"Will I Get Sick?":
Parents' Explanations to Children's Questions about a Novel Illness

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Abstract

When encountered with a novel illness, children often ask for information about the illness and its impact on health from their parents. Although prior studies have explored how parents generally described the coronavirus to their children, there is an ambiguity in whether parents' explanations about the coronavirus were about the coronavirus itself or about the pandemic more generally. Furthermore, it remains to be explored how parents responded to questions about the impact of the coronavirus on health. So, the current study explored how parents ($N = 425$) responded to specific questions that sought out information about the coronavirus and its impact. The results suggest that parents use their child's specific questions as an opportunity to foster their child's understanding about an illness. At the same time, parents also use their responses to shield their child from potential upsetting information about the impact of the coronavirus on health and well-being.

Keywords: Coronavirus, novel illness, parent-child conversation, parent explanation, shielding

"Will I Get Sick?": Parents' Explanations to Children's Questions about a Novel Illness

Children start to have a rudimentary understanding of germs and illnesses during the preschool years (Kalish, 1996; Solomon & Cassimatis, 1999) and they continue to refine their understanding of illness well into the formal school years (Myant & Williams, 2008; Toyama, 2016). Conversations with adults and more knowledgeable others provide important information about key unobservable biological concepts, such as germs (Harris & Koenig, 2006). Given this prior work, the goal of this study was to examine the type of information parents provide about the coronavirus to explore what kind of biological information children might acquire from parents.

The COVID-19 pandemic created a unique social milieu to investigate how adults respond to children's questions about novel illness. Since parents were a primary source of information for children to learn about the coronavirus and its impact during the pandemic (Menendez et al., 2021), investigating parent-child conversations about the coronavirus could provide an important context to understand how children advance their understanding of illness and viruses. Although several studies have explored parent-child conversations about the COVID-19 pandemic (Haber et al., 2022; Leotti et al., 2021; Menendez et al., 2021; Ünlütabak & Velioğlu, 2022), it is unclear how parents responded to children's specific questions seeking information about biological or health aspects of the coronavirus. As such, this study investigated parents' responses to specific questions asked by their children which could have been used to seek biological information about the coronavirus (i.e., 'What is the coronavirus?', 'How do you get the coronavirus?') and its impact on health (i.e., 'Am I going to get sick?', 'Is a family member or friend going to get sick?'). In addition, we examined how parental and child factors might be associated with parents' responses to these questions.

Parent-Child Conversations

Young children actively use questions as a method to acquire new information about the world in order to fill gaps in their knowledge (e.g., Callanan & Oakes, 1992; Mills et al., 2010; Ronfard et al., 2018). Explanations elicited by these questions can be important for helping children understand key concepts that cannot be acquired through first-hand experiences (e.g., Frazier et al., 2009) such as a novel illness. Even though it is impossible for children to learn from observation that viruses cause illnesses, parent's testimony can facilitate children's learning about such unobservable biological concepts (Harris & Koenig, 2006). Prior research suggests that parent's testimony enables preschool-age children to understand that invisible viruses or germs are living entities that exist in the world without ever observing them with their naked-eyes (Harris et al., 2006; Lane, 2021; Menendez et al., 2021).

In addition to learning about the existence of viruses and germs from parents' testimonies, children can learn about causal mechanisms of illnesses through parents' causal explanations (Au & Romo, 1999). Prior studies with 3- to 11-year-olds have demonstrated that providing children with an explicit causal explanation about an illness improves children's understanding of illness transmission (Conrad et al., 2020; DeJesus et al., 2021; Legare et al., 2009; Myant & Williams, 2008), and such understanding promotes adaptive behavioral change in children (e.g., Blacker & LoBue, 2016; Leotti et al., 2021). Thus, understanding how parents respond to children's questions about a novel illness can provide an insight into what kind of information (e.g., reference to virus, causal explanation, severity of illness) children are provided with when asking their parents questions about viruses and illnesses.

Parents' Explanations about the Coronavirus

Two prior studies (Haber et al., 2022; Leotti et al., 2021) asked parents with a child between the ages of 3 to 9 years to report how they explained the coronavirus to their child without specifying what prompted the explanation (i.e., child's question, spontaneous explanation) in a parental survey. These researchers found that parents placed more emphasis on social and behavioral changes that were brought about by the pandemic (e.g., preventative measures) than on biological aspects of the virus (e.g., reference to virus/germ, how the virus is spread) when explaining the coronavirus to their child. For instance, Leotti and colleagues (2021) found that about 73% of parents' descriptions of the coronavirus mentioned risk and preventive measures (e.g., importance of hand washing) whereas less than half of the descriptions mentioned biological aspects of the virus (virus/germ related responses: 39%; causal explanations: 8%). Even though the findings suggest that parents are less likely to provide biological explanations when explaining the coronavirus to their child, these findings might not be the best representation of parents' actual responses to children's questions seeking specific information about the coronavirus due to the nature of the survey question that was asked.

Parents in both studies were asked to report how they generally explained the coronavirus to their child. For instance, Haber and colleagues (2022) asked parents to "please share how, if at all, [they] explained the Coronavirus to [their] child". Even though the question asks about the virus, parents could have broadly interpreted it as a question asking about the pandemic in general since the term 'coronavirus' is closely associated with the pandemic. Furthermore, during the early stages of the pandemic children between the ages of 3 to 12 years asked more questions about social and behavioral changes than specific questions about the coronavirus itself to their parents (May, 2020 for Haber et al., 2022; April, 2020 for Menendez et al., 2021). This was when most of the U.S. states were under stay-at-home orders (March - May of 2020;

Moreland et al., 2020). Since both studies were conducted at a relatively early stage of the pandemic (May, 2020 for Haber et al., 2022; March, 2020 for Leotti et al., 2021), parents could have focused their responses on the social and behavioral changes, things that were more asked about by children, than questions about the biological aspects of the virus. So, parents could have been biased to focus more on the social changes than biological aspects of the coronavirus when answering a broadly stated survey question. Thus, it is unclear whether lack of emphasis on the biological aspects of the virus in parents' explanations is due to actual lack of biological explanation in parents' responses or due to the broadly stated question that was used in prior studies.

One way to eliminate this possible ambiguity regarding parents' explanations about the coronavirus is by examining parents' responses to children's specific questions. Prior research on parent-child conversations suggests that parents' responses are tailored toward the type of questions that are asked by children (e.g., Mills et al., 2022). For instance, parents are more likely to respond with causal explanations when answering 3- to 5-year-old children's 'why' and 'how' questions than other types of questions (Kelemen et al., 2005). So, examining parents' responses to specific questions that could be used to seek biological information about the coronavirus (i.e., 'What is the coronavirus?') might be more informative with regard to how parents explain the coronavirus. Furthermore, examining responses to a question that directly seeks information about the coronavirus transmission (i.e., 'How do you get the coronavirus?') could be a better way to investigate whether parents provide causal explanations about the coronavirus than by asking more broadly how parents might explain the coronavirus.

Parents' Responses to Questions about the Impact of the Coronavirus on Health

Prior studies on parent-child conversations about the COVID-19 pandemic found that children between the ages of 3- to 12-years asked questions about the impact of the coronavirus on health in addition to questions about the coronavirus and social changes (Haber et al., 2022; Menendez et al., 2021; Ünlütabak & Velioğlu, 2022). These results suggest that children are not only curious about the virus that resulted in the pandemic and the social changes that are affecting their daily lives, but also about the impact of the virus on their own and others' health. Given that some prior work has only asked parents to report how they generally explained the coronavirus (Haber et al., 2022; Leotti et al., 2021), we do not know how parents actually responded to specific questions about the health impact of the coronavirus. In studies where parents reported answers to specific questions in a survey (Menendez et al., 2021; Ünlütabak & Velioğlu, 2022), the data was not described based on the type of question that the children asked. This means that prior research provides limited information about how parents actually responded to children's specific questions about health. However, examining parents' responses to a question that indirectly asks how contagious a novel illness is (e.g., 'Am I going to get sick?') could provide additional information for understanding what kind of information children acquire about a novel illness from their parents.

In addition to factual biological information about an illness, information on whether the child or others will get sick from the illness could play an important role in the child's understanding of an illness. Prior studies suggest that preschool-age children's understanding of causal mechanisms related to illness influences their understanding of illness transmission (Conrad et al., 2020; DeJesus et al., 2021; Legare et al., 2009). In addition to causal information about an illness, information on the impact of the illness on the child's own and others' health (e.g., suggesting that one would or would not get sick) could provide children with some insight

into the contagiousness of the illness. However, since the coronavirus was one of the leading causes of deaths in the U.S. during the pandemic (Shiels et al., 2022), parents could have decided to protect or 'shield' their child of the true health-impact of the virus (e.g., child and/or others will not get sick from the coronavirus). Such shielding behavior from parents has been reported in parent-child conversations with preschool-age children about death (e.g., one will not die; Rosengren et al., 2014). Furthermore, parents of children between the ages of 3 to 12 years have reported that they shield their child from information about the COVID-19 pandemic (Menendez et al., 2021). So, parents might choose to shield their child from certain information about the pandemic and suggest that their child and others will not get sick from the virus to protect their child from information that they believe could potentially negatively impact their child's wellbeing (e.g., Rosengren et al., 2014; Stein et al., 2019).

However, the parents' response to shield their children from certain information related to the health-impact of the illness could potentially contradict important biological information about the transmission of the coronavirus (i.e., a causal explanation of the virus). The conflicting information on how a novel virus gets transmitted and that there might not be any negative consequences on the child's own and/or others' health could provide children with an incomplete biological understanding of the illness. So, understanding how parents respond to children's specific questions about the child's and others' safety might provide richer information to understand how children advance their knowledge about viruses and illnesses through their question asking.

Influence of Individual Factors on Parents' Responses

Parents' responses to their child's questions can be influenced by both child and parental factors. As for the child factors, prior studies have suggested that both age and the child's

perceived knowledge influence parents' explanations. For instance, parents of older children have been shown to be more likely to provide complex explanations (Callanan & Oakes, 1992) and share information about an illness (Adduci et al., 2012; Clarke et al., 2005; Stein et al., 2019) than parents with younger children. However, parents were more likely to provide younger children with information that is intended to scaffold children's understanding of a new concept than older children (e.g., connecting to prior knowledge, experience; Mills et al., 2022). In addition to child's age, the child's level of knowledge has been found to influence parent's explanations. For example, Palmquist and Crowley (2007) found that parents with children between the ages of 5 to 7 years were more likely to provide explanations about a museum exhibit if their child did not have much knowledge about the exhibit. So, parents' responses to their child's questions about the coronavirus might vary depending on their child's age and background knowledge.

In addition to child factors, parents' own knowledge in a particular domain could influence how they respond to children's questions. Knowledgeable parents are more likely to provide information related to topic at hand (Eberbach & Crowley, 2017) and more likely to provide explanations in response to a child's question (Menendez et al., 2021; Mills et al., 2022). In line with this work, parents' responses to children's questions about the coronavirus could be influenced by their knowledge of biology in general and of the COVID-19 pandemic.

Parents' responses could also be influenced by their comfort level with the topic of a particular question. Researchers have shown that parents of young children often do not like to talk to their children about topics related to reproduction or death. Parents suggest that these topics are not appropriate for young children because the children lack the cognitive and emotional maturity to handle them (Nguyen & Rosengren, 2004). When it comes to death,

parents report trying to shield their child from information about death and related events (Rosengren et al., 2014). This also appears to be the case for COVID-19 at least for some parents. When parents were asked whether they shield their child from the COVID-19 information, about half of them responded that they do shield their child (Menendez et al., 2021). Therefore, whether or not a parent decides to shield their child from information about illness might be an important individual difference that could influence the answers they provide to their children. This could be even more evident when parents are asked to answer a specific question that directly asks whether their child will get sick from the coronavirus since parents have tendency to protect their children from information about illnesses (e.g., Stein et al., 2019).

Lastly, how parents have been impacted by the COVID-19 pandemic could have an influence on how they respond to their child. Parental stress has been suggested to negatively impact parent-child interactions (Deater-Deckard, 1998), and parents have reported that changes that are brought about by the pandemic (e.g., change in child-care routines) have made them feel more stressed compared to pre-COVID times (Adams et al., 2021). So, it is possible that parents' perception of how the COVID-19 pandemic has influenced their lives in terms of stress might impact their responses to their child's questions. Specifically, the impact of COVID-19 could have negatively influenced parent-child conversations through parents' avoidance behavior to children's questions. Thus, the impact of COVID-19 on parents' lives might be an important individual factor that is related to how parents respond to their children's questions.

The Current Study

Past research has shown that children seek out information about the coronavirus and its impact on health from parents when asking about the COVID-19 pandemic (e.g., Menendez et al., 2021). However, prior studies on parent-child conversations about the pandemic do not

provide a clear picture on how parents responded to *specific* questions about the biological or health aspects of the coronavirus. The purpose of this study was to explore parents' responses to specific questions that could have been used to seek out information about the coronavirus and its impact (i.e., 'What is the coronavirus?', 'How do you get the coronavirus?', 'Am I going to get sick?', and 'Is a family member or friend going to get sick?'). Additionally, we examined how parents' responses to these questions were dependent on both parental and child factors.

In order to get a better understanding of what kind of information parents provided about the coronavirus, we examined parents' responses to two specific questions that children could have asked when searching for specific biological information about the coronavirus: 'What is the coronavirus?' and 'How do you get the coronavirus?'. Because parents' responses are tailored to the questions children ask (e.g., Mills et al., 2022), we expected parents to provide more biological explanations (e.g., in relation to the virus, causal explanations) about the coronavirus to these specific questions than was reported in prior studies (Haber et al., 2022; Leotti et al., 2021). Furthermore, we expected parents to respond with more causal explanations when they were asked specifically about the casual mechanism of coronavirus (i.e., "How" question) as parents are more likely to respond with causal explanation when asked a 'How' question than other types of questions (Kelemen et al., 2005; Mills et al., 2022). We also expected parents to respond with more factual information about the coronavirus (i.e., that it is a virus or germ) when asked about the coronavirus itself (Kelemen et al., 2005). As for individual factors, we expected children's age to be significantly related to parents' responses such that parents with older children would provide more information related to the virus and causal explanation as past research has shown that parents are more likely to share illness information with older children (Stein et al., 2019). Additionally, because parents are more likely to provide

explanations to children who are perceived to lack knowledge (Palmquist & Crowley, 2007), we expected parents to provide more information related to the virus and causal explanation to children who are perceived to have lower levels of biology knowledge. Lastly, based on past research we expected that parents who view themselves as more knowledgeable about biology and the COVID-19 pandemic would provide more virus and causal explanations (e.g., Eberbach & Crowley, 2017).

A second set of questions that were explored in the current study concerned the impact of coronavirus on one's and others' health: 'Am I going to get sick?' and 'Is a family member or friend going to get sick?'. It is possible that parents would respond to these questions differently as one ('Am I going to get sick?') directly involves their child and the other ('Is a family member or friend going to get sick?') does not. However, it is unclear from past research how parents respond to these specific questions. So, one of the goals of this study was to explore parents' responses to these questions, specifically examining whether parents suggest that one would or would not get sick from the virus, or just avoid answering these questions. Concerning the individual factors, we expected child's age and biology knowledge, and parent's biology and COVID knowledge to be significantly related to parents' responses similar to the questions about the coronavirus.

For questions on the impact of the coronavirus on health, we also wanted to see whether there were any individual factors that would influence parent's avoidance behavior to answering these questions. Because parents prefer to protect their child from information that could potentially negatively impact their child's wellbeing (e.g., Rosengren et al., 2014; Stein et al., 2019), we expected parents who shield their children from the information about COVID-19 and

are more impacted by the COVID-19 pandemic would be more likely to avoid answering their child's questions.

Method

Participants

A total of 505 parents who were over the age of 18, lived in the US, and had at least one child between ages of 3- to 7-years, were recruited from Amazon Mechanical Turk (MTurk). We recruited parents with children between the ages of 3- to 7-years because children's conception of illness undergoes substantial change during this age range (Kalish, 1996; Solomon & Cassimatis, 1999). During the preschool years, children start to understand that illnesses are caused by invisible organisms like germs (Kalish, 1996; Legare et al., 2009) and acquire a basic understanding of contagion (Myant & Williams, 2005). By 9 years of age, children start to provide accurate explanation of biological mechanisms of contagions (Myant & Williams, 2005). Since children start to gain knowledge about illnesses and contagion during preschool and the early school years, examining how parents with children between the ages of 3- to 7-years respond to questions related to the Coronavirus can provide information on what kind of information children acquire about the coronavirus and illnesses, in general, during the time when children gain important knowledge about illnesses and contagion. Following Menendez and colleagues' study (2021) which explored parent-child conversations on the COVID-19 pandemic through a parental survey, we aimed to recruit a total of 500 parents with an expectation that some of the respondents would be filtered out for completing the survey under false pretenses.

Seventy-seven individuals were excluded from the final sample for failing at least one attention check that was included in the survey and three additional parents were excluded for

providing nonsensical responses to the four questions that were central to this study (e.g., responding with a number for all questions). The final sample included 425 parents (M_{age} = 37.2 years, range = 22 - 67 years; 246 females). The survey was open from December 29th to December 30th, 2020. On average respondents took about 35 minutes to complete the survey and they were paid $6.

At least one respondent was from 46 of the 50 states of the United States. The majority of respondents (78%) identified their race and ethnicity as Caucasian/White and non-Hispanic (*n* = 333). Other respondents identified their race and ethnicity as African American/Black (*n* = 42), Asian/Pacific Islander (*n* = 17), Hispanic/Latino (*n* = 20), Native American (*n* = 7), and multi-racial or other (*n* = 6). As a proxy for socioeconomic status, respondents were asked to indicate their perceived social status using the MacArthur Scale of Subjective Social Status (Goodman et al., 2001). The scale asks respondents to place themselves on a scale from 0 (denoted as people who are worst off: least money, least education, and least respected jobs) to 10 (denoted as people who are the best off: most money, most education, and most respected jobs). The mean score of our final sample was 5.63 (*SD* = 1.99). Additionally, respondents were asked to indicate their highest earned degree. Most respondents (64%) earned at least a bachelor's degree: some high school (*n* = 1), high school degree (*n* = 38), some college (*n* = 63), associate degree (*n* = 51), bachelor's degree (*n* = 197), master's degree (*n* = 72), and doctoral level degree (*n* = 3).

Procedure and Measures

Three methods were used to screen out participants who did not meet the study's recruitment criteria and answer the survey conscientiously. First, MTurk was setup so that the study survey was visible only to MTurk workers who resided in the US, were a parent, and had a MTurk prior survey approval rating of 90%. Second, MTurk workers who were able to access

the survey were presented with three screener questions which were intended to verify that they were in fact a parent with a child between the ages of 3- and 7-years and residing in the US. These questions were presented with distractor questions such that participants would not have known which answer to these questions would allow them to continue with the survey. Participants who passed the screener were presented with a consent form and were allowed to complete the survey. Furthermore, attention check questions were embedded in the survey to screen out participants who did not answer the questions conscientiously. Refer to Supplementary Materials for more information about attention check questions.

The survey consisted of 191 questions and was administered through the Qualtrics platform. The main purpose of the survey was to better understand how parents responded to children's specific questions related to the COVID-19 pandemic. The questions used in the survey were the most frequently asked questions by children to their parents concerning the pandemic reported in Menendez and colleagues' study (2021). In addition to children's questions, parents were asked to report on their coping, anxiety, and worry levels, whether their child attends school in-person or not, and who they think should teach their child about COVID-19. The survey also included measures of parent and family functioning (e.g., Alcohol and Substance Use Questionnaire, Child Rearing Disagreement, Duke University Religion Index) to better understand the influence of contextual factors on parent-child conversations. Because the survey was part of a larger study, only questions that are relevant to the current study are presented below. The full survey can be found at: https://osf.io/a8us3/?view_only=64f617ec0eb0422a9e8f173e665417c4.

Parent Responses to Child's Questions. In the entire survey parents were asked if their child had asked them twelve specific questions about the coronavirus and the pandemic.

However, since the majority of the questions were focused on the pandemic (e.g., “Why they cannot go to school?”), we examined responses to four questions that were directly relevant to this particular study and informed by the findings of Menendez et al., 2021. First, parents were asked to “indicate whether [their child] has asked any of the following questions” in a ‘Yes’ or ‘No’ format: “What is the coronavirus?”, “How do you get the coronavirus?”, “Am I going to get sick?”, and “Is a family member or friend going to get sick?”. Then, for the questions that parents indicated ‘Yes’, they were presented with an open-ended follow-up question that asked “what [their] response [was] when [their child] asked” the question.

COVID-19 Impact Scale. In order to get an overall measure of how the COVID-19 pandemic impacted participants, the Coronavirus Impact Scale (Stoddard et al., 2021) was used. The first 8 items of the scale have been reported to provide a reliable measure of the overall impact of COVID-19 (α = 0.64 - 0.75; Stoddard et al., 2021). These 8 items were used in the current study to assess parent’s view on how COVID-19 has affected their life (α = 0.81 for the current study). Parents were asked to rate the impact of the pandemic on a 4-point Likert scale ranging from 0 (‘No change’) to 3 (‘Severe’) with the following question: “How has the Coronavirus pandemic impacted your [areas of life]”. The areas of life were “daily routines”, “family income/employment”, “food access”, “medical health care access”, “mental health treatment access”, “social support”, “COVID-19 related stress”, and “family discord”. These values were summed to provide the COVID-19 Impact Score ranging from 0 to 24.

Shielding. Similar to Menendez et al., 2021, parents were asked whether they shield their child from information about COVID-19 by asking them to complete the following sentence: “I try to shield [my child] from the COVID-19 situation because:”. They were provided with the following options to choose from: “I do not shield my child from information about the COVID-

19 situation," "I think that the COVID-19 is no different than the seasonal flu," "I think we are making too big a deal about the virus," "I do not want to worry them," "I do not think they are able of coping emotionally with it," and "I do not think they are old enough to understand what is going on." Parents had the option to choose multiple reasons.

Knowledge. Parents were asked to "indicate [their]/ [their child's] level of understanding of biology" using a 7-point Likert scale (1 = 'Far below average'; 7 = 'Far above average'). Also, parents were asked to report if they "feel like [they] have enough knowledge or information to answer [their] child's question about the current situation surrounding COVID-19" using a 7-point Likert scale (1= 'Strongly disagree; 7 = 'Strongly agree').

Demographics. Parents reported demographic information including age, gender, race/ethnicity, subjective SES (Goodman et al., 2001), educational level, and state of residence.

Parent-Response Coding.

Different coding categories were used for the questions about the coronavirus ('What is the coronavirus?', 'How do you get the coronavirus?') and about the impact of coronavirus ('Am I going to get sick?', 'Is a family member or friend going to get sick?'). Hereinafter 'What', 'How', 'Sick-self', and 'Sick-other' will be used to refer to the four questions respectively. Nine categories were used to code for the coronavirus question responses: virus, general illness, avoid, causal explanation, novelty, prior knowledge, severity of illness, preventative measures, and health related (see Table 1 for description and examples). The first three categories were mutually exclusive. Similarly, seven categories were used to code for the impact question responses: yes, no, uncertain, avoid, preventative measures, family as protector, and reassurance. The first 4 categories were mutually exclusive. These categories were based on categories that were used in prior studies (Haber et al., 2022; Leotti et al., 2021; Menendez et al., 2021).

Responses of participants who were excluded from the final sample were also used to finalize the coding categories for the health-impact questions. The excluded responses provided a great reference point in creating the coding categories in addition to 'Yes', 'No', and 'Avoid' responses since it was unclear how parents would respond to the health-impact questions. For each question, two coders coded at least 20% of the parents' responses for interrater reliability. Cohen's Kappa statistic for all coding categories were at least 0.73 and any disagreements were resolved through discussion.

Table 1.

Parent-Response Coding and Examples

Questions about the Coronavirus				
Response Category	Description	Example	Cohen's Kappa	
			'What	'How'
Virus*	Includes virus or germs as description.	"Coronavirus is a virus that can't be seen..."	1	.95
General Illness*	Describes the coronavirus as sickness, illness, or disease.	"Coronavirus is a type of disease."	.88	1
Avoid*	Avoids the question.	"People throughout the world have been impacted by the coronavirus."	.79	.81
Causal Explanation	Explains how the coronavirus is transmitted.	"It spreads through air and contacting physically others."	.90	1
Novelty	Explains that the coronavirus is novel.	"New strain of virus."	.90	-
Prior Knowledge	Provides illness analogy or other prior knowledge/experience.	"Coronavirus is like the flu."	1	1
Severity of Illness	Describes the coronavirus as something that makes people very sick and/or is deadly.	"It is a dangerous virus destroying us."	.96	-

Preventative Measures	Mentions preventative measures (e.g., mask, washing hand, etc.) and/or following rules.	"It's a disease you can catch from other people so it's important to wash your hands and wear a mask."	1	.95

Questions about the Impact of Coronavirus on Health

Response Category	Description	Example	Cohen's Kappa	
			'Self-sick'	'Other-sick'
Yes*	Suggests possibility of getting sick.	"I told her that it is very possible that she could get sick…"	.90	.90
No*	Suggests possibility of not getting sick.	"I told her I don't think so."	.95	.90
Uncertain*	Shows uncertainty in their response.	"It's a lottery."	1	.86
Avoid*	Avoids answering the question.	"I said we can pray that she doesn't get sick..."	1	.80
Preventative Measures	Mentions preventative measures (e.g., mask, washing hand, etc.) and/or following rules.	"Not if you wash your hands and cover your face."	.92	.88
Family as Protector	Mentions parent/family will protect them from the coronavirus.	"No, I will keep you safe."	.75	.73
Health Related	Mentions age or health as a reason.	"Probably not. You're healthy and it only affects adults."	.78	.85
Reassurance	Comforts the child that everything will be okay.	"You will be fine. Don't worry."	.79	.94

Note. * = Mutually exclusive items; 'What' = 'What is the coronavirus?'; 'How' = 'How do you get the coronavirus?'; 'Self-sick' = 'Will I get sick?'; 'Other-sick' = 'Will a family member/friend get sick?'; Responses that did not fit the categories were coded as Other (Kappas ≥ 0.79).

Analytical Approach

Parents' overall responses to questions about the coronavirus ('How' and 'What') and impact on health ('Sick-self' and 'Sick-other') were examined. A generalized linear mixed-

effects model with a binominal link function was conducted in R to examine whether parents' responses varied as a function of question type ('How' and 'What', 'Self-sick' and 'Other-sick') and differed by child factors (age and biology knowledge). Child's age and biology knowledge, and question type were included as predictor variables in the models. Because parents provided responses to multiple questions, by-participant random intercepts were included in the models. Then, logistic regressions were conducted in R to examine whether parents' responses to each question differed by child and parental factors. Specifically, child's age, child's biology knowledge, parent's biology and COVID-19 knowledge, parent's education, parent's COVID-19 Impact Score, and parent's shielding were included as predictor variables. Data files and analysis script can be found at: https://osf.io/a8us3/?view_only=64f617ec0eb0422a9e8f173e665417c4

Results

Descriptive Statistics

The majority of parents reported that their child asked questions about the coronavirus and its impact. About 75% of children (n = 319) asked their parent about what the coronavirus is and 62% (n = 263) asked how it is transmitted. For questions on the impact of the coronavirus on health, about 57% of children (n = 242) asked whether they themselves would get sick from the coronavirus and about 57% (n = 241) asked whether a family member or a friend would get sick. In addition, about half of the parents (52%, n = 219) reported that they shield their child from information about the COVID-19 pandemic (see Supplementary Materials for reasons and other descriptive statistics).

Parents' Responses to Questions about the Coronavirus

Overall responses. Parents' responses to questions about the coronavirus (both 'How' and 'What') included not only biological information (e.g., virus/germ, causal explanation), but

also information that could foster children's understanding of the coronavirus (e.g., connection to child's prior knowledge, severity of the illness). Most common responses used by parents were related to virus/germ (43%), causal mechanism (31%), and general illness (28%). See Table 2. Furthermore, about 40% of responses were related to child's prior knowledge (e.g., illness analogy; 21%) and severity of illness (20%).

Table 2.

Parents' Responses to Coronavirus Questions and Difference between Question Types

Responses	Overall No. (%)	By Question [No. (%)]		*OR*
		'What'	'How'	
Virus/Germ	248 (43%)	169 (53%)	79 (30%)	3.08***
General Illness	161 (28%)	127 (40%)	34 (13%)	5.42***
Avoid	38 (7%)	14 (4%)	24 (9%)	0.02*
Causal Explanation	181 (31%)	14 (4%)	167(64%)	0.02***
Prior Knowledge	120 (21%)	99 (31%)	21 (8%)	7.04***
Preventative Measures	84 (14%)	14 (4%)	70 (27%)	0.11***
Severity of Illness+	119 (20%)	118 (37%)	1 (0%)	
Novelty+	43 (7%)	42 (13%)	1 (0%)	

Note. No.: Number of responses; Overall: Number of responses to both 'What' and 'How' questions; 'What': Number of responses to 'What' question; 'How': Number of responses to 'How' question; OR: Odds ratios for question type predicting each response ('How' as the reference group and child's age and biology knowledge were mean centered); +: OR is not reported for Severity of Illness and Novelty responses due to low frequency of these responses for "How" question; Total of 15 responses were coded as Other ('What' = 5, 'How' = 10).

In order to examine the relation between parents' overall responses to the Coronavirus questions and individual child factors, generalized linear mixed-effects models were fitted with child's age, child's biology knowledge, and question type ('How' VS 'What') predictors with by-participant random intercepts for each response. Parents' responses to the questions varied by

the child factors. Parents were more likely to provide biology-related explanations (i.e., reference to virus/germ, causal explanations, novelty of the virus) when they perceived their child to have a lower level of biology knowledge (OR = 0.82, x^2 (1, N = 582) = 6.89, p = .009; OR = 0.72, x^2 (1, N = 582) = 8.56, p = .003; OR = 0.78, x^2 (1, N = 582) = 4.40, p = .036 respectively). However, parents were more likely to explain the coronavirus in terms of its severity (e.g., make one very sick) with older children (OR = 1.25, x^2 (1, N = 582) = 4.83, p = .028). Both child's age and biology knowledge significantly predicted parents' use of child's prior knowledge (OR = 1.34, x^2 (1, N = 582) = 6.04, p = .014; OR = 0.73, x^2 (1, N = 582) = 9.13, p = .003 respectively) such that parents were more likely to incorporate child's prior knowledge in their explanations about the coronavirus when they perceived their child to have a lower level of biology knowledge and for older children. Child factors did not significantly predict other responses (all ps > .05, see Supplementary Materials).

Parents' responses were also dependent on the type of question that was asked by the child (see Table 2). As expected, parents were more likely to provide factual information about the coronavirus (i.e., responses related to virus/germ or general illness) when responding to 'What' than 'How' question (OR = 3.08, x^2 (1, N = 582) = 29.31, p < .001; OR = 5.42, x^2 (1, N = 582) = 43.03, p < .001 respectively). Parents also provided more novelty and severity information when responding to 'What' than 'How' question, but we were unable to run the analysis for these two responses due to low usage of the responses for 'How' question. Also, parents were more likely to incorporate child's prior knowledge when responding to 'What' question (OR = 7.04, x^2 (1, N = 582) = 37.33, p < .001). However, as was expected, parents were more likely to provide information about causal mechanism of the coronavirus when asked 'How' question (OR = 0.02, x^2 (1, N = 582) = 43.41, p < .001). In addition, parents were more

likely to provide information on preventative measures and avoid answering the question when responding to 'How' than 'What' question ($OR = 0.11$, x^2 (1, $N = 582$) = 38.57, $p < .001$; $OR = 0.02$, x^2 (1, $N = 582$) = 4.26, $p = .039$ respectively).

Relation between Responses to Individual Questions and Individual Factors. To closely examine the relation between child and parental factors and parents' responses to each question, the top three most frequent responses that were provided by parents for each question were examined. See Table 3. That is, we examined whether child (i.e., age, biology knowledge) and parental (i.e., biology knowledge, knowledge about COVID, education, COVID Impact Score, and shielding) factors predicted 'virus/germ', 'general illness', and 'severity of illness' responses for 'What' question and 'causal explanation', 'virus/germ', and 'preventative measures' responses for 'How' question in logistic regression models

Table 3.

Relation between Individual Factors and 'What' and 'How' Responses

	'What' Question								
	'Virus/Germ'			'General Illness'			'Severity of Illness'		
Predictors	*OR*	*CI*	*p*	*OR*	*CI*	*p*	*OR*	*CI*	*p*
Child Age	1.08	0.89-1.30	.446	0.92	0.75-1.11	.366	1.26	1.04-1.55	**.022**
Child Biology Knowledge	0.81	0.68-0.96	**.018**	1.01	0.84-1.20	.949	0.94	0.78-1.12	.474
Parent Biology Knowledge	1.15	0.92-1.44	.224	0.90	0.72-1.13	.369	1.02	0.81-1.29	.865
Parent COVID Knowledge	0.93	0.74-1.17	.556	1.14	0.90-1.45	.286	0.92	0.73-1.17	.501
Parent Education	1.16	0.96-1.42	.129	0.84	0.68-1.02	.075	1.04	0.85-1.27	.732
COVID Impact Score	1.01	0.96-1.06	.816	0.96	0.91-1.02	.171	1.04	0.98-1.09	.209
Shielding	1.03	0.66-1.63	.884	0.86	0.54-1.36	.511	0.69	0.43-1.10	.121

	'How' Question	
'Causal Explanation'	'Virus/Germ'	'Preventative Measures'

Predictors	*OR*	*CI*	*p*	*OR*	*CI*	*p*	*OR*	*CI*	*p*
Child Age	1.05	0.84-1.31	.677	1.06	0.84-1.34	.625	1.03	0.81-1.31	.820
Child Biology Knowledge	0.65	0.52-0.81	**<.001**	0.80	0.64-0.99	**.042**	0.88	0.70-1.10	.260
Parent Biology Knowledge	1.14	0.88-1.48	.323	1.08	0.83-1.40	.565	1.21	0.93-1.60	.166
Parent COVID Knowledge	1.12	0.85-1.47	.425	1.15	0.87-1.54	.333	1.17	0.88-1.60	.286
Parent Education	1.03	0.81-1.30	.813	0.95	0.76-1.20	.663	1.02	0.79-1.31	.904
COVID Impact Score	0.94	0.88-1.00	.056	0.96	0.90-1.02	.190	1.07	1.00-1.14	.058
Shielding	0.69	0.41-1.19	.181	0.91	0.52-1.57	.732	2.21	1.25-3.96	**.007**

Note. OR = Odds Ratios; CI = Confidence Interval (95%); Individual factors, except for Shielding, are mean centered.

When responding to 'What' question, only child factors were related to parents' virus/germ and severity responses. Parents were more likely to provide virus/germ response when they perceived their child to have a lower level of biology knowledge ($OR = 0.81$, x^2 (1, $N = 319$) = 5.73, $p = .018$). However, parents were more likely to explain the coronavirus in terms of severity of illness (e.g., one could get very sick or even die from the virus) to older children ($OR = 1.26$, x^2 (1, $N = 319$) = 5.39, $p = .022$). There was no individual factor that significantly predicted parents' use of general illness response (all $ps > .05$). See Table 3 for other factors.

When responding to 'How' question, only child's biology knowledge was related to parents' use of biological information to answer the question. Parent were more likely to use of causal explanation and virus/germ response when they perceived their child to have a lower level of biological knowledge ($OR = 0.65$, x^2 (1, $N = 263$) = 14.92, $p < .001$; $OR = 0.80$, x^2 (1, $N = 263$) = 4.18, $p = .042$ respectively). However, parents' responses about preventative measures were related to parent's shielding ($OR = 2.21$, x^2 (1, $N = 263$) = 7.43, $p = .007$), suggesting that

parents who shield their child from the COVID-19 information were more likely to mention preventative measures when asked about how the virus is transmitted.

Parents' Responses to Questions about the Impact of Coronavirus on Health

Overall Responses. The most frequent response that parents provided for the health-impact question was 'No'. See Table 4. About half of the responses (51%, $n = 245$) suggested that one will not get sick from the virus whereas only about 18% ($n = 89$) of the responses suggested that one could get sick from the virus. About a third of the responses expressed uncertainty (13%, $n = 62$) or avoided the question (17%, $n = 84$). Most parents' responses also included additional information. Responses included information about preventative measures (33%, $n = 161$), family as protector (e.g., parent protecting the family from COVID-91; 17%, $n = 80$), and health-related information (e.g., young age and physical health; 7%, $n = 34$). Also, about a fourth of the responses (24%, $n = 116$) provided reassurance to the child about getting sick from the virus (e.g., not to worry, they will be fine, parent will protect them).

Table 4.

Parents' Responses to the Health-impact Questions and Difference between Question Types

Responses	Overall No. (%)	By Question [No. (%)]		*OR*
		'Self-sick'	'Other-sick'	
Yes	89 (18%)	36 (15%)	53 (22%)	0.14**
No	245 (51%)	154 (64%)	91 (38%)	4.86***
Uncertain	62 (13%)	24 (10%)	38 (16%)	0.17*
Avoid	84 (17%)	26 (11%)	58 (24%)	0.01***
Preventative Measures	161 (33%)	91 (38%)	70 (29%)	1.62
Family as Protector	80 (17%)	51 (21%)	29 (12%)	2.24**
Health Related+	34 (7%)	26 (11%)	8 (3%)	3.44**
Reassurance	116 (24%)	81 (33%)	35 (16%)	4.51***

Note. Total: Number of responses to 'Self-sick' and 'Other-sick' questions combined; 'Self-sick': Number of responses to 'Self-sick' question; 'Other-sick': Number of responses to 'Other-

sick' question; OR: Odds ratio for question type predicting each response ('Other-sick' as the reference group and child age and biology knowledge were mean centered); $^{+}$: Shows logistic regression since random intercept model did not converge; One response for 'Self-sick' question was coded as Other.

In order to better understand the relation between parents' overall responses to the health-impact questions and individual child factors, generalized linear mixed-effects models were fitted with child's age, child's biology knowledge, and question type ('Self-sick' VS 'Other-sick') as predictors with by-participant random intercepts for each response. Parents' responses were related to the child factors. Parents were more likely to suggest 'No' and use reassurance responses when they perceived their child to have a lower level of biology knowledge (OR = 0.69, x^2 (1, N = 483) = 9.31, p = .002; OR = 0.68, x^2 (1, N = 483) = 7.13, p = .008 respectively). However, parents were more likely to provide responses related to preventative measures and suggest that family will provide protection for older children (OR = 1.32, x^2 (1, N = 483) = 4.89, p = .027; OR = 1.36, x^2 (1, N = 483) = 4.00, p = .046 respectively). Child factors did not significantly predict other responses (all ps > .05, see Supplementary Materials).

Parents' responses to the health-impact questions were also dependent on whom the question was asking about (see Table 4). Parents were more likely to suggest 'No' and reassure their child when asked about the child than others (OR = 4.86, x^2 (1, N = 483) = 27.40, p < .001; OR = 4.51, x^2 (1, N = 483) = 18.83, p < .001 respectively). In addition, parents were more likely to use family as protector (e.g., parent protecting the child from COVID-19) and health-related (e.g., young children don't get COVID-19) responses when responding to a question about the child than others (OR = 2.24, x^2 (1, N = 483) = 6.69, p = .010; OR = 3.44, x^2 (1, N = 483) = 10.29, p = .003 respectively). However, parents were more likely to suggest 'Yes', answer with

uncertainty (e.g., I don't know, Maybe), and avoid answering the question when asked about others ($OR = 0.14$, x^2 (1, $N = 483$) = 8.79, $p = .003$; $OR = 0.17$, x^2 (1, $N = 483$) = 5.90, $p = .015$; $OR = 0.01$, x^2 (1, $N = 483$) = 13.39, $p < .001$ respectively).

Relation between Responses to Each Question and Individual Factors. To better understand the relation between individual factors and parents' health-impact question responses, a logistic regression model was fit to test whether parental and child factors predicted 'Yes', 'No', and avoidance responses for each question. We decided to examine parents' 'Yes' and 'No' responses to better understand which factors were related to parents' decision to tell their child that one would or would not get sick from the virus. Also, avoidance response was examined because we wanted to see whether parent's shielding behavior and impact of COVID-19 were related to their avoidance behavior in answering the questions.

For the question concerning the child, parents were more likely to suggest that their child will not get sick when they perceived their child to have a lower biology knowledge ($OR = 0.68$, x^2 (1, $N = 242$) = 11.72, $p = .001$). However, parents' 'Yes' responses and avoidance behavior were only related to parental factors. Parents who shield their child from the COVID-19 information were less likely to suggest that their child will get sick ($OR = 0.45$, x^2 (1, $N = 242$) = 4.25, $p = .045$). Also, parents who reported higher COVID Impact Score or who reported shielding their child were more likely to avoid answering the questions of whether the child will get sick from the coronavirus ($OR = 1.11$, x^2 (1, $N = 242$) = 4.57, $p = .037$; $OR = 3.79$, x^2 (1, $N = 242$) = 8.35, $p = .007$ respectively). See Table 5 for other factors.

Table 5.

Relation between Individual Factors and Responses to the Health-impact Questions

	'Self-sick' Question		
	'Yes'	'No'	'Avoid'

Predictors	*OR*	*CI*	*p*	*OR*	*CI*	*p*	*OR*	*CI*	*p*
Child Age	0.96	0.72-1.29	.794	1.09	0.88-1.36	.419	0.95	0.68-1.34	.765
Child Biology Knowledge	1.34	1.00-1.83	.057	0.68	0.54-0.85	**.001**	1.16	0.83-1.65	.396
Parent Biology Knowledge	1.29	0.90-1.87	.166	1.03	0.79-1.35	.804	0.93	0.62-1.41	.745
Parent COVID Knowledge	0.82	0.59-1.17	.248	1.27	0.98-1.67	.074	0.94	0.66-1.41	.757
Parent Education	0.85	0.63-1.17	.317	1.12	0.89-1.41	.348	0.99	0.68-1.47	.958
COVID Impact Score	1.01	0.93-1.10	.787	0.98	0.92-1.04	.538	1.11	1.01-1.23	**.037**
Shielding	0.45	0.20-0.96	**.045**	1.37	0.79-2.39	.269	3.79	1.51-10.85	**.007**

	‘Other-sick’ Question								
	‘Yes’			‘No’			‘Avoid’		
Predictors	*OR*	*CI*	*p*	*OR*	*CI*	*p*	*OR*	*CI*	*p*
Child Age	0.96	0.75-1.24	.753	1.01	0.81-1.27	.913	1.17	0.90-1.55	.248
Child Biology Knowledge	1.01	0.80-1.28	.945	0.82	0.67-1.01	.064	1.24	0.97-1.60	.088
Parent Biology Knowledge	1.12	0.82-1.53	.472	1.13	0.86-1.48	.378	0.95	0.69-1.30	.731
Parent COVID Knowledge	1.01	0.74-1.42	.942	1.36	1.02-1.86	**.044**	0.62	0.44-0.86	**.005**
Parent Education	1.04	0.80-1.36	.801	0.94	0.75-1.18	.599	1.15	0.87-1.55	.340
COVID Impact Score	0.99	0.92-1.07	.851	0.94	0.88-1.00	.056	1.09	1.02-1.18	**.019**
Shielding	0.64	0.34-1.20	.168	1.06	0.61-1.83	.844	2.55	1.33-5.05	**.006**

Note. OR = Odds Ratios; CI = Confidence Interval (95%); Individual factors, except for Shielding, are mean centered.

However, only parental factors were related to parents’ responses to the question about others. Parents with more knowledge about the COVID-19 pandemic were more likely to suggest that others will not get sick from the virus ($OR = 1.36$, $x^2\,(1, N = 241) = 4.32$, $p = .044$). Similar to ‘Sick-child’ question, parents who shield their child or reported higher COVID Impact Score were more likely to avoid answering the question ($OR = 2.55$, $x^2\,(1, N = 241) = 7.97$, $p = .006$;

OR = 1.09, x^2 (1, *N* = 241) = 5.62, *p* = .019; respectively). Additionally, parents who reported that they had lower knowledge about the COVID-19 pandemic were more likely to avoid answering the question (*OR* = 0.62, x^2 (1, *N* = 241) = 8.56, *p* = .005). However, there was no individual factor that significantly predicted parents' 'Yes' response (all *ps* > .05, see Table 5).

Discussion

Similar to prior work (Menendez et al., 2021), children typically asked two distinct types of questions when confronted with a novel illness: 1) asking for information about the illness itself and 2) asking about the impact of the illness on the health and safety of themselves and others. Although prior work had identified these questions, it was unclear from the prior research how parents responded to these specific questions when asked by their children. The current findings suggest that parents provided biological information when responding to children's specific questions about the coronavirus. However, when parents were asked about the impact of the coronavirus on safety of the child and others, they were reluctant to suggest that the child and others could get sick from the virus. This is important, because, by downplaying the severity of the illness, parents may lead children to be less likely to adhere to safety precautions. In addition, how parents responded to these questions depended on a variety of factors both at the level of the child and parent.

Responses to Questions Regarding the Coronavirus

Most parents reported that their child asked questions seeking information about the coronavirus. Parents' responses to these specific questions were more focused on the biological aspect of the coronavirus than previously reported (Haber et al., 2022; Leotti et al., 2021). Prior research reported that less than 40% of parents' explanations mentioned viruses or germs when asked how they generally explained the coronavirus. In the current study, more than half of the

parents' responses (53%) mentioned viruses or germs when asked what the coronavirus is specifically by their children. Furthermore, 60% of the parents from the current study provided causal explanation when specifically asked how the coronavirus gets transmitted, while only about 8% of parents' responses mentioned causal explanation in the study by Leotti and colleagues (2021). So, parents' description about the coronavirus did focus on biological aspects of the virus. This difference is likely due to the different types of questions that were asked: broad versus targeted questions. Assessing parents' responses to targeted questions may provide a clearer understanding of how parents respond to children's questions.

However, we cannot rule out the difference between our results and previous research is not due to when during the course of the pandemic the studies were conducted. Leotti and colleagues (2021) and Haber and colleagues (2022) conducted their studies during the early stage of the pandemic (March and May of 2020 respectively) whereas the current study was conducted in December of 2020, over six-months later. Since the current study was conducted 9 months into the pandemic, it is possible that parents in the current study were better informed about the coronavirus enabling them to provide more biological information when asked about the coronavirus. Also, children could have asked more questions concerning the coronavirus than about the social changes that were brought about the pandemic since families had been experiencing the social changes for about 9 months when the data for the current study was collected. So, there is a possibility that both the timing and the targeted questions influenced the difference in parents' explanations about the coronavirus.

When examining parents' responses to the coronavirus questions, their responses were tailored to the specific question that was asked. When asked about what the coronavirus is, more parents described it in terms of virus (e.g., "A virus that affects people") and the severity of the

virus (e.g., “It is a type of virus which will kill us”). Also, the information provided was tailored to the child’s prior knowledge and experiences (e.g., “The coronavirus is a virus like the flu but it makes you really sick”). However, parents used more causal explanations to respond to the question on how the coronavirus gets transmitted. They also provided more responses that included information about the preventative measures and rules to this type of question. So, parents’ responses were not only tailored to the question that was asked but also provided additional information to foster children’s understanding of their responses for that particular question. This is consistent with prior studies that have suggested that parents’ responses differ by the type of question the parents were asked (Mills et al., 2022) and provide additional information to foster learning of their child (e.g., Crowley et al., 2001).

Furthermore, parents’ responses were generally tailored to the child’s biology knowledge but not to the child’s age. Parents were more likely to provide biological explanations to answer questions about the coronavirus (i.e., virus/germ, causal explanation) when they perceived their child to have a lower level of biology knowledge. This suggests that parents use children’s questions as an opportunity to foster children’s understanding of illness especially when they think their child does not have the relevant knowledge. This aligns with previous research by Palmquist and Crowley (2007). Thus, parents might be more sensitive to their child’s biology knowledge than age and spend the time to provide biological explanation about an illness when they think their child could benefit from such information. This finding is important as most research in cognitive development examines age as a factor, but relatively few studies have collected information about parents’ perception of their children’s knowledge. Our research suggests that parents are sensitive to what children know and tailor their responses to the child’s level of knowledge.

Even though child's age was not related to parents' biological explanations, it predicted parents' use of severity information when explaining what the coronavirus is. Parents were less likely to provide information about how severe the illness was to younger children. This finding is consistent with prior research on parent-child conversations about death which suggest that parents tend to shield young children from information about death (Rosengren et al., 2014). Parents' shielding behavior regarding the topic of death could explain why child's age was a significant factor in parents' explanation of terminal illness to children (Stein et al., 2019). Since explaining terminal illness inevitability include information about death, child's age could have been an important factor in parents' explanation of the illness. However, when explaining the coronavirus, parents had the option to not include the severity information as was evident from the current study. Thus, parents provide biological information to answer children's questions about a novel illness, but at the same time, they limit what kind of information is being provided to their children about the possible severity of the illness, especially for younger children.

Contrary to our hypothesis, parents' knowledge about biology or COVID-19 did not significantly predict parents' responses to questions about the coronavirus. One possible reason for this finding might be because the current study did not code for complexity of parents' responses. Knowledgeable parents might have provided more detailed and comprehensive responses to the questions than less knowledgeable parents (Eberbach & Crowley, 2017). However, it was difficult to code for complexity of parents' responses in the current study as most responses were relatively brief. This could be because participants of the current study were responding to children between the ages of 3- to 7-years. Additionally, the retrospective nature of the parents' report could have led the participants to provide a brief summary of how they responded to the questions.

However, parents' shielding behavior significantly predicted parents' responses to the question about coronavirus transmission. Parents who reported shielding their child from the COVID-19 information were more likely to provide preventative measures when asked about how the virus gets transmitted. This could be a way for parents to shield their child from the COVID-19 information by avoiding answering questions about how the virus gets transmitted by instead providing information on how to protect oneself from the virus.

Responses to Questions Regarding the Impact of Coronavirus on Health

Given that more than half of the parents (52%) shielded their child from information about the COVID-19 situation, parents tried to protect their child when answering the health-impact questions. However, the way that they shielded their child from the health-impact question differed by whom the question was asking about. Parents were more likely to avoid answering the question when it was about others (24% vs 11% for child), whereas they were more likely to respond that one will not get sick from the coronavirus when asked about the child (64% vs 38% for other). This suggests that, for the question about the child being sick, parents might shield their child by directly denying that the child can get sick from the coronavirus, but for the questions about other people, they shield by avoiding the question. Although it is possible that some parents thought that the virus was not dangerous, this would not explain why their responses change depending on whether the question was about their child or someone else (as in that case they would say that the virus would not impact the health of the child or others). Therefore, it is more likely that parents' responses are due to shielding.

Another difference between parents' responses to the health-impact questions was that they provided more reassurance responses (e.g., "Don't worry", "You will be fine") and information about the preventative measures when asked about their own child rather than

others. Parents were more likely to shield their child when asked about the child's health by suggesting that the child will not get sick from the coronavirus and providing reassurances and realistic means on how they are being or can be protected (e.g., protective measures, protection from parent's actions). So, parent-child conversations might serve multiple roles (Bridgewater et al., 2021; Menendez et al., 2021). Specifically, during conversations about the impact of an illness, parents provide information, but also reassurance and suggest ways that the child is being protected from the illness.

Furthermore, parents considered their child's biology knowledge when responding to the health-impact questions. Parents were more likely to suggest that one would not get sick if they perceived their child to have a lower level of biology knowledge. It is unclear why parents would suggest that the coronavirus will not impact the health of the child and others when they perceive their child to have a lower level of biology knowledge. However, this could relate to parents' desire to protect their child from being worried about the COVID-19 pandemic especially when they perceive their child to have less understanding about biology in general. Thus, like questions about the coronavirus, parents might be more concerned with the child's biology knowledge than child's age when describing the impact of a novel illness on health.

As for parental factors, parents who shield their child from the COVID-19 information were less likely to suggest that their child would get sick. This supports the aforementioned argument that parents might shield their child by suggesting that the child would not get sick from the coronavirus when the question is about the child. Also, parents' knowledge was related to their response as expected. Parents' who reported that they have more knowledge about the COVID-19 pandemic were more likely to suggest that one will not get sick from the coronavirus. More research is needed to figure out why this might be, but it could be that parents, who have

more knowledge about the coronavirus, might think they have enough information to protect their family from the coronavirus.

Similarly, parents' avoidance responses were related to their stress and shielding behavior as expected. Parents who shield their child from the COVID-19 information and reported higher COVID Impact Scores, were more likely to avoid answering both health-impact questions. Furthermore, parents with a lower level of COVID knowledge were more likely to avoid the question about others. So, parents' avoidance responses to the health-impact questions seem to be related to parental factors: parents' stress and knowledge, and their shielding behavior.

In sum, although most parents directly answered children's health-impact questions, their shielding attitude was evident from their responses. Parents were more likely to suggest 'No' than 'Yes' when asked whether one will get sick. Furthermore, parents were more likely to avoid the question when they shielded their child from the COVID-19 information. Similar to the coronavirus questions, child's biology knowledge, but not child's age, was related to parents' responses. Parents were more likely to suggest to their child that they will not get sick when parents perceived their child to have a lower biology understanding. Even though parents try to provide more biological information to their child when they perceive their child to have a lower level of biology knowledge, they try to shield their child from understanding that the child, themselves, is also vulnerable to the virus. Thus, parents were providing misinformation on how contagious the virus is. Such contradictory information (providing factual biological information, but incorrect information on how contagious the virus is) could potentially impact children's understanding of biological underpinning of contagion and lead children to engage in less cautious behavior.

However, one thing to consider is that parents' decision to shield their child when asked about health-impact questions could be due to the manner in which the coronavirus manifested symptoms varied greatly by individual. While older and immune compromised individuals were most vulnerable to the virus, it appeared almost random whether someone would experience any symptom or more severe symptoms when people contracted the virus. Thus, answering health-impact questions might not have been entirely straightforward. In this manner, it is not all that surprising that parents tend to shield their child and suggest that the child would not get sick, hoping that the low probability of children getting severe symptoms from the coronavirus would support shielding children from this information.

Limitations

One limitation of this study is the retrospective nature of the parents' report of their responses to the four targeted questions. Parental responses were not recordings of parent-child conversations and thus we relied on parents' memory on how they responded to the questions. However, since children's questions about the coronavirus are infrequent, parental report might be the best source of information to capture how parents responded to the questions. We would suggest, however, that like questions children ask about death, children's questions about the coronavirus and the pandemic are likely highly salient to parents, given how dramatically the pandemic changed all aspects of children's lives and family function.

A second limitation of this study concerns potential parental bias to our targeted questions. However, parents were first asked to report whether their child has asked our four targeted questions and if so, they were asked how they responded to the questions in an open-ended format. So, we do not expect that the targeted questions would have biased parents' responses. It is also the case that we got a wide range of responses from parents, and in some

cases, parents freely stated that they provided children with misinformation about the severity of the illness. Furthermore, a similar approach has been used in prior studies to examine parent-child conversations (Menendez et al., 2021; Ünlütabak & Velioğlu, 2022).

A third limitation of this study is that 'What is the Coronavirus?' question might not have been asked by children to acquire biological information about the coronavirus and could have been interpreted more broadly by the parents, as a question about the pandemic in general. However, the parents of the current study reported that their response to the 'What' question was related to the virus (53%) or general illness (40%). Additionally, about a third of the parents (37%) mentioned the severity information about the coronavirus. Thus, even though children might not have asked the question with a specific intention of acquiring biological information, most parents did provide them with biological information to help children to better understand about the coronavirus.

A fourth limitation of this study is the potential impact on the results of our recruitment method. Prior studies recruited participants using a participant registry, social media, and online recruitment forums (Haber et al., 2022; Leotti et al., 2021), whereas this study used Amazon Mechanical Turk similar to Menendez et al., (2021). These differences in recruitment methods could potentially influence the results. We decided to recruit through Amazon Mechanical Turk to reach parents from diverse backgrounds across the U.S. and to account for different experiences that families might have had through living in different states. Even though the majority of parents who participated in the study identified themselves as White and highly educated (similar to prior studies), we were able to recruit parents from 46 different states.

A final limitation of this study is the lack of diversity in the study sample. Participants who participated in the study were predominately White parents. This makes it difficult to

generalize the findings from this study to other populations as prior research on parent-child conversations have demonstrated that there are cultural differences in how parents explain certain topics to their children (e.g., Gutiérrez et al., 2020; Rosengren et al., 2014). Given that some of the people most impacted by the COVID-19 pandemic were from minority groups (Hill & Artiga, 2022), the findings from this study might not be representative of how parents in certain groups responded to their children's questions about the coronavirus and its impact.

Future Implications

Parent-child conversations provide an important context to understand how young children advance their knowledge about a certain topic. Before entering formal schooling, children rely on adults' testimonies to learn and expand their knowledge about the world (Chouinard, 2007; Frazier et al., 2009; Harris et al., 2006). Research on parent-child conversations at museums have shown that the way parents ask questions and explain concepts to their children influences children's engagement and subsequent learning of those concepts (Callanan et al., 2017; Jant et al., 2014; Willard et al., 2019). In addition, the current findings suggest that examining how parents respond to children's specific questions provides a clearer understanding of the information that children acquire from their parents. Since children actively use questions as a method to acquire new information about the world in order to fill gaps in their knowledge (Callanan & Oakes, 1992; Mills et al., 2010; Ronfard et al., 2018), gaining a clearer understanding of what kind of information children acquire from their questions could provide insight into children's cognitive development. Thus, assessing parent-child conversation, specifically looking at parents' responses to children's specific questions, could inform why young children come to understand certain concepts when they do and how they might form certain misunderstandings.

Conclusion

The current study explored how parents responded to four specific questions that were asked by children concerning the coronavirus and its impact. Parents focused on the biological aspects of the coronavirus when responding to specific questions about the coronavirus. However, they tried to shield their child when asked about the health-impact questions by suggesting that one will not get sick from the coronavirus. One individual factor that was consistently related to parents' responses to both types of questions was a child's biology knowledge. Parents were more likely to provide biological information about the coronavirus and suggest that people will not get sick from the virus when they perceived their child to have a lower level of biology knowledge. Thus, the current findings suggest that parents' responses to their child's questions can provide important information that furthers child's biological knowledge especially when they perceive their child to have a lower biology understanding. However, it is also clear that parents sometimes provide inaccurate information in hopes to protect their child from information that could potentially negatively impact their child's wellbeing. Thus, examining both questions about an illness and its impact on child's safety provides a richer context into understanding how children's understanding about illnesses and viruses develops. In addition, since parents' responses to children's questions were often tailored to perceptions of the child's knowledge rather than the child's age, future research should explore in more detail how factors other than the child's age influence important parental behaviors during parent-child interactions.

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