*
- *One set of their grandparents is immune compromised so they have been worried about their health.*
- *One person in our immediate family has an autoimmune disorder, so I think we are all a bit more nervous and cautious right now.*
- *Father just finished chemotherapy and was in a vulnerable population.*
- *If his dad will get sick (high-vulnerable risk group).*
- *I (their mother) is a medically vulnerable (high risk) person, due to underlying health issues. We see some other people doing things our family just can't participate in quite yet, and that has been really hard. I see them worry about me more than any child should worry about their momma, and I feel so guilty for being the reason they can't do a lot of things other families are now allowing their children to do.*

Some children were worried about family members in the medical field getting sick while at work.

- *He was worried that my husband would get the virus while working at the hospital.*
- *Her aunt, a nurse, catching it at work.*
- *I am a nurse working with COVID-19 patients so she is nervous that we will get sick.*

Over a quarter of kids' worries were about getting sick themselves, often in addition to worries about people mentioned above. These worries included fears of getting sick and what would it be like if they were sick.

- *"Will I get really sick?"*
- *She says she thinks getting it sounds scary.*
- *"What would happen if I get sick?"*
- *He's just had a general anxiety about getting sick and what would happen if he had to go to the hospital. It's low level but there.*
- *I think he's just a little more worried/alert to being sick in general than he used to be (by which I mean he literally never paid attention or worried about a sniffle or cough).*
- *With my son having his condition. He knows that his body works differently than others. He asked me what would happen to him if he got COVID-19.*
- *She has asthma and initially we were worried about her getting exposed, though less so now as that doesn't seem to be a big risk.*
- *Initially, he worried that he had the virus.*
- *She has worried that her shortness of breath (after running) was a symptom.*

Some children also expressed concern that they or someone they know might get sick and die from coronavirus. These comments were double coded as worries about getting sick and worries about dying and are discussed under “Worries about people dying (including themselves). “

Worries related to not being able to see others (friends, relatives, etc.)

Around a quarter of children were worried about the fact that they were unable to see other people during the pandemic. Most frequently, this worry was related to not being able to see and play with their friends.

- *His biggest worries are about not getting to play with his friends properly any time soon.*
- *Only child so has difficulty processing not being able to physically play with her friends.*
- *Missing playing with friends and neighbors.*
- *Loss of friend interactions.*
- *Worried she'll forget what her friends look like.*
- *He is worried that he won't see his friends for a long time.*

Some children expressed worries about not being able to see relatives, particularly grandparents.

- *The effect on her ability to see people that she cares about.*
- *Also, about not seeing family and friends for a long time.*
- *Why we can't spend time with his grandparents.*
- *Not being able to see grandparents/relatives.*

Some caregivers mentioned that this social isolation from friends and family was causing their child to be lonely.

- *He is worried sometimes about not seeing family. He is lonely.*
- *Loneliness and isolation from her friends.*

A small number of children expressed worry about the uncertainty related to not knowing when they would be able to see friends or family (see also “Worries related to an uncertain future”).

- *When will we ever see our friends again?*
- *When will she see their friends or different family members.*
- *Being able to hug older family members.*

A few children were worried that they would never be able to see friends or family again.

- *Never being able to play with friends.*
- *Not ever being able to see their friends in person again.*
- *Can I never hug anyone in my family again?*

Worries related to school

Children had a variety of worries related to school. Most of the worries were related to not being able to go back to the actual school building in the fall of 2020. There were also a few worries about in-person school being cancelled in the spring of 2020.

- *Not being able to go to school.*
- *Worried that his school will stay closed.*
- *About her school not opening back up in the fall.*
- *Wanted to go to school.*

Some children were worried about the uncertainty related to not knowing what would happen with school or when they would be able to go back (see also “Worries related to an uncertain future”).

- *When she will be able to go back to school.*
- *Also, very worried about how there are no known plans for school.*

A few children were worried that they would never go back to school. “Now, he worries that he will never go back to school or see his friends again.”

A few children expressed worries about returning to school in the fall. These concerns were around what school might be like when they return and how it might be different.

- *Very worried about what school will look like in the fall. I get asked questions a lot about what will be the same, what will be different, and will they be able to play with friends again.*
- *Whether they will be able to start school like normal in the fall.*

One child expressed concern about the virus spreading when children return to school. “When we go back to school, if people have the virus and spread it again.”

Worries about people dying (including themselves)

Children were worried about people dying from the coronavirus. For some children, this was a general worry. “The fact that people are passing away from it seems scary.” For other children, they expressed a specific worry that people they know might die, including their parents, grandparents, friends, and other loved ones. One child specifically worried, “What happens to her if her parents die?”

- *He has at times worried that his parents (us) will die.*
- *She doesn't want people to die and specifically worried about her grandparents.*
- *If her grandparents or friends get sick, will they die?*
- *Fear of losing loved ones.*

A few children were worried about the coronavirus and their own mortality.

- *Death of himself.*
- *If coronavirus will kill you.*
- *He has a new fear of dying. He hears so many people dying, people we know and people on TV, and it has made so many anxieties for him that seeking a doctor's help is the next step. He asks too often for simple things "but can I die from that" or "how will I feel if I die."*

Worries about changes in activities, plans, and routines

Children were worried about changes to their daily routines as well as changes to activities they like to do. Some of these activities were everyday activities like playing on the playground, while others were special activities that happen in the summer like going to summer camp or on vacation. Some children just missed going places and worried about plans being cancelled. (Note: Changes related to school, while similar, are discussed under “Worries related to school.”)

- *She misses going places.*
- *Everything cancelled and closing.*
- *She worries about plans being cancelled.*
- *Not being able to do things they love.*
- *When can we go back on the playground.*

- *She worries about how this impacts her summer camp.*
- *Once COVID was declared a pandemic, she worried about no longer being able to go on our planned vacation, or any vacations in the up-coming summer. But she is otherwise not worried.*

For many children, their daily routines had changed which caused them to worry. For some children, this disruption had been particularly difficult to adapt to.

- *All the changes in routine, like having school at home.*
- *Changes to his daily life.*
- *Our schedule has changed drastically and it's caused a lot of anxiety to spike up, causing big tantrums and outbursts.*
- *There's a general underlying sense of fear my child has in this new normal where all his routines have been disrupted.*

Worries related to an uncertain future

The uncertainty around the future of the pandemic and when things would go back to “normal” was a cause of worry for some children. Much of this uncertainty was around how long society would need to follow preventative measures, which means children didn’t know when they would be able to go back to school or see friends and family members like they normally would. This uncertainty caused some children to worry, wondering “when” they would go back to some of their normal routines and “how long” the pandemic would go on. For some of these children, they seemed to feel that life would eventually go back to normal but worried about when that would be.

- *I think they have the same fear that I do, when is this all going to end?*
- *When life will go back to normal.*
- *What will "normal" look like in the future, and will this coronavirus be an ongoing problem?*
- *When can they go out and do things?*

For some children, they were worried specifically about when they would get to see friends and family and play like they normally would with their friends again.

- *She's mostly worried about the uncertainty surrounding what is going to happen in the future. She'd like to know when she can play with her friends or go to play spaces.*
- *When will she see their friends or different family members?*
- *How long we have to stay away from friends.*

The uncertainty about what would happen to school in the fall was also a cause of worry for some children, particularly around when they would be able to go back and when school would be back to normal if they did go back.

- *When he can go back to school.*
- *When will going back to school be the way it used to be?*

For some children, the uncertainty brought with it a fear that the pandemic would never end and things would never go back to normal. These worries were often related to never being able to do things that they used to such as travel, play with friends, go to school, and interact with family.

- *Will our life be like this forever?*
- *At this point I think she worries that the social distancing restrictions won't ever end, and that coronavirus will never go away.*

- *Can I never hug anyone in my family again?*
- *Now, he worries that he will never go back to school or see his friends again.*
- *Worry about life being permanently different, not being able to go back to normal routines, playdates, travel, etc.*

Worries related to the ways people can contract the virus

Some children had worries related to the ways people can contract the virus. A few of these were general worries about coming into contact with the virus, while most of these worries were specific to various ways the virus can be contracted (surfaces, from others).

- *Coming in contact with germs.*
- *She has been afraid to go places because of the possibility of getting the virus.*
- *Touching surfaces. Being in public spaces.*
- *Getting stuff we need from the stores.*
- *Fear of going outside, fear of contracting the virus, fear of being around other people, worried about items being brought into the house being contaminated, worried about Amazon packages, worried about groceries.*
- *Bringing the virus home when a parent's come back from the store.*
- *My daughter has been worried about getting sick when she has appointments (she's a medically fragile kid and has regular ENT, Pulmonology, Orthopedic appointments).*

Many of these worries were related to the dangers of getting too close to other people because of the risk of getting the virus.

- *She still doesn't like when people get too close to her. She feels very strongly about social distancing.*
- *Getting too close to other people who might have been infected.*
- *We just went inside a grocery store for the first time and my son was very nervous about being in a store and being near people.*
- *She's also started fearing kids getting too close to her, which is hard.*
- *The sense that it is everywhere and invisible and dangerous, the danger of hugging, playing, talking with others outside of our immediate family.*

Worries related to preventative measures

Some children expressed worries about generally being safe and the measures they and others need to take to prevent getting sick. This includes wearing a mask, hand washing, social distancing, and staying home.

- *They were a little worried about doing the right things so we didn't catch the virus.*
- *To be safe going out without getting sick.*
- *Having to wear a mask and looking silly in it, having to stay home so much.*
- *She has expressed concerns about making sure we have masks, wondering why we are so focused on it.*
- *Doesn't like seeing people in masks.*
- *Social distancing and keeping six feet between ourselves and strangers.*
- *About social distancing in the appropriate way.*
- *That we should stay home so we don't get it.*

A few children were worried that preventative measures would always be in place in the future.

- *She was worried that social distancing and stay at home orders were going to continue forever.*
- *That the quarantine will last forever.*

Worries about passing the virus on to others

Some children were worried that they would pass on the virus to others.

- *Possibly spreading it to others, like older people, without meaning to, and when asymptomatic.*
- *They are worried they may pass it to other people.*

A number of kids express specific concerns about spreading it to a family member or relative, most often mentioning their grandparents.

- *Worried about being around grandparents when they stop by for sidewalk visits. He worries he will get them sick.*
- *He worries that he will be the one to infect his grandparents.*

Worries about people not following guidelines

Some children were worrying about other people who were not following public health prevention guidelines (wearing masks, social distancing).

- *My child worries that other people are not taking the virus seriously. He gets really frustrated when we see people without masks or socializing in groups.*
- *Noticing people not social distancing and questioning it.*
- *They feel upset about other people not following guidelines.*

Other worries

There were other worries mentioned by only a few caregivers. A few children were worried about *their pet getting sick*. A few had worries about when or if there would be a *vaccine*. A few children had *testing-related worries* - worried about people getting tested, people who can't get tested, or if they would have to get a nose swab if they got COVID-19. Children's worries related to *how the coronavirus spreads* were mentioned by a few caregivers. A few caregivers also mentioned worries related to the *origination of the coronavirus*, specifically why it happened and a worry about conspiracy theories, "She heard on the news the conspiracy theory about coronavirus being made in a lab and she wonders why anyone would want to hurt someone else on purpose."

Other children's worries mentioned by only one caregiver include:

- *Many adults talked about all the scary news and numbers and when it was first happening, things escalated quickly so there was a lot to talk about. (We live in MA.) I think she was just scared because even if she didn't understand all the information in the news that the adults around her talked about, she felt the emotion (fear) behind it.*
- *Worry about small businesses...worry about an upcoming move.*
- *That this is dangerous now.*
- *Everything!*

Supporting Caregivers' COVID-19 Pandemic-Related Information Needs

Where Caregivers Find Information to Help Children Understand COVID-related Topics

Caregivers looked to a wide variety of resources to help their children understand topics related to COVID-19. To understand the range of resources caregivers were turning to during the first part of the pandemic, they were asked, “Besides Brains On! episodes, where else have you found information to help your child understand topics related to the coronavirus?” Of the caregivers who responded to this question, only 10% relied solely on Brains On! podcast. Most (90%) reported turning to additional resources to help their child understand coronavirus-related topics. Of the 326 caregivers turning to additional resources, around two-thirds (65%) were using resources meant for an adult or general audience. A smaller percentage of caregivers (40%) were using resources developed specifically for children (other than Brains On!).

As illustrated in Figure 6, caregivers were turning to a variety of resources to help their children understand topics related to the coronavirus with news sources and podcasts (other than Brains On!) most frequently mentioned. Below are descriptions and examples of these resources, along with distinctions between kid-focused and adult-focused resources where applicable.

Most frequently mentioned	Sometimes mentioned	Rarely mentioned
<ul style="list-style-type: none">• News sources• Podcasts	<ul style="list-style-type: none">• Governmental resources• Video content (non-news)• School-provided resources	<ul style="list-style-type: none">• Radio• Searching online or using websites in general• Online educational resources• Other science-related resources• Medical professional or medical institution• Magazines• Parenting-focused resources• Books• Social media• Scientific studies• Other resources

Figure 6: Resources where caregivers found information to help their children understand coronavirus-related topics ($n = 326$).

News sources

More than any other resource, caregivers relied upon the news as a source for information. Responses were most often general references to “the news”, “the local news”, “newspapers” or “trusted news sources” and did not identify the specific source. When caregivers cited specific resources, most

frequently cited included New York Times, Washington Post, and CNN. Also mentioned were The Guardian, Today Show, and Democracy Now. News sources for kids were also included here with the New York Times Kids' Section most noted, while other kid-focused resources included CNN 10, CBC Kids, First News, and Behind the News.

Podcasts

Caregivers turned heavily to other podcasts to help understand and inform their child about the coronavirus. Podcasts families were turning to were typically themed around science, news, or the coronavirus itself. While a chunk of responses simply stated "other podcasts", caregivers identified 29 podcast resources by name (see the list of podcasts in Appendix B). These podcasts were predominantly aimed at adult audiences, however, Wow in the World, a kid-focused STEM podcast, stood out as the most cited podcast resource distantly followed by two other kid-focused podcasts, But Why? and Tumble. Some of the adult-focused podcasts mentioned included Short Wave, Science Vs, Coronavirus Daily, and Life Kit.

Governmental resources

Some caregivers used one or more governmental resources. These resources included information provided by public health offices locally (such as their city/county or their state), nationally (like the Centers for Disease Control and Prevention), and internationally (World Health Organization). The Centers for Disease Control and Prevention was the most frequently mentioned governmental resource. A few caregivers also noted briefings by public officials and policy makers as a source of information.

Video content (non-news)

Non-news video resources were used by some caregivers to help their children understand the coronavirus. Video sources were a mix of entertainment and education for both adult and child audiences. Some caregivers turned to content provided by network television or a streaming service like Netflix. Sesame Street was mentioned by a number of caregivers, especially the CNN/Sesame Street Town Hall about COVID-19. Public programming networks, like PBS, were also frequently mentioned. Some caregivers cited specific kid-focused programming including Sid the Science Kid, ABCMe shows, CBC Kids Programming, StoryBots, and Brain Child. One caregiver cited a decidedly adult-focused resource, "selected bits from late night talk shows," as helpful in dispelling bad advice concerning the coronavirus pandemic. YouTube videos were also seen as a helpful resource. Specific kid-focused YouTube channels or videos that were mentioned included the Amoeba Sisters, Miss Megan's Camp Kindergarten song about mask wearing, the SciShow Channel, Crash Course episodes on pandemics and the math behind spreading, and Dr. Binocs.

School-provided resources

Schools were a source of information for a small number of caregivers. The majority of these responses did not elaborate on the actual resource other than saying information came from school or through a teacher. The few detailed responses included teacher/class discussions about the coronavirus, "information and activities related to the virus," "some electronic-books about social distancing," and "assignments from school centered around how he could help others during uncertain times."

Radio

A small number of caregivers highlighted radio, public radio in particular, as a helpful resource in understanding the coronavirus. Most of these responses identified National Public Radio, Minnesota

Public Radio, or a local public radio station as the resource. Caregivers accessed radio content in multiple ways including online and using printed materials. A few caregivers specifically mentioned a comic book for kids created by National Public Radio titled “Exploring the New Coronavirus.”

Searching online or using websites in general

A group of caregivers described general searches for information online without specifying where or in most cases what was being searched. Typical responses included “Google”, “Websites”, “Internet”, or “Online research.”

Online educational resources

Caregivers reported a number of helpful online educational resources, most of which have kids as the primary audience. Most of these online educational resources provided caregivers and teachers with lesson plans and/or supplemental materials to school curriculum. One resource, Brain Pop, was the most frequently named online educational resource. Additional helpful online educational resources included TedEd videos, Scholastic, Mystery Doug, MEL Academy, a paid app called Marco Polo, and a Coursera class on COVID-19 contact tracing.

Other science-related resources

Some caregivers turned to other science-related resources that were almost exclusively aimed at an adult audience. Many of these resources provided visual aids for understanding the coronavirus and pandemic spread. Online COVID-19 dashboards were most frequently cited, with a few people specifically mentioning the Johns Hopkins Coronavirus Resource Center. Other caregivers were less specific about the resource, but talked about sharing scientific visuals with their child, “charts and graphs from reliable medical sources”, “images and other visuals to help better understand coronavirus,” and “we look at epidemiological graphs.” Other science-related resources identified by caregivers included Live Science, Peterattiamd.com, nextstrain.org, and kidshealth.org. Kidshealth.org was the only resource in this group offering a kid-focused portal at their webpage.

Medical professional or medical institution

A small group of caregivers identified individuals and institutions within the medical community as helpful resources in understanding the coronavirus. These responses included caregivers who spoke with friends who were doctors or other medical professionals, caregivers who got information from their child or family physicians, and caregivers whose information came from an institutional source like a hospital or clinic.

Magazines

Some caregivers found magazines useful for helping their child understand the coronavirus. These magazines were primarily intended for a kid audience and included Time for Kids and This Week Junior. Adult magazines were less frequently cited and included Scientific America, The Atlantic, and This Week.

Parenting-focused resources

A small group of caregivers identified parenting-focused resources they found helpful. Whether these were a podcast, blogs, websites, email or print communications, the resources were for and about parenting.

Books

A small number of caregivers listed books as a resource. Most of these responses did not specifically identify the name of book, although one described a book about microbes and another said they used a medical textbook. Specific books that were mentioned included kid-focused books; a Steve Mold book about viruses, home-school curriculum publisher Pandia Press' "Pandemic" unit, and the Magic School Bus books.

Social media

A few caregivers mentioned finding information on social media sites such as Facebook and Twitter and tended to be something shared by another caregiver. Caregivers did not typically describe the type of information or resources found. However, one caregiver did mention finding useful *"a few illustrations explaining COVID-19."*

Scientific studies

A handful of caregivers indicated finding peer reviewed studies or scientific articles (not news articles) helpful. Most of these caregivers did not offer any detail about the studies they read. However, one caregiver did name two specific sources - the American Academy of Pediatrics and Contemporary Pediatrics.

Other resources

A number resources mentioned by caregivers fell into the "other" category because they were too vague or unlike any of the main categories described above. Some of these caregivers noted an article or blog post they read but did not specify a source or the content of the article. Additional "other" resources included children's entertainers, a charity and a child therapy nonprofit, a church, an online journaling site, a local library pamphlet, a time capsule activity, a coloring book, and a caregiver's higher education institution.

Topics Caregivers Want Help Discussing With Their Child

Caregivers are looking for help discussing a wide range of topics related to the coronavirus with their child. Caregivers were asked "What coronavirus-related topics or questions would you like help discussing with your child?" We received responses from 286 caregivers. Responses to this question were coded into themes that emerged from the data, which are reported below along with example responses. As illustrated in Figure 7, caregivers have varying needs. Instead of a few topics mentioned frequently, caregivers mentioned a range of varying topics they would like help discussing with their child.

The topics most frequently mentioned by caregivers are related to the impact of preventive measures on children's lives, more so than topics related to the science of the virus. These impacts of preventative measures include changes in how kids experience school, how to safely socialize and reenter society, what a "new normal" focused on prevention might look like, how to talk about people who are not following guidelines, uncertainty around how long everyone's lives will be different, effects on mental health related to kids being lonely, etc. Note that these codes were not double coded as "prevention," as the prevention code focused on specific preventative measures like social distancing, wearing masks, and washing hands. The range of emotions kids are experiencing during the pandemic and information about treatment options (especially vaccines) were also topics some caregivers wanted help discussing with their child.

Most frequently mentioned	Sometimes mentioned	Rarely mentioned
<ul style="list-style-type: none"> School 	<ul style="list-style-type: none"> Preventative measures Safely reentering society during the pandemic Kids' emotions Uncertainty related to the length of the pandemic Treatment 	<ul style="list-style-type: none"> How to safely socialize People not following guidelines Transmission Infection Coronavirus origins Comparison to other pandemics and illnesses How the coronavirus may affect people differently What a post-pandemic future might be like Decisions related to reopening parts of society Geography of the coronavirus Economics Why scientific knowledge may change Immunity Other topics

Figure 7: Coronavirus-related topics caregivers would like help talking to their children about (n = 286).

School

School was the topic most frequently mentioned by caregivers, however, even then it was only mentioned by around a quarter of caregivers. Schools in the United States were closed in the spring of 2020 and when participants completed the survey in June 2020 it was unknown what school would look like in the fall. Caregivers most often wanted help talking to their children about what school might be like in the fall, which includes what safety practices might be in place if school is in person (wearing masks, social distancing practices, etc.), what distance learning may look like, or what a hybrid model might be.

- *Going BACK to school and what will be different.*
- *How schools can function safely without spreading the virus.*
- *What safety measures are needed for the return to school?*
- *What we need to be careful of, or do things differently when school reopens.*
- *He's very concerned about school and what it will or won't look like in the fall.*
- *What to expect in schools next year (how there might be hybrid models, etc.--it probably won't be normal).*

- *Heading back to school. What will that look like? What can they do? What's the science behind those decisions?*
- *Various ways to handle social distancing in the classroom/on the playground. What a "new normal" could be in this sense, from the perspective of a kid.*
- *What happens about extracurriculars, or things that used to be normal like field trips and assemblies.*
- *Wearing masks at school.*
- *Taking the bus.*
- *How to approach the return to sports.*
- *And, once safe measures for school are solidified, it might be great to learn about what schools are doing around the world and the US.*

In addition to how school might be different, caregivers also want help talking to their children about why school might be different, including why it might need to remain closed and the need to do distance learning, or why in person school may be different.

- *I think once we have a sense of what school will be like in the Fall, it might be handy to explore WHY all the changes. It's going to be rough....*
- *How schools across the country will have to consider different learning formats for the upcoming school year, and the benefits and need for these measures to keep both students and teachers safe.*

Some caregivers want help stressing to their children the importance of the safety measures that need to be taken if school is in person, as a few caregivers worry that their child will have problems following the guidelines.

- *As schools get ready to open soon, social distancing in a school environment will become a HUGE topic in our household...help families navigate discussions around this tough topic.*
- *For her age, any songs or books that reiterate safe behavior for when she goes back to camp or school would be helpful. We're not sure what things will look like when she returns to camp and school, but we're very sure that a 5yr old will still have trouble adhering to guidelines even though she understands the virus.*
- *Maybe reinforcement on good hygiene practices as society begins to function again, like at school or on sports teams. Not having my kids with me at home and losing control of the situation makes me nervous about their well-being, so I am trying to prepare them with the best habits and information possible.*

For some children, going back to school in person may cause fear or anxiety. Caregivers want help talking about these emotions and how to feel safe around others at school (see "Kids Emotions" for more discussion of the range of emotions caregivers would like help talking to their children about).

- *We will need help when we go back to school! Talking about feeling anxious being around people, about wanting to be physically near people when we still can't be, how to wear a mask all day at school. Basically, a whole episode about what going to school will be like with social distancing.*
- *How the protocol for them going to school will be and why it is helpful, not scary.*
- *It feels challenging right now, as cases massively decline in our state (PA), to convince our kids that it might be safe to open our social circles to close family and friends in the right circumstances. They really absorbed the message of social distancing and took up the cause to*

protect themselves and for the greater good, and this intermediary time when people are starting to loosen restrictions a little, feels hard to navigate for them. I know that they will not feel safe about returning to school in the fall either. So, it would be nice to see some content about how they can navigate this time and start to think about feeling safe at school when (if) it opens.

Preventative measures

Caregivers would like help talking about preventive measures with their children and the reasons why it is important to take these actions. These measures include social distancing, wearing masks, washing hands, staying physically healthy, and contact tracing. Some caregivers also want help talking about the social responsibility of taking preventative measures for the common good of their community.

Caregivers would like help talking about various topics related to social distancing (which includes stay at home orders and quarantine). Topics related to social distancing include why social distancing measures need to be taken, why children can't see their friends or family members, why certain things are cancelled or why they are harder to do, how long people might need to socially distance, and the impact of social distancing on case numbers.

- *Would love to hear how quarantine and social distancing is helping to "Flatten the Curve".*
- *Talk about how it's safe to walk around the block, to venture into your neighborhood, as long as you stay 6 feet apart.*
- *The idea of not being with family has been very hard for all of us to truly understand. We're in an area that's been ordered to stay at home and my parents/his grandparents are some of our primary support systems. It's been hard to explain to him (and his brothers) why we must distance from them.*
- *How long we have to social distance and why. Why they can't interact with their friends the way they used to.*
- *Why vacations are challenging, why camps have been cancelled.*

Caregivers would also like help talking about masks, specifically why it is important to wear masks, how to wear them properly, and the impact of wearing them on controlling the virus.

- *Mask use: How to use masks correctly. Why they are beneficial.*
- *Mask wearing and importance.*

A few caregivers had some other topics around masks that they would like help talking to their children about.

- *How our lives could change with wearing masks all the time possibly.*
- *Wearing masks sucks and it would be nice to find a way to acknowledge that in addition to promoting it. It's hot out, no one wants to wear, something that makes them hotter.*
- *My son wants to know why, after wearing a face mask for hours on end recently, he still felt like he had his mask on after he had taken it off.*
- *Info on how masks started being used in medicine?*

A number of preventative measures were mentioned by a smaller number of caregivers. These topics include the importance of hand washing, specifically about soap and how it works to eliminate the virus; the importance of staying healthy through physical exercise, eating healthy, and getting plenty of sleep; what activities are safe and how to stay safe during activities to prevent getting sick (this

includes a comment about social justice versus social distancing); and what contact tracing is and how it works to help further prevent the spread of the virus. One caregiver wanted to know how to talk about the combination of rules and knowing that it is hard for kids to always remember the guidance.

- *Any way to talk about WHY the rules are effective and how when combined they can become more effective than each alone? I know there is so much that is still unknown. She has so many questions. So many. Are masks, hand away from face and staying 6-feet apart really enough? What if... (someone sneezes, I touch my face by accident, I get closer than 6 feet but we both have masks and it's only for a few seconds.) So many "what ifs" and I just don't know how to respond, but the questions are so valid because she knows that she's a kid and they don't always *think* about the rules all the time.*

Some caregivers also wanted preventative measures talked about in relation to the importance of social responsibility and taking care of their community.

- *The importance of caring for others within our community by preventing the spread of illness.*
- *Understanding the social obligation we have to one another and why even though we are healthy we owe it to others to be safe.*
- *What we can continue to do to keep the more vulnerable safe.*

Safely reentering society during the pandemic

Caregivers want help talking to their children about how to safely reenter society during the pandemic as places begin to open back up. Quite a few caregivers referred to this time as a "new normal" and want help talking to their children about how this "new normal" may be different from what life was previously like.

- *Transitioning into the new normal.*
- *Moving forward--a really gentle approach to how things may start to go into a "new normal" focusing on the benefits.*
- *What the "new normal" may look like in months to years time.*
- *My son thinks that the coronavirus will 'go away' and we will go back to 'normal'. It is hard for us to make him understand that we need to figure out how to live with it. He has started going to school and he wants the playdates to start as well, which we are not allowing. I think the difficulty is that even we don't know what it means to 'live with the virus.' Does it mean - no play dates at all (even though school is open) or a play date with one special friend (and only that friend) and that too in a park? Or does it mean something else?*

Some caregivers wanted help talking to their children about how these changes may be in place for years to come.

- *How life may or may not be different for the next few years.*
- *Projecting long-term into the world with coronavirus until a vaccine is developed (as in, we aren't just putting up with these changes in everyday life for just 3 or 6 months, how will schools, activities, etc., adjust and how can we help ourselves get used to these probably uncomfortable adjustments).*

Some caregivers stressed that some of these changes may be long-term changes in society that don't necessarily go away after a vaccine is found.

- *I think we need more help understanding the long-term lifestyle changes.*

As part of this new normal, caregivers want help talking to their kids about the variety of children's everyday experiences that are or may be different because of the pandemic. (Comments about school, while related to reentering society, are coded separately under "School." Responses related to socializing again with friends and family, also related to reconnecting in this new normal, can be found under "How to safely socialize.")

- *What going to the doctor, store, haircut might look like.*
- *We live in Ohio so they're starting to reopen Ohio. Responsible restart, I guess is what they're calling it. So just kind of seeing how restaurants are going to work, going back to church is going to work. Like for church, they're having signup geniuses to sign up to go to church, and then they're going to assign you where you're going to sit. How does it work sitting in a restaurant to eat when you have to have a mask on the whole time? How does that work? How things are going to change? How are we going to put the filter that into our daily lives?*
- *How it would affect his future. And just how life and school will look different. Helping to understand how daily life could change for the future. How it might look whenever he can go to the grocery store, or maybe bowling again or things like that.*

Caregivers would also like help talking to their children about the ways they can be safe as things start to open up, especially as some children may be worried about re-entering society or see conflicting behaviors from people who are not following guidelines.

- *How to be safe enough as opening up?... What is safe for kids when opening?*
- *How to adjust when things return to normal--my son has not seen another child (in-person) for 3 months. He is apprehensive and a bit worried about getting sick or passing on the virus. We reassure him, but it may be nice to hear from another source that there are ways we can stay safe.*
- *So many people are disregarding advice regarding social distancing and wearing masks. This is confusing for children, so more information on why these things remain important as communities reopen would be good.*

As parts of society start to reopen and ease restrictions, a number of caregivers want help navigating the various risks in order to make safe decisions for their family. This also means help talking to their children about navigating risk and the reasoning behind their decisions.

- *How to navigate risk as cities and states are starting to loosen their stay at home guidance. The virus has not gone away so there is still risk but it is not black and white.*
- *As different locations around the world and around the US have been easing restrictions, how to think about what that means for infection rates and how families might make their own choices within what's allowed in their location. My child is very confused (as am I!) about what can and can't be done and where.*
- *I guess the hardest part about life right now is decision-making--ten thousand decisions all the time. OK to go in that store quickly? OK to see a neighbor 10-feet away with masks? OK to play with friends not in masks? I think it's really hard to be clear and firm about expectations when we keep changing and adapting the expectations. We want to be safe but also preserve mental health and it's hard to explain to kids why we will do some things and not others.*
- *How to be careful as things start to re-open, it's confusing to kids now that states are starting to soften the restrictions. Why are they doing that when case numbers are going up? What do kids need to keep doing even though things are relaxing? Answering these questions could help parents*

as they are navigating these questions at home. It could help reinforce the safety protocols that we need to continue to take, even as things re-open.

- *Also probably discussions of risk, how do we make these decisions on risks? My kids all want to go back to gymnastics ... My dad is on immunosuppressive therapy for a disease and so we have to decide, how do we calculate this risk and help figure it out? Do we go back to gymnastics because that's what we need? But then we isolate ourselves even more from my parents. So, the issue of risks and making those types of tradeoffs and knowing how you can never be 100% safe.*
- *As they open things up, should we be going out again, or should we still remain mostly at home? ...How do you make that decision of what is safe to do now? We don't really feel like we're getting good sources to make family decisions on how to move forward.*
- *I'd like to see more information on relative risks and appropriate ways to social distance. Especially as things are opening up explaining the nuance of, for example: "you can see friends from a distance away but not go in their house", etc., would be helpful.*
- *How to apply critical thinking and scientific literacy to making decisions and assessing risk.*

Kids' emotions

Caregivers want help talking to their children about how to deal with the range of emotions they are feeling during the pandemic and address issues around children's mental health.

- *Handling the emotions around coronavirus and the ongoing stress and inconvenience of staying home.*
- *The emotional toll it has taken on all of us and how that may manifest in different ways.*
- *About feelings. More into it is an unprecedented time and it's okay to feel overwhelmed.*
- *It might have been helpful to have information about how other kids and families are dealing with the emotional aspects of quarantine.*
- *How to take care of your mental health during the pandemic.*
- *Maybe a discussion on mental well-being while quarantining.*
- *The science of anxiety and mental health.*

As described earlier in this report, many of these emotions are related to worries, fears, or anxiety children have about the pandemic. Some of this anxiety is related to worries about getting sick themselves or others getting sick. Children also have a range of emotions and fears related to going back to school or reentering society after being at home for a long period of time. Caregivers want help talking to their child about how to manage the variety of anxiety and worries their child has been feeling.

- *How to manage the anxiety that children may experience because of their fear of the virus.*
- *Anxiety about being sick or getting others sick.*
- *Social emotional learning techniques that could help ease children's anxiety when they are worried about getting sick.*
- *I think there will be a lot of anxiety about going back to school in August. The social-distancing rules are fine when they are theoretical and we are staying at home, but jumping back into school might feel scary.*
- *I would love to see some child-friendly sources addressing coronavirus-related anxieties in children as schools resume.*
- *How to re-enter the world now that restrictions are being lifted and not be afraid.*

- *Talking about feeling anxious being around people.*
- *Being safe but not living in fear.*

Children are also worried about not being able to see their friends. This not only contributes to feelings of anxiety but the social isolation can lead to feelings of loneliness. Caregivers want resources that acknowledge and validate the loneliness children are experiencing and provide ideas on how to deal with that emotion. (See ideas for kids to safely socialize under “How to safely socialize.”)

- *The social effects of being isolated--how it is normal to feel upset about that!*
- *I also am really looking for ways to help deal with the anxiety and isolation due to school/camp closure, social/emotional skills, connection to other kids, ways to express and process anger and resentment about the virus forcing isolation and boredom... how to stay hopeful even when you're sick of your family and house. :)*
- *Mental health and isolation. Being without physical affection/contact/normal play with her friends is hard. Being without the structure of school is hard. Having no camps this summer is hard. She is so bored and we do our best, but have to work. Given the likelihood that school will not be the same this fall, this is a long-term challenge.*
- *I think that an episode focusing on the social impact would be helpful. My son really misses "hugging my friends" - it hurts to hear him say that.*

A few caregivers also mentioned discussing other emotions kids are feeling such as sadness and anger.

- *The emotional side effects of adapting life to the virus would be good. Talking about feelings of sadness and anger and fear and boredom, and how common they are and tips on coping (especially when resources they may have had pre-COVID-19 may be currently unavailable). Emotional issues and resilience in dealing with changes to daily life due to COVID-19.*
- *Also, talking about the potential psychological issues with childhood experts that kids may be dealing with like sadness and how it's ok to feel that way.*

Uncertainty related to the length of the pandemic

Everyone is currently living through an uncertain time. We don't know when there will be a vaccine or how long preventative measures will need to be taken. We don't know when aspects of children's lives like school and socializing with friends will go back to “normal.” Uncertainty can cause worries and fears and caregivers would like help talking about this uncertainty with their children.

- *Uncertainty is hard! We don't know what reopening will look like or when--so hard for kids to envision anything other than what they already know.*
- *Answering their questions about what will or will not happen in the future when my answer is "I don't know."*
- *How it is normal to feel anxious about the uncertainty of when life will return to normal, etc. I think this is impacting her much more than coronavirus.*

The biggest uncertainty caregivers want help talking to their children about is the uncertainty of when the pandemic will be over and how long people's lives will be different.

- *When will the virus end? This is a constant question, and I don't know how to answer it.*
- *The likely length that disruptions may occur. Kids have such a difficult time with time. It's difficult explaining that this may last a long time.*

- *I would also like advice on how to talk about the unknown future. She wants to know "when it will end."*
- *Why isn't it over yet? When will things be the same?*
- *When will it go away? Will the world ever go back to normal?*
- *The same questions we all have. How long will social distancing last?*

A few caregivers wanted help answering children's questions about how we will know the pandemic is over. And as one caregiver mentioned, helping children understand, "How it's not just a switch that turns on and off."

Children's lives have changed and they miss activities like school and socializing with friends. Caregivers would like help talking to children about the uncertainty of when they will be able to do these activities again.

- *When he can have a birthday party.*
- *When he can see/play in person with his friends again.*
- *Thinking about when indoor play dates might be safe.*
- *When can we play sports again?*
- *Understanding why we don't have a good answer to "When can I do X again?" questions.*
- *I'd like reassurance and a time frame of when we will have large gatherings again.*
- *When can we see our friends? Grandparents?*
- *The uncertainty around returning to school and when she can see her friends/resume other activities--or really, just dealing with uncertainty in general.*

The uncertainty of the future is predicated on when there will be a vaccine or more effective treatment. As discussed under the heading, "Treatment", a few caregivers would like help talking to their children about the uncertainty of how long it will take before there is a coronavirus vaccine. "When is the coronavirus going to have a vaccine and more effective treatment?"

Treatment

A number of caregivers want help talking about treating the coronavirus, both in terms of vaccines to prevent infection and treatment if someone is infected. In relation to the vaccine, some would like help talking about the process of how vaccines are developed, how they are tested to determine their safety, and how long this process can take before vaccines are available to the public (also see "Uncertainty related to the pandemic").

- *How vaccines are made and then made available to the public.*
- *The process of vaccine testing.*
- *What scientists are working on, vaccine progress.*
- *The science of vaccines... We have some idea about the vaccines because we have family members that are working in the vaccine field...But for the kids, have a bit of a misunderstanding about how it actually happens. So something that would step them through what the process is and how a vaccine works, how a vaccine is developed, and how the science is done, but in a way that they could really understand. I've seen more things about how inoculation works with a vaccine. And why inoculation helps us, because kids regularly get shots, and we have to explain that to them, and so they have a better understanding of that, but they don't have as much of an understanding about the science of how the vaccine actually is developed and gets to market.*

- *How will we know that the vaccine is safe?*
- *How fast can we get a vaccine? What are all the steps of getting the vaccine? All these trials are going well, okay, well, what does that mean? What's the trial? What do they have to do to go through all that so that could be something helpful, kind of explain all the hoops that have to get jumped through to make a vaccine getting to where it's where we needed to be.*
- *I would like to have a better answer for like a timeline of, okay, they have to develop this vaccine. How long does a vaccine take to develop? What are the processes that it goes through to develop it?*
- *He always asks us why the vaccine is not available yet.*
- *How do scientists figure out what medicine is good for stopping coronavirus for each person?*

A smaller group of caregivers want help talking about how vaccines work in general and the coronavirus vaccine specifically.

- *How do vaccines work?*
- *How these vaccines are supposed to work and if they will need to be repeated annually like the flu.*

A few caregivers want help talking to their children about how doctors are treating people who are sick with COVID-19.

- *I think that treatment would be helpful to understand. What a ventilator is and other various medical equipment. How medicine is made...etc.*
- *Something on how doctors treat patients with coronavirus. I think that's the big unanswered question for him right now.*

How to safely socialize

As discussed earlier in the report, kids are worried about not being able to see friends and family and some children are lonely since they can't socialize as they normally would due to social distancing guidelines. Caregivers would like help talking to their children about how to safely socialize.

- *How we can stay connected to friends and family when we can't see them in person.*
- *How to maintain healthy friendships while social distancing.*
- *The importance of social engagement to our well-being, and how we might be able to find these moments with our family and friends even if we can't be physically close to them.*
- *How to safely interact with friends in person.*
- *How to deal with things like outside distance playdates while still keeping responsible, would be helpful.*
- *The importance of keeping masks on and staying distanced during playdates.*

Some caregivers asked for ideas of things kids can do to safely play with others to maintain that social connection, specifically games/activities that can be done in person at a physical distance.

- *As the pandemic extends and we begin to re-calibrate our daily lives in a new normal, information and examples about how to begin to play with other children, will be very helpful.*
- *It would be interesting to hear from other kids how they have been coping with the social distancing, shared resources, activities, games, ways of connecting. How coronavirus has changed the way children socialize and learn.*

- *Ideas for what they may be able to do with friends... (socially distanced activities - my kids came up with social-distanced tag). Ways to connect with friends NOT on a screen.*
- *Perhaps sharing ideas for games, activities that people can do while maintaining a physical distance.*
- *Also like to walk through things that are ok to do- like "ok, you are sad you can't see your cousins, but you can FaceTime play video games with them, call them, write them, etc." to give kids alternatives they can do.*

People not following guidelines

Some caregivers would like help discussing with their children why some people are not following public health preventive guidelines (wearing masks, social distancing) or have different beliefs about the severity of the virus (beliefs that may be counter to scientific evidence). The differences in behavior that children see can be difficult for caregivers to explain as well as confusing for children to understand, especially when they see other kids who may not be following guidelines and playing together.

- *How to discuss why some people aren't taking the same steps as others to keep everyone safe.*
- *Why some people don't seem to care about going on/wearing masks/taking precautions. It is hard because we are extremely cautious (still sheltering in place, doing grocery delivery/pickup) but when we are driving to stores she will see people not social distancing or wearing masks or going to restaurants like there is nothing happening. So, that can be confusing for kids.*
- *It is hard to explain to them why other kids in the neighborhood are all playing together (non-family) while they are not allowed to play with their friends (rule breakers vs rule followers).*
- *My child is having a hard time seeing neighbor kids play with each other, and she can't. She is trying to engage with them from 6+ feet away, but there are many neighbor kids that are not physically-distancing like us and playing in close contact with each other. This is so hard for my child to see and feels left out, and she asks "why don't they take COVID seriously?", "why don't they care?", "it doesn't look like they have COVID - can't I play with them?" I feel sorry for her that she feels this pressure, and other parents are taking this seriously like we are.*
- *Why people don't believe in it, conspiracy theories, etc.*

Caregivers would also like guidance on how to navigate these differences in preventive behaviors and talk about them with their child.

- *How to socially navigate differing approaches (not yelling at people who aren't wearing masks).*
- *What to do when you are in a place where other people aren't social distancing or wearing masks... a park, etc.*
- *When your family is maybe taking things more seriously than other people, how to manage that difference.*
- *How to handle personal relationships with people whose ideas of social distancing are different from ours.*

Transmission

Some caregivers would like help talking about transmission of the coronavirus. Some of these topics are related to general information about how the virus spreads between individuals (or species), as well as how the virus is spreading at a larger scale.

- *More detail on how transmission occurs.*

- *I would like help with explaining how the virus can enter one's body. All the way from when the virus is on (example) a table and one's hand touches it, then the hand touches one's eyes. Then from there, does it enter your body right away? Or does it need to still find a path into your body? Another question is, if the virus is on your hand, can it enter your body from there? And how long does it live on your hand?*
- *Maybe more about how viruses go from one species to another?*
- *Information about how the virus is spreading.*

Some caregivers would like help talking about conditions that may increase or decrease the possibility of transmission.

- *Talk about how when you're outside and it's windy, the virus blows away and won't land on you.*
- *Difference between germs spreading indoors and outdoors.*
- *Why summer seems to be less risk for viruses.*
- *I want to know more about why pools and bodies of water are safe.*

A few caregivers want help talking about additional waves of the coronavirus and what that means.

- *What multiple waves means.*
- *Our kids have been asking questions about what happens if there is a second wave.*
- *Why they keep on saying that it is going to come back in the fall. Why is it? Why is it the fall that's going to be the threat?*

Infection

A number of caregivers want help talking about various topics related to infection. These topics include what it is like if you get COVID-19, how the virus makes you sick, what to do if you get sick or someone you know is sick, and information about the various outcomes of the disease (death and recovery).

- *What to expect if you get COVID-19.*
- *What to do if someone you love contracts coronavirus. What to do if you've been exposed to coronavirus.*
- *How to support someone who tests positive.*
- *How it makes people sick.*
- *There have been some articles about the microcoagulations (especially in the placenta) and we would like to know more on how the microcoagulations are a result of COVID-19. There was also mention of COVID-19 not only being respiratory but also cardiovascular, which attributes to the wide range of symptoms. I would love to hear your approach on explaining the cardiovascular aspect of the virus. I explained one way, but I am not sure if I was able to word it for her correctly or not.*
- *We haven't focused on how the virus can kill people. It's a complicated subject. Most cold/flu seasons do not result in deaths and school closure for us.*
- *I would like to hear more about the success rate of survival. The statistics that are often reported are of those who lost their lives, not those who survived.*

Some of the topics about infection were specific to kids contracting the coronavirus.

- *Maybe interviews with kids who have been sick and recovered.*
- *As a child, what to do if you get sick.*

- *How contagious it is for kids?*
- *Should we be talking about Kawasaki disease?*
- *Updates on the most recent research re: if/how kids are carriers of COVID-19 and if the research still supports initial theories that symptoms aren't as dire if kids contract the virus.*

Coronavirus origins

Some caregivers would like help talking about the origins of the coronavirus, specifically how the virus first appeared and why it exists.

- *How did coronavirus appear in the first place? Why are we having a hard time figuring out where it came from?*
- *Did it really start with a bat? How does that work?*
- *My kids would like to know why it is here.*
- *How spillovers happen and the role humans play in starting new pandemics by disrupting habitats/environments...the connection between human-caused climate change and infectious disease.*

One caregiver stressed the need to disconnect the virus from China, where it first originated. Referring to the virus in this way has led to instances of racism against members of Asian and Asian American communities. (Other issues of racism that are occurring in relation to the pandemic are discussed in “How the coronavirus may affect people differently.”)

- *I think it is helpful to disassociate the coronavirus from being Chinese. We are Asian (not Chinese) and even our kids have associated the virus as a 'Chinese thing' and while it comes from a totally innocent place (when we asked further, it's really because they know it started in China), it's easy to see how that narrative when not shared properly can quickly become damaging especially as interpreted by other kids.*

Comparisons to other pandemics and illnesses

Caregivers would like content to help their children understand how the current COVID-19 pandemic compares to other pandemics that have happened in history (historical comparisons), as well as how the coronavirus compares to other diseases (biological comparisons).

Most often caregivers asked for help talking about other pandemics in history to help children understand what life was like for other people during prior pandemics. These comparisons to other events in history and how people made it through can help address the uncertainties and worries children feel right now, giving them some hope for the future. One caregiver wanted to know the history of vaccines, which is an important historical context in relation to how prior pandemics ended.

- *It's worth understanding where this pandemic falls in scope and scale of history, specifically to emphasize that it is "a rare moment in history" but that other large transformative events have happened in previous generations and we, humans, have adapted our lifestyles and moved forward.*
- *History of other pandemics and how children made it through.*
- *Historical examples of recovering from previous pandemics or illnesses to help show that while long, it still will be temporary.*
- *I think the idea that this [the pandemic] is a part of human experience over history could help normalize it for her (and all of us).*

- *Other times humanity has survived pandemics and what helped. Maybe finding stories from family history about the influenza pandemic last century.*
- *Maybe something about epidemics of the past? How did people get rid of smallpox, polio, and other flus?*

One caregiver talked about historical examples not of prior pandemics, but other major changes in society like a disaster or scientific discovery, as a way to put this moment in time into perspective for children.

- *I think that a discussion of major social changes that were preceded by either a disaster or a major scientific discovery might help put this time in perspective.*

A few caregivers mentioned they would like help talking about biological comparisons of COVID-19 to other diseases that children may be familiar with in relation to case numbers, transmission, how it spreads, and vaccines.

- *It might actually be useful to talk about statistics and give context relative to other diseases: Are these numbers "big" or "small"? What about if we look at age? How does this compare with (pre vaccine) smallpox? Flu? SARS?*
- *Is the coronavirus the fastest to spread compared to other sicknesses? And does that make it more dangerous?*
- *How there are other coronaviruses that are just like the common cold.*
- *If they (vaccine) will need to be repeated annually like the flu.*

How the coronavirus may affect people differently

The coronavirus is known to affect people differently in terms of the severity of the illness and outcomes, with some people being infected but not showing any symptoms. Caregivers want help talking to children around these differences in general as well as differences related to age and underlying health conditions.

- *Why some people get really sick and die while others are asymptomatic.*
- *Why it affects people so differently. She knows that a lot of people have died from it, and there's other people that don't even know they had it.*
- *What does "underlying health conditions" mean, and how does that impact people who contract COVID-19?*
- *Would like help discussing, as they do research and find how it affects other age groups and may have a greater impact than just on older generations, how to discuss that with kids.*

There were some caregivers that wanted help talking to their child around the intersection of systemic racism and the coronavirus, specifically how different racial groups are disproportionately affected by COVID-19.

- *How this virus has disproportionately affected black people in the US and connection with institutionalized racism.*
- *It is affecting African Americans more - this is an issue.*
- *How coronavirus and the general unrest in the world right now with the Black Lives Matter movement intersect!*
- *In light of race issues coming to a head... how coronavirus has disproportionately affected minorities.*

- *Racial disparity in disease outcomes.*
- *How the virus is differentially affecting people of different races and why.*

What a post-pandemic future might be like

A number of caregivers would like help talking to their children about what the future might be like post-pandemic and the lasting effect the pandemic might have on society. One caregiver wanted help talking about when and if there might be another pandemic.

- *How or if this will change society forever.*
- *Ways it will affect us (society, those who have recovered, etc.) in the long term.*
- *I would love to have something that deals with visions of a post-pandemic society; how to build it and considerations that will impact social structure, health care preparedness and universal safety net, the importance of society complying with best practice recommendations, the probability of other pandemics of zoonotic viruses... I think especially a treatment of society and how to re-imagine the society we want in the future, including sustainability and safety, and how this pandemic may offer an opportunity to design our future in a way that just continuing as we had been would not have permitted. (I think it offers a positive and empowering view for kids to consider).*
- *How life may look permanently different, particularly resources for maintaining a culture of masks and social distancing long-term, not just as a temporary/quarantine measure.*
- *How will this change us in a larger way? How will this change our world for the better going forward?*
- *When will there be another pandemic? Will I have to worry about this again?*

Decisions related to reopening parts of society

Some caregivers want help answering questions related to reopening parts of society. This includes questions about why places are reopening (in some instances when cases haven't gone down), how decisions are made in relation to reopening, and if reopening means that the virus has decreased or is gone.

- *Why we are reopening even though nothing has scientifically changed.*
- *How coronavirus is still a big deal even though it's getting less press, and states/businesses are pushing to open up.*
- *What now that things are improving? Is the coronavirus gone?*
- *How biological data feeds into decision making processes around phases of quarantine/social distancing.*
- *Maybe a more social-science based exploration of how the decision-makers in their life (school superintendents, county executives) weigh and make public health decisions.*

Geography of coronavirus

Some caregivers would like help talking about the geographic differences both within the United States and around the world about the spread of the coronavirus, the impact it is having in people's lives, and the preventative measures being taken.

- *Why AZ is a hot spot.*

- *We are based in NYC, so my concern is around other parts of the country opening up. My son has already been asking about the virus spreading in other places because they are not as locked down as NYC.*
- *Why the US hasn't gotten its act together when other countries have (why we can't visit grandparents abroad, etc.).*
- *And, once safe measures for school are solidified, it might be great to learn about what schools are doing around the world and the US.*
- *More information about other countries and how they are tackling the virus.*

Economics

A small number of caregivers want help talking to their children about the economic effects of the pandemic. Comments included the economic impact on families, businesses, communities, and the global economy.

- *The world economy changing.*
- *How financial stress affects families.*
- *The economic impact of the virus. The medical/science part is easier for me to explain, but I don't know how to talk about how this affects our world in other ways besides just health.*

Why scientific knowledge may change

Scientists are continually learning more about how the coronavirus spreads, how to treat it, and what preventative measures are necessary. This means as they learn more, information about the virus and public health guidelines may also change. Caregivers would like help talking about this aspect of the nature of science with their children and how the scientific process leads to new understandings and guidance.

- *Changing science- how it is expected that information is updated.*
- *I would love for an episode on HOW we have learned more about the virus and how that is influencing recommendations and changes we are seeing around us.*
- *Why the responses (mask/no mask, different medicines) keep changing.*
- *How to understand the scientific process as it relates to medical guidance that shifts as more aspects of the coronavirus are researched and new discoveries are made.*
- *We've had some trouble helping our kids understand why there's so much we still don't know about the virus, and how we can make smart decisions about our actions when the recommendations keep changing.*

Immunity

A small group of caregivers would like help talking about immunity with their children. This includes what immunity means, what antibodies are, the concept of herd immunity, and antibody testing.

- *Immunity: teaching how time will tell if immunity is conferred long term vs short term.*
- *What it means to have an antibody test. And also talking about the inherent reliability or unreliability of these tests. How you can't ever totally be sure on those.*

Other topics

There were a variety of other topics that were mentioned less frequently by caregivers, but are still important questions that children are asking or topics that caregivers want help discussing.

There were a number of caregivers that wanted help talking about *various virus-related topics*. This includes specifics about what can *get rid of the coronavirus* or if it will ever go away.

- *Can the coronavirus go away?*
- *How sunshine affects viruses?*
- *How can we stop it in the future are the questions he still asks.*
- *Chemistry of viruses, including virus topology--understanding how it disintegrates on cardboard in one day, metal in three days.*

A few caregivers wanted help talking about questions related to *how viruses mutate*.

- *How the virus evolved or how others could do the same thing too in the future.*
- *How do scientists figure out how viruses can mutate?*

A discussion of the *differences between viruses and bacteria* were mentioned by a few caregivers. There were also a few other viruses-related comments.

- *If animals can get the virus (my son wants to know).*
- *I think it would be interesting to have some more information about the researchers who are working in the field to study animals that are reservoirs for viruses like these. My daughter is really interested in finding out about the different things researchers are doing. We couldn't find any good kid-related material about how scientists study bats and look for viruses.*

A few caregivers wanted help talking about different kinds of *tests*. It was unclear if they meant viral testing or antibody testing in their responses.

- *The different kinds of tests and what they mean.*
- *False positives & negatives regarding testing.*
- *How to be tested and what that is like.*

How to judge information children are hearing about the coronavirus was brought up by a few caregivers.

- *How to differentiate fact from opinion when looking at or listening to "news." Kids struggle with that and my kids are constantly sharing things they overheard as "fact." Help! :)*
- *Why are there so many arguments and opinions regarding coronavirus, how do you know what to believe?*

A few caregivers wanted help talking to their children about what the *words "pandemic" and "epidemic"* mean.

There were a variety of other topics mentioned by one caregiver.

- *As we typically wish, we need things that help children with disabilities to understand what is happening. Many children with autism are struggling with the radical changes to our everyday life, and resources to help that would be helpful!*
- *Good things that have happened (like protections for pangolins or reduction in pollution).*
- *What happens when you go to the doctor for a serious illness?*

Children's Questions Related to the COVID-19 Pandemic

Children submitted a wide range of questions to Brains On! about the coronavirus. Children's questions were coded into one or more themes, which are reported below along with examples of responses. Themes were developed based on topics that emerged from the data. As illustrated in Figure 8, children's questions span a wide range of topic areas. The most frequently submitted questions were related to preventative measures and uncertainty around the length of the pandemic.

Most frequently mentioned	Sometimes mentioned	Rarely mentioned
<ul style="list-style-type: none">• Preventative measures	<ul style="list-style-type: none">• Uncertainty about the length of the pandemic• Coronavirus origins• Transmission• Treatment• Comparison to other illnesses and pandemics	<ul style="list-style-type: none">• Coronavirus features and name• School• Animals• Coronavirus affecting people differently• Infection• General virus questions• Geography of the coronavirus• Getting rid of the coronavirus• Symptoms• Immunity• Other question topics

Figure 8: Topics of kids' coronavirus-related questions ($n = 177$ submissions).

Preventative measures

Children had questions about the various preventative measures people take to help stop the spread of the virus and prevent getting sick themselves. There were a variety of questions about distancing themselves from other people. This included questions around social distancing, stay at home orders, and quarantine. Some of these questions were related to why those actions were necessary as well as uncertainty around how long distancing/stay at home guidelines may last (also see "Uncertainty about the pandemic" for a discussion about kids' questions about how long they may need to change behaviors).

- *Why does social distancing help?*
- *How long are we going to need to socially distance?*
- *What is social distancing?*
- *Why is it OK to play with the kids in my family, but not other kids?*
- *Why do we need to stay at home?*
- *How does shelter in place kill COVID-19?*
- *Why do they make you wait 14 days if you might have had contact with the virus?*
- *When will quarantine be over/end?*

- *Who decides if someone needs to do quarantine?*
- *Will we have to go into isolation again?*

Masks were another preventative measure children had questions about. Some of these were questions to help them understand why wearing a mask is important in preventing the spread.

- *Why do we have to wear masks?*
- *How do masks prevent the coronavirus from spreading?*
- *Why is it so hard to breathe in a mask?*
- *Should I wear a mask when I ride my bike outside?*

Some children's questions were related to keeping their hands clean through handwashing or sanitizing. Children wanted to know how soap and sanitizer work to get rid of the virus. A few children had questions asking why hands dry out when you wash them a lot.

- *How does soap kill germs?*
- *Why does soap help wash away the coronavirus?*
- *Does the virus totally die when you wash your hands?*
- *Why do you have to wash your hands a lot?*
- *How does hand sanitizer work?*
- *Is hand sanitizer as good as washing hands?*
- *Why does hand sanitizer sting sometimes?*
- *With COVID-19, my mom is making sure my siblings and I wash our hands frequently. But now, the backs of my hands are so dry, and sometimes around my knuckles, the skin is so dry it's cracked and bleeding. My mom says it's because I'm washing my hands, but what I want to ask is.... Why does washing your hands with water make them dry out?*

There were a number of other questions kids had about preventative behaviors, reasons for doing them, and other things they may do to stay safe.

- *Why can't I play on the playground if no one else is playing?*
- *Does it really help to wipe down our groceries?*
- *I heard on the news that coronavirus can spread because of air conditioning. How do I stay safe inside buildings?*
- *Besides wearing a mask and washing my hands, are there any natural remedies (supplements, mind/body practices, etc.) that I can use to keep myself healthy during this time?*

A few children had questions related to things they could do to keep them busy while they were staying at home under quarantine.

- *Since we are at home due to the coronavirus, what are some entertaining science related activities we can try?*
- *Stuff to do in quarantine or at least like, recommendations about it?*

Uncertainty about the length of the pandemic

Children want to know how long the pandemic will continue to affect them and their normal activities. They have a sense that it will end but are uncertain when that will be. That uncertainty can be difficult for children and was the topic of many questions.

- *When will coronavirus end?*
- *How long is the coronavirus going to last?*
- *When will life go back to normal?*
- *When do scientists think the coronavirus pandemic will be over?*
- *When is this pandemic actually going to end, beyond things opening up?*
- *When will this pandemic be over? When will quarantine be over/end?*
- *How long do you think we will have to stay home during the coronavirus?*

There were some children that had questions specifically about when they would be able to do certain things again like go to school, see friends, go to the playground, etc.

- *I really miss my friends at school. I want to know when can I go back to school.*
- *My son asks a lot when this will be over and he can go to a playground again.*
- *When are we going to get to go back to school?*
- *Do you think we can go back to school in the fall?*

Some children had questions around the uncertainty of when a vaccine or “cure” would be ready or how long it might take.

- *When will the vaccine come out?*
- *How long does it take to find a cure?*

There were some children whose uncertainty was more extreme and related to a worry that things might never change or the coronavirus may never go away. While other questions were related to a timeline of when things might happen, these questions voiced uncertainty around if things would ever go back to “normal” or the pandemic would ever end.

- *Are things going to be normal again?*
- *Will coronavirus ever end?*
- *Is coronavirus going to come back every year?*
- *What if the coronavirus never goes away? What will life look like then?*
- *Will school ever be the same?*

Coronavirus origins

Several children asked questions about the origin of the coronavirus. Many of these questions were general questions about how the virus came to be such as “how did the coronavirus start?” or “how was coronavirus made in the first place?” However, some children drew on information they knew about the coronavirus origins (such as where it started and what animal may have been involved in its inception) and wanted to know more.

- *Is it true that the coronavirus came from sick animals that were caged for trading? I heard this happened because of meat, what kind of meat?*
- *Is it true that the coronavirus started from a bat in a cave in China?*
- *How did the virus first get into the bat or pangolin or whatever animal it came from?*
- *How did the COVID-19 virus spread from animals to humans? Isn't that really rare? Also, what was the secondary animal that allowed the virus to spread to humans?*
- *Where did COVID-19 come from? Was it really from bats? If no one in China got the virus, would it have happened somewhere else?*

Transmission

Children had a variety of questions related to transmission, or spread, of the coronavirus. Some questions were general questions about how the virus is spread to people.

- *How do people get the coronavirus?*
- *Why does the coronavirus spread?*
- *How does the coronavirus spread?*
- *How does the coronavirus get from object to object?*
- *Can the coronavirus spread through the air, apart from coughing?*

Some questions were about specific places or conditions that could increase or decrease the likelihood of transmission.

- *Could I get sick from a swimming pool? What about touching a slide at the playground?*
- *If the coronavirus can be contagious in droplet form does that mean we can't go to swimming pools?*
- *How likely is it to get COVID-19 from running past another person outside? If viruses are so small can't they get through masks?*
- *After we wash our hands we touch the tap again if the tap is infected do we still get infected?*
- *Is COVID-19 found in wastewater from homes before it is used as reclaimed water for various parks?*
- *Does coronavirus spread outside more than inside?*

A few children had questions about how the coronavirus gets into your body.

- *Kara and Gilly (virus characters in Brains On! episodes) told us that COVID-19 can be transmitted through your nose, eyes and mouth. What about your ears? Those are face holes, right?*
- *Can COVID-19 get in our eyes or nose?*

Treatment

Children had a variety of questions about treatments for coronavirus, both as preventative treatment through a vaccine or medicine to treat someone who has contracted the virus. At times it was unsure what kind of treatment (vaccine or medicine) they were referring to.

A number of the questions were around the progress of the development of treatments and how long it would take before there was a vaccine, medicine, or "cure" for COVID-19 (Also see "Uncertainty about the pandemic" for a discussion about kids' questions about when things might happen).

- *When will a COVID-19 vaccine be ready?*
- *How long will it take to make a working shot like a flu shot?*
- *How far are scientists from coming across a cure?*
- *Do you think we will get a vaccine for COVID-19?*
- *What is the progress on medicine for it?*

There were a number of questions related to the process of how vaccines are developed.

- *How do scientists develop the coronavirus vaccine?*
- *What are some of the ideas about a coronavirus vaccine right now?*
- *Why does it take so long to find a cure to something like the flu or coronavirus?*

Children also had a range of other questions related to treatments for COVID-19. Some of these were also coded as “Comparisons to other illness and pandemics.”

- *I heard that there will be a vaccine like we get for other diseases. How will we get the vaccine? Who is making it? Will I have to get a shot?*
- *How many people are working on a cure?*
- *Will a different vaccine from the coronavirus work on COVID-19 or not?*
- *Is it true that if you have a flu shot, you are less likely to get COVID-19?*
- *What medicines are used to treat COVID-19?*

Comparisons to other illnesses and pandemics

Some children had questions related to how the coronavirus compared to other diseases and other pandemics. Most of their questions were related to biological comparisons of COVID-19 to other diseases. Most of these comparisons were related to children wanting to understand the coronavirus in comparison to the flu and the flu vaccine, an illness and treatment they were most likely already familiar with. A few children had question about other illnesses like smallpox, the black plague, the bubonic plague, and other kinds of coronaviruses.

- *Which is more dangerous coronavirus or flu?*
- *How is Coronavirus deadlier than the flu?*
- *How can I tell COVID-19 is different from the regular flu?*
- *Why is there a flu vaccine, but not a COVID-19 vaccine?*
- *Why does it take so long to find a cure to something like the flu or coronavirus?*
- *Is the coronavirus like small pox and you can only get it once and then you are immune?*
- *How is COVID-19 like the black plague?*
- *Debate idea? Bubonic plague vs. corona virus.*
- *How is this strain (COVID-19) different from other coronavirus strains that we already know of?*
- *Some children had questions that related to their curiosity of other pandemics that may have occurred in history.*
- *Has there been any other pandemics besides this one, and if so, can you describe them?*
- *What other major pandemics have there been in recent times?*

Coronavirus features and name

Some children had general questions about the coronavirus. This include the basic question, “what is the coronavirus?” Others asked about the name of the virus.

- *Why is it called coronavirus?*
- *Why is it 19 in the name? Why corona?*
- *Why did they use Latin to name it?*

Some children had questions about the characteristics or structure of the coronavirus.

- *How did the coronavirus develop its shape? Tell me about the structure of a virus.*
- *Why is the coronavirus all spiky?*
- *What color is the COVID-19 virus?*
- *Does the coronavirus make noise?*
- *It is invisible?*

School

In the United States, schools closed in the spring of 2020 and kids began to do distance learning from home. Some kids had questions around why schools closed.

- *If coronavirus isn't dangerous to most kids, why did all the schools close?*
- *Why is my school cancelled for two weeks?*
- *Does it help if we don't go to school?*

Children also had questions about what school might be like when they go back and when the return to school might happen (also see "Uncertainty about the pandemic" for a discussion about kids' questions about when things might happen).

- *What will it be like when we go back to school?*
- *If we do go back to school, will our teachers be wearing masks? Will we?*
- *Will school ever be the same?*
- *I really miss my friends at school. I want to know when can I go back to school and if it will be different. And how? I just moved to a new town and have no friends or siblings I like listening to Brains On! to hear other kids feel the same!*
- *When are we going to get to go back to school?*

One child voiced a concern about what happens if they can't go to school but their parents have to go to work.

- *What if parents can only go to work and then kids can't go to school because of the corona virus?*

Animals

A number of children had questions about how coronavirus affects animals. Many of these questions were related to concerns about pets getting the coronavirus (dogs and cats).

- *Can dogs and cats get coronavirus? How come they don't have to wear masks?*
- *Can a dog get hurt if it gets coronavirus? Can pets give the coronavirus to their owners?*

A few children had questions about how the coronavirus affects animals in general.

- *Can animals get the coronavirus?*
- *Can the Coronavirus kill an animal?*
- *Why does the virus impact humans and not other animal cells when our DNA is so similar?*

Coronavirus affecting people differently

Some children had questions related to how the coronavirus affects people differently. A few kids wanted to know why some people didn't show any symptoms even if they are infected. "Why do some people show symptoms and get sick from the coronavirus and others don't?" Most of the questions were about differences based on characteristics of people, age, gender, or underlying conditions. With a number of the questions specifically about why kids don't seem to get as sick as adults.

- *Why are kids not getting as severe cases as adults? Is there a certain age that more people are dying from COVID-19?*
- *Why aren't kids as affected? There was a Swiss study that says kids can hug grandparents because they don't carry the virus, is this true?*

- *Why is coronavirus not as dangerous to kids as it is to older people? Is coronavirus dangerous to kids who have systemic juvenile idiopathic arthritis like I do?*
- *Is there a reason biologically why men seem to be dying more than women?*

Some of the questions weren't comparisons between kids and adults, but simply questions about how the coronavirus affects kids like them.

- *Recently kids are also being affected with the virus, are there severe cases of infection in kids and are they treatable?*
- *How many kids have gotten the virus?*
- *Do kids get coronavirus?*

Infection

Children asked questions about what was happening inside the body during infection - the how and why the coronavirus makes people sick.

- *How does coronavirus make us sick?*
- *Why does the coronavirus make us sick?*
- *What happens if you get the coronavirus?*
- *How does COVID-19 harm people?*

General virus questions

Some children had general questions about viruses, not specific to the coronavirus. These questions covered a broad range of virus-related topics.

- *How are viruses formed outside a cell? And why do viruses and germs exist? And how many virus species are there in the world?*
- *Is a virus living?*
- *Do viruses eat?*
- *Are all viruses bad?*
- *Why do you get sick from a virus?*
- *How do virus's clone their-selves??*
- *How long does it take for a germ or virus to walk 1 foot?*

Geography of the coronavirus

Children had questions about how coronavirus was affecting different areas of the world and if there were areas that may have less cases than others.

- *Has COVID-19 reached everywhere in the world?*
- *Where in the world is safest from the coronavirus?*
- *Are there some countries that don't have the coronavirus or have a little bit of the coronavirus in that country?*

One child questioned if the United States could learn from countries that have less spread. "What kind of patterns are we seeing in different countries with the spread of coronavirus? Can we use those ideas to help us here in the US?"

Getting rid of the coronavirus

A few children had questions about what can get rid of the coronavirus. These were questions about if the virus can survive in certain conditions and how the virus “dies.”

- *How can the corona virus die?*
- *How long does COVID-19 virus last when it is not in a person?*
- *Does a coronavirus (any coronavirus) ever die or leave your body?*
- *Can the coronavirus survive in acid?*
- *Why does the coronavirus not like the heat?*
- *Do cold temperatures kill the virus?*

Symptoms

Children had a number of questions about symptoms people might have if they contract the coronavirus. Some of the children’s questions were about specific symptoms they had heard about.

- *What is COVID toes?*
- *Why does the coronavirus have so many different symptoms? Like coughing or sneezing or upset stomachs or rashes or pink eye?*
- *Why are there so many different kinds of symptoms (loss of smell/taste, problems with your lungs, and problems with circulation, etc.)?*

Other questions were about the development of symptoms and what symptoms you have if you’ve got COVID-19.

- *Why does the COVID-19 symptoms only show up after 2 weeks?*
- *My question is, how does your body develop the coronavirus symptoms?*
- *How do you tell that you’ve got COVID-19?*

Immunity

A few children had questions related to if they got coronavirus could they get it again or if they would be immune. Some questions were specifically about antibodies and antibody testing.

- *Is the coronavirus like small pox and you can only get it once and then you are immune?*
- *If you get it, after you are better can you get it again?*
- *Is it 100% certain that you will get the antibodies if you get COVID-19?*
- *I have heard about some antibody tests... how do they work? What do the results mean?*
- *Would like to know what research tells us about how protected people are from the coronavirus after having it. Can you explain what antibodies are and why they matter?*

Other question topics

A few children had *questions about scientists, medical workers, and other people* who are more directly involved in addressing the issues of the pandemic. They wondered about things like what it was like to work in the medical field during the pandemic or how scientists were working on treating the virus and developing a vaccine.

- *How many people are working on a cure?*
- *How do scientists study the coronavirus without getting sick?*
- *Who is the scientist who discovered it?*

- *What does it feel like for a front-line medical worker who is risking their lives to save other people's lives? Is it important for them to not feel overly stressed because they can consider committing suicide?*

A few children wanted to know more about what the [coronavirus test](#) was like or why there were problems getting enough tests for people. *“Why is it so hard to do all the testing? Because if they can do it for some people, and it's just a swab, why is it so hard?”*

A few children wanted to know why some people were [not following prevention guidelines](#) such as staying at home or social distancing. *“Why aren't some people staying home and risking their health and others?”*

Some children had questions about the [mutation of the coronavirus](#). *“Why and how is the coronavirus mutating?”*

A couple of children had questions related [how to judge information](#) about the coronavirus to know if it is information they can trust. *“How to tell the difference between the right and wrong ways to get rid of coronavirus? Please add some examples of wrong and right ways.”*

A couple of children asked if [coronavirus affected plants](#). *“Can the Coronavirus infect a plant?”*

There were a variety of other questions mentioned by a small number of children.

- *Should I be scared about the virus?*
- *Why is the coronavirus so dangerous?*
- *Are there more strands?*
- *Why are people crazy about toilet paper?*
- *How can a kid like me help others during the coronavirus pandemic? We have been staying at home and social distancing. Can I do more?*
- *Are there any BENEFITS of having coronavirus in the world APART from less pollution and carbon emissions?*

SUMMARY OF FINDINGS

Main Findings

Children's Questions Related to the COVID-19 Pandemic

Children have many questions about the coronavirus and are looking to their caregivers for answers. Almost all caregivers in our study (97%) said their child had asked them a question about the coronavirus. Overall, caregivers are “comfortable or very comfortable” answering their child’s questions (90%).

The coronavirus-related questions children submitted to Brains On! spanned a wide range of topic areas. The most frequently submitted questions were related to preventative measures and uncertainty around the length of the pandemic. Some children asked questions about the origin of the coronavirus; transmission, or spread, of the coronavirus; and/or treatments for coronavirus, both in terms of preventative treatment through a vaccine or medicine to treat someone who has contracted the virus. See Figure 8 on page 39 for a full list of question topics.

Child-Caregiver Conversations Related to the COVID-19 Pandemic

All caregivers in our study had at least one conversation, if not more, with their child about the coronavirus. Most had talked with their child about a variety of topics including what the coronavirus is, what children and their families can do to prevent getting sick and prevent spreading the virus, and how their family’s daily life had changed because of the pandemic. Overall, caregivers were “comfortable or very comfortable” talking to their child about the coronavirus (96%). More caregivers said they were “very comfortable” talking to their child (74%), than answering their child’s coronavirus-related questions (62%).

Children's Worries About the Coronavirus

Worry and fear are common emotions for children during the pandemic. Over two-thirds (68%) of children in our study expressed worries or fears about the coronavirus. Children were worrying about a wide range of things in relation to the coronavirus during the earlier part of the pandemic (between December 2019 to early June 2020). The most frequent worry during this time period was around people getting sick from the coronavirus, often talking about an immediate family member, grandparent, or themselves. A smaller percentage of children were worried about death. Many of children’s worries were related to changes in their lives because of preventative guidelines (such as stay at home orders and social distancing) to stop the spread of the coronavirus – missing family and friends, not being in school, changes in plans, and preventative measures they needed to take themselves. The uncertainty surrounding the pandemic was also worrisome to children as they didn’t know how long their life would be changed because of these preventative measures, and some children were worried their life would never go back to “normal.” See Figure 5 on Page 12 for a full list of children’s worries.

Supporting Caregivers' COVID-19 Pandemic-Related Information Needs

Most caregivers in our study (90%) reported turning to resources in addition to the Brains On! podcast to help their child understand coronavirus-related topics. News sources and podcasts (other than Brains On!) were the most frequently mentioned resources. When looking at the intended audiences of these resources, more caregivers are relying on resources meant for adults or a general audience (65%), rather than resources developed specifically for children (40%). This is because there is a lack of sufficient child-focused resources to support kids' pandemic-related information needs. This dearth of ready and appropriate information has left caregivers in the precarious position of filtering and translating complicated and changing pandemic information to their children. As one caregiver described, "We are doing a lot of 'translating' into accessible terms."

Caregivers are looking for help discussing a wide-range of topics related to the coronavirus with their child. The topics most frequently mentioned by caregivers are related to the impact of preventive measures on children's lives, more so than topics related to the science of the virus. These impacts of preventative measures include changes in how kids experience school, how to safely socialize and reenter society, what a "new normal" focused on prevention might look like, how to talk about people who are not following guidelines, uncertainty around how long everyone's lives will be different, and effects on mental health related to kids being lonely. The range of emotions kids are experiencing during the pandemic and information about treatment options (especially vaccines) were also topics some caregivers wanted help discussing with their child. See Figure 7 on page 23 for the full list of topics.

Cross-Cutting Themes Across the Research

Dealing with Uncertainty

Broad questions and worries about uncertainty -- well beyond the uncertainty of the scientific process -- turned up across the data. There was a sense that while people may know that things will return to normal eventually, no one knows how long that will take. It's important to note that even though the uncertainty caused worries, a sense of continued hope for a return to normalcy was evidenced by many of the participants in this study. But at the same time, we saw repeated concerns that leaders and health experts cannot say how long preventative measures will be in place or how long until key activities, like school, socializing with friends and family, camp, sports, and vacation, will be back to "normal" again, if ever. Some children even expressed a worry that life may never go back to "normal." Underlying much of the uncertainty are questions about vaccine development and when a vaccine will be available, which is seen by many as key to returning to a normal routine.

One way to help address children's feelings of uncertainty is to provide historical context for what they are currently experiencing. Caregivers may have knowledge of historical examples of pandemics, or may have experienced a similar type of disaster, however most children have not. As seen in the data, caregivers want help talking about historical comparisons of other pandemics. Drawing on historical examples of how children and their families lived during a pandemic, how specific aspects of their lives were different (e.g. school, playing with friends), and how they coped with these changes can help address the uncertainties and worries children are currently feeling, giving them some hope for the future.

Understanding the Nature of Science

Now is a time when people are seeing the scientific process in action in a way they may never have before, including the testing of theories, the gaining of new insights, and the missteps that can happen along the way. In an effort to increase collaboration across the global scientific community, studies are being shared before they are peer reviewed and public health guidelines change as new information about the virus is learned, which at times can contradict what scientists previously thought they knew about the virus. There is a transparency about the messiness of the scientific process that the public often does not see or may not have previously paid attention to. This transparency may make the scientific process seem messier than the version of science often taught in school, causing some people to feel like no one knows the answers, or even harder, that we don't have a roadmap to show us how to get to the answers. As information about the virus changes and guidelines become revised, it can lead people to feel like they don't know what information to believe or what guidance to follow. This changing nature of science is a topic caregivers want help discussing with their child.

This attention to the scientific process, and how new insights are developed, is often referred to as the *Nature of Science*. One aspect of the nature of science particularly relevant to our research is described in the Next Generation Science Standards as, "Scientific knowledge is open to revision in light of new evidence" (NGSS Lead States, 2013). As illustrated in Table 2, across ages 5 - 12 (grades K - 6) the standards stress the need to understand the idea that scientific knowledge can change when new information or evidence is found. Though ideas related to the *Nature of Science* have been integrated to a certain extent in science classes for years, it has been added in greater depth to school science standards only in the last decade or two, perhaps missing many of the parents of today's elementary school students and so they may not be adequately equipped for talking about this idea with their children, hence the desire we saw from some caregivers for help talking about this topic with their child.

Table 2: Learning outcomes by grade related to the standard "Scientific knowledge is open to revision in light of new evidence."

Grade range	Learning outcomes
K - 2	<ul style="list-style-type: none">• Science knowledge can change when new information is found.
3 - 5	<ul style="list-style-type: none">• Science explanations can change based on new evidence.
6 - 8	<ul style="list-style-type: none">• Scientific explanations are subject to revision and improvement in light of new evidence.• The certainty and durability of science findings varies.• Science findings are frequently revised and/or reinterpreted based on new evidence.

Changes in Children's Lives Because of Preventative Measures

Many of children's worries are related to the changes in their lives because of preventative guidelines intended to stop the spread of COVID-19 (e.g. stay at home orders, mask rules, and social distancing recommendations). These measures, while instigated for worthwhile reasons, have caused huge disruptions both physically and emotionally for children. Children are not physically going to school, socializing with friends and family, or engaging in routine or planned activities. Avoiding these various activities, while a health precaution, has led to increased social isolation and feelings of loneliness in

some children. Caregivers expressed a need for support talking about and acknowledging the sense of loneliness their children may be experiencing. They are also looking for meaningful ways children can safely socialize with friends and family, especially when they lack the in-person interactions with other kids at school.

As parts of society begin to reopen and a “new normal” of living during a pandemic sets in, caregivers want help discussing and navigating the risks related to safely re-entering society and interacting with people outside of their household. This includes visiting businesses that are reopening, going back to school in-person, and participating in other activities that involve interacting with people in close proximity while keeping preventative guidelines in mind. As evident in our data, caregivers are clearly struggling themselves with understanding and evaluating the risks associated with participating in various activities. They are looking for guidance about how their children can socialize safely and navigate the risks involved, particularly setting up activities that children can do with their friends. Caregivers also need support in explaining the reasoning behind relative risks to their children, why preventative measures are important, and how their children can employ them to ensure they are having safe interactions with others.

Children’s Mental and Emotional Health

In addition to the emotional impact of preventative measures on their social relationships, many aspects of the pandemic are causing children to experience worry or fear. Much of what children are seeing and hearing about the coronavirus is scary, particularly if they know someone who has contracted COVID-19. Children’s top worries about the pandemic were that someone they knew, including themselves, would get sick. Death from the virus came up less often, but was a worry for some children. Worries that weren’t related to getting sick, but consequences of following preventative measures as discussed above, also had an impact on children’s emotions and mental health. Disruptions to children’s daily life and routines, the uncertainty of when they may get to see friends and family again, and a variety of worries related to going back to school were just some of the other worries taking an emotional toll on children. Caregivers are looking for resources to help children understand and cope with the range of emotions they might be experiencing, as well as guidance on how they can support their children’s mental health during this time.

REFERENCES

- Frey, W.H. (2019). *Less than half of US children under the age of 15 are white, census shows*. Retrieved from <https://www.brookings.edu/research/less-than-half-of-us-children-under-15-are-white-census-shows/>
- Fontenot, K., Semega, J., & Kollar, M. (2018). *Income and poverty in the United States: 2017. Current population reports*. Washington, D.C.: U.S. Department of Commerce.
- Grack Nelson, A., Dominguez, J., & Van Cleave, S. (2019). *Brains On! research: Listener survey*. St Paul, MN: Science Museum of Minnesota.
- Next Generation Science Standards Lead States. (2013). *Next Generation Science Standards: For States, By States. Appendix H – Understanding the Scientific Enterprise: The Nature of Science in the NGSS*. Retrieved from: <https://www.nextgenscience.org/resources/ngss-appendices>

APPENDIX A: SURVEY SAMPLE DEMOGRAPHICS

Characteristics of Brains On! Coronavirus Episode Listeners

Most child listeners of the Brains On! coronavirus episodes are in the 5 – 10 age range (see Figure 9).

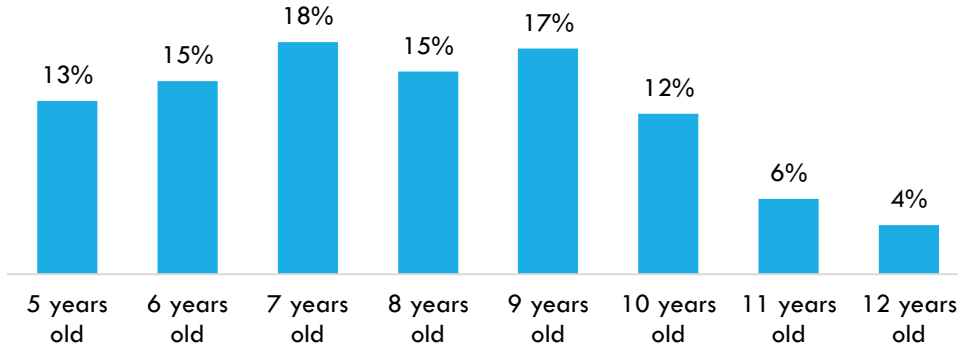


Figure 9: Ages of child listeners for Brains On! coronavirus episodes ($n = 401$).

More male children (57%) listened to a Brains On! coronavirus episode than female children (42%) or children who preferred to self-describe their gender (1%). Those who self-described their gender wrote in “non-binary – she/they”, “Gender non-binary,” and “They/Them.”

The audience of child listeners lacks racial/ethnic diversity with 75% of 5- to 12-year-old listeners identifying (by their caregiver) as white only (see Table 3). For comparison, according to 2018 census data, 50% of children age 15 and under in the United States identify as white non-Hispanic (Frey, 2019). Note: The data in Table 3 are only for child listeners in the United States.

Table 3: Race/ethnicity of U.S. child listeners of Brains On! coronavirus episodes ($n = 339$).

Race/ethnicity	Percent of children ages 5 to 12
White	75%
Multiracial ^a	16%
Asian	5%
Hispanic or Latino	4%
Black or African American	<1%
American Indian or Alaskan Native	0%
Native Hawaiian or Pacific Islander	0%

a. Respondents could choose multiple racial/ethnic groups. People that chose multiple groups were recoded as “multiracial.”

Characteristics of Respondent Households

As illustrated in Figure 10, over two-thirds (70%) of respondents come from highly-educated households with at least one person in the household holding a graduate degree. Most households (94%) have at least one adult holding some kind of post-secondary degree. Note: This data is only for households in the United States.

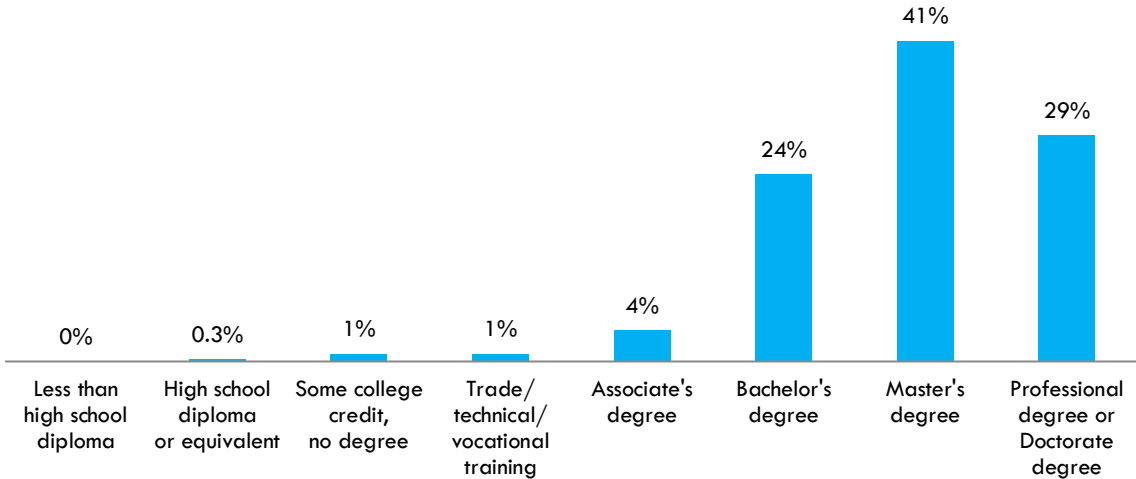


Figure 10: Highest education level attained in U.S. respondent households (n = 345).

As illustrated in Figure 11, a majority of households (63%) have a pre-pandemic annual household income of \$100,000 or more¹. For reference, the United States median household income in 2017 was \$61,372 (Fontenot, Semega, & Kollar, 2018). With this in mind, respondent households tend to be more affluent than the average U.S. household (83% of respondent households make over \$75,000 a year). Note: This data is only for households in the United States.

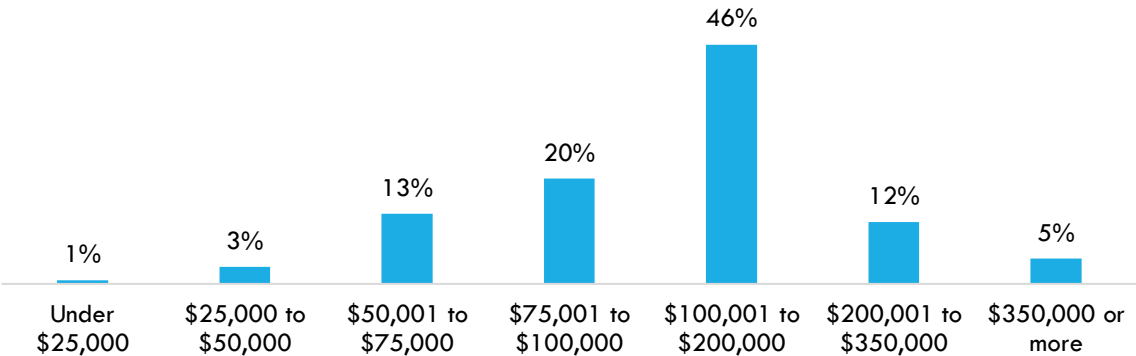


Figure 11: Pre-pandemic annual household income (before taxes) in U.S. respondent households (n = 312).

¹ We asked about pre-pandemic annual household income, instead of current income, since many families had changes in income during the pandemic (furlough, unemployed, decrease in wages, or other changes in income) or their income was in flux so it was difficult for them to answer based on current income.

A majority of respondent households (59%) had at least one adult that has a job in a science, technology, engineering, math, and/or medical/health sciences field (see Figure 12).

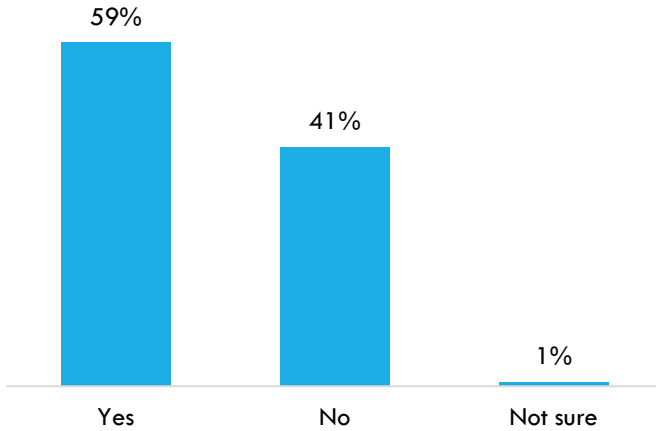


Figure 12. Percent of respondent households with an adult in a STEM-based job ($n = 398$).

Most respondents are from the United States (see Figure 13). When only considering the United States, respondent households came from almost every state as illustrated in Figure 14. California had the most responses, which is also a location of two of the Brains On! hosts. Not included in Figure 14 is one response from a US territory, Palau.

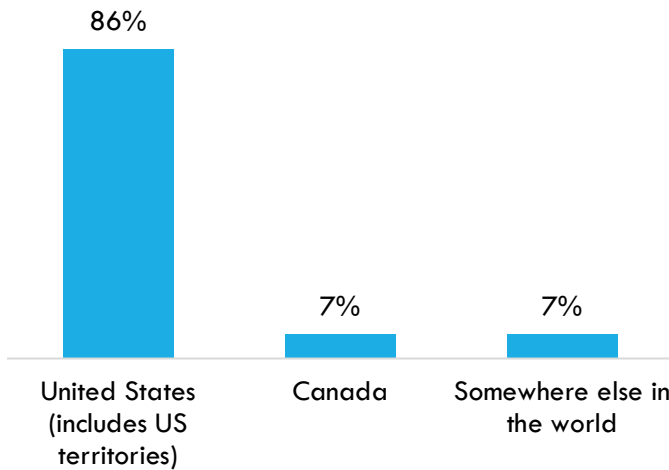
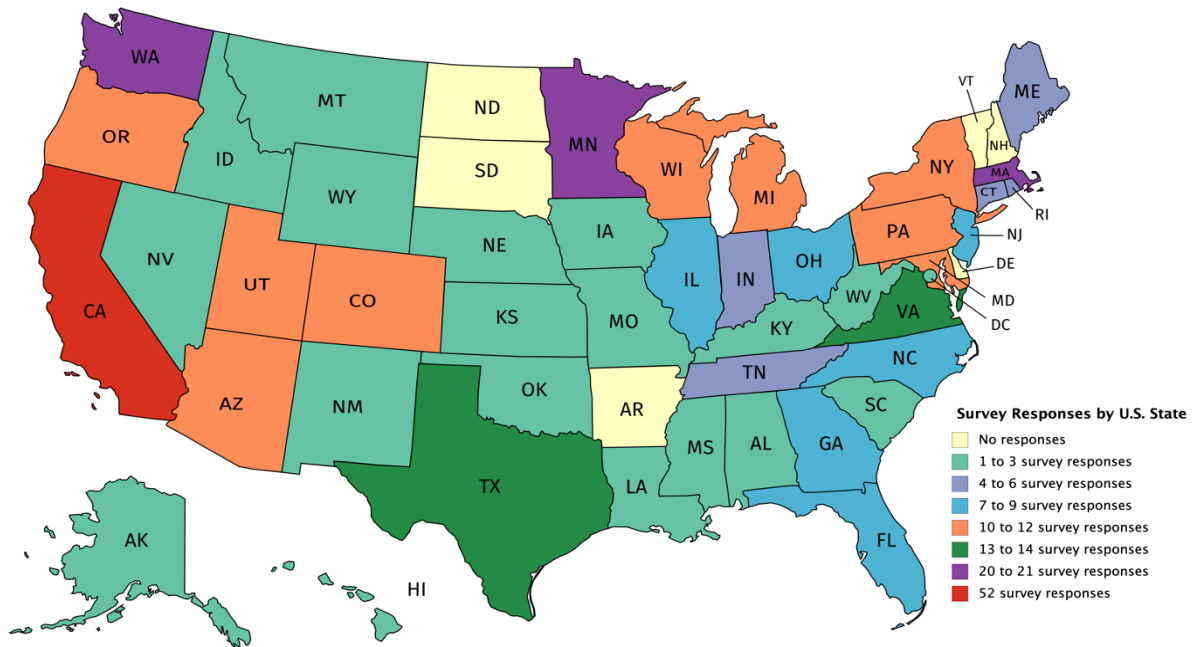


Figure 13: Respondent household locations in the world ($n = 397$).



Created with mapchart.net ©

Figure 14: Respondent household locations in the United States ($n = 343$).

Information About Adult Filling Out Survey

Of adults who filled out the survey, most (89%) were female caregivers in the household (11% male, 1% preferred to self-describe). This does not represent adult listeners in general since we didn't ask respondents to randomly choose an adult from the household. It could have just been that females were more likely to complete the survey. Note: The survey was sent to the email address of the person who signed up for the study. There were not instructions on what adult in the household should fill out the survey to try to get a more representative sample of adult experiences. The following tables (Table 4 and Table 5) provide more data on adult respondents' age range and racial or ethnic groups.

Table 4: Age of adult filling out survey (n = 400).

Age range	Percent of adult respondents
18-29	3%
30-39	44%
40-49	51%
50-59	2%
60-69	0%
70-79	0%
80 and above	0%

Table 5: Race/ethnicity of adult filling out survey. Note: This data is only for respondents from the United States (n = 341).

Race/ethnicity	Percent of adults
White	84%
Multiracial ^a	6%
Asian	6%
Hispanic or Latino	4%
Black or African American	<1%
Native Hawaiian or Pacific Islander	<1%
American Indian or Alaskan Native	0%
Racial or ethnic group not included in the list ^b	<1%

a. Respondents could choose multiple racial/ethnic groups. People that chose multiple groups were recoded as "multiracial." b. There was one adult with a race/ethnicity that was not included in the list, "From Guinea Bissau and Cape-Verde."

APPENDIX B: OTHER PODCASTS USED AS A RESOURCE

Caregivers identified 28 podcasts (other than Brains On!) that they used to help inform their children about the coronavirus. These podcasts are listed below and are separated into those with a focus on kid audiences and those focused on more of an adult or general audience. Kid podcasts were more frequently mentioned than other adult oriented podcasts. The top five podcasts mentioned (listed in order of highest to lowest) were Wow in the World, But Why, Tumble, Short Wave, and Science Vs.

Podcasts: Kids

- But Why
- Fun Kids Science Weekly
- KidNuz
- Story Pirates
- Tumble
- What if World
- Wow in the World

Podcasts: Adults

- ABC This Week with George Stephanopoulos
- CNN Coronavirus Fact Vs Fiction with Dr. Sanjay Gupta
- Coronacast - ABC Radio
- Epidemic
- Everyday Einstein
- NPR CV Daily
- NPR Life Kit
- NPR Up First
- New York Times The Daily
- Ologies with Alie Ward
- Pantsuit Politics
- Public Health On Call
- Radio Lab
- Sawbones: A Marital Tour of Misguided Medicine
- Science Vs.
- Short Wave
- Splendid Table
- The Darkest Timeline
- This Podcast Will Kill You
- This Week in Virology
- Unspookable

APPENDIX C: WHAT WOULD HELP CAREGIVERS FEEL MORE COMFORTABLE DISCUSSING THE CORONAVIRUS

Listed below are responses from 26 caregivers about what would help them feel more comfortable talking to their child about the coronavirus and/or answering questions their child has about the coronavirus.

- *Being more informed myself.*
- *Having more knowledge myself.*
- *If I had a deeper understanding on how a pandemic evolves and ceases to be.*
- *If I was an epidemiologist (ha ha!).*
- *If there was more concrete information about it from public health experts and/or the government.*
- *More facts! I am not a doctor or scientist, so that affects my ability to answer questions, but there are also simply a lot of unanswered questions yet, even for the experts.*
- *More knowledge maybe? The thing is with coronavirus, you don't know that much. You don't want to give wrong information. It's changing, and they're learning about it so quickly that I don't know that I could give accurate answers because I'm not a scientist.*
- *More answers to give them would be great. It's scary offering them the unknown.*
- *If there was just more certainty about the virus and its modes of transmission.*
- *Kids want predictability and structure. The nature of this pandemic makes it difficult to give them that kind of reassurance. I also don't want to give them wrong answers or spread misinformation.*
- *Knowing more and knowing it with certainty.*
- *Learning how to answer when I don't know the facts or the facts are unknown/uncertain.*
- *Being able to predict the future of our living our lives with the virus.*
- *Knowing the future.*
- *Having some sense of hope for a day when things can resume to normal.*
- *Having solid information, myself, and being able to filter out the political side of the pandemic.*
- *Having a reliable source.*
- *Access to more careful information that isn't filtered through mass media or partisanship. I was really glad to see that Brains On! was doing these episodes because I trust the show to give children careful, balanced information that won't panic them but will help them know how to be safe.*
- *More advice on how to give him information (e.g., that COVID can be dangerous for older people) without scaring them (e.g., I don't want to make him worry that his grandparents could die).*
- *Not sure how to address questions relating to people dying.*
- *More information about navigating decisions as places open up. How to navigate the emotions, anxiety, and the unknown about seeing people and visiting places again. Also, suggestions for navigating when others have a different level of comfort seeing people and being out.*
- *She wants to know why we are social distancing & wearing masks when do many people she sees in public are not. She wants to know when it will be over. I don't have answers.*
- *Better understanding of how to approach the subject with a 5-year-old.*

- *Mainly my child being older. Age seven still seems very young to discover how scary the world can be. But, answering curiosity is important in our household, so I work to answer with age-appropriate information. What equals "age-appropriate" is hard to decide.*
- *I still haven't fully processed the pandemic myself, so sometimes I have trouble controlling my emotions. I try not to break down in front of my child but sometimes I am visibly upset. I feel like a good resource for parents might be some strategies for how to talk about the hard topics without getting overly emotional.*
- *It's really difficult to figure out how she is asking the question.*