

6-30-2023

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To cite this article: Rachael Piltch-Loeb, Richard James, Sandra S. Albrecht, Alison M. Bутtenheim, Jennifer BEAM Dowd, Aparna Kumar, Malia Jones, Lindsey J. Leininger, Amanda Simanek & Shoshana Aronowitz (2023) What Were the Information Voids? A Qualitative Analysis of Questions Asked by Dear Pandemic Readers between August 2020-August 2021, Journal of Health Communication, 28:sup1, 25-33, DOI: [10.1080/10810730.2023.2214986](https://doi.org/10.1080/10810730.2023.2214986)

To link to this article: <https://doi.org/10.1080/10810730.2023.2214986>



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Published online: 30 Jun 2023.



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What Were the Information Voids? A Qualitative Analysis of Questions Asked by Dear Pandemic Readers between August 2020-August 2021

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In the current infodemic, how individuals receive information (channel), who it is coming from (source), and how it is framed can have an important effect on COVID-19 related mitigation behaviors. In light of these challenges presented by the infodemic, Dear Pandemic (DP) was created to directly address persistent questions related to COVID-19 and other health topics in the online environment. This is a qualitative analysis of 3806 questions that were submitted by DP readers to a question box on the Dear Pandemic website between August 30, 2020 and August 29, 2021. Analyses resulted in four themes: the need for clarification of other sources; lack of trust in information; recognition of possible misinformation; and questions on personal decision-making. Each theme reflects an unmet informational need of Dear Pandemic readers, which may be reflective of the broader informational gaps in our science communication efforts.

This study highlights the role of an ad hoc risk communication platform in the current environment and uses questions submitted to the Dear Pandemic question box to identify informational needs of DP readers over the course of the COVID-19 pandemic. These findings may help clarify how organizations addressing health misinformation in the digital space can contribute to timely, responsive science communication and improve future communication efforts.

Introduction

Since the beginning of the COVID-19 pandemic, there has been an overabundance of information, with nearly every media channel

covering the latest developments in disease etiology, treatments, and policies (Krause, Freiling, Beets, & Brossard, 2020). This high volume of information from multiple sources has led to what the World Health Organization (WHO) describes as an “infodemic.” An infodemic is characterized as “too much information, including false or misleading information, in digital and physical environments [which] causes confusion and risk-taking behaviors that can harm health [and] leads to mistrust in health authorities and undermines the public health response” (World Health Organization, 2022).

Communication creation and delivery exist along three dimensions: content, channel, source (Berlo, 1960; Glik, 2007; Metzger, Flanagin, Eyal, Lemus, & McCann, 2003). Content is the specific message being communicated, channel is the platform or mode of delivery, sometimes referred to as medium, and source is the person or organization behind the information.

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Research prior to and during the current pandemic found that each dimension can influence how a piece of communication is interpreted and acted upon. For instance, information channels sharing COVID-19 information – both traditional and social media – can be very effective in influencing public opinion, particularly related to the COVID-19 vaccine. However, affinity for highly ideological information channels is associated with embracing debunked misinformation, expressing doubt and mistrust of health authorities, and refusing effective treatments and preventive strategies (Annenberg Public Policy Center, 2021). Information from mainstream media and local news outlets that is seen as straightforward, not sensationalized, and accurate can increase vaccine acceptance (Taha, Matheson, & Anisman, 2013). In contrast, research has shown that social media platforms contribute to vaccine hesitancy by promoting personal narratives over empirical data and by connecting anti-vaccination messaging to broader belief systems of freedom of choice and parental rights (Arif *et al.*, 2018; Basch & MacLean, 2019; Ekram, Debiec, Pumper, & Moreno, 2019; Moran, Lucas, Everhart, Morgan, & Prickett, 2016).

The framing of content can also shape its impact. Anti-vaccine messaging tends to be successful in part because it tends to be more focused on emotions and personal anecdotes in contrast to the data-driven messages used by pro-vaccination literature and platforms like government websites (Caulfield *et al.*, 2019; Hughes *et al.*, 2021). Emotional approaches tend to be more appealing to social media users and are consistent with other content that is often shared on social media (Callender, 2016). There is evidence to suggest that narrative and visual persuasion can be more effective than factual–argumentative approaches (Adebayo, Mhonde, DeNicola, & Maibach, 2020; Carrion, 2018; Chang, 2008; De Wit, Das, & Vet, 2008, p. 8; Krakow, Yale, Jensen, Carcioppolo, & Ratcliff, 2018; Kreuter *et al.*, 2010; Murphy *et al.*, 2015; Murphy, Frank, Chatterjee, & Baezconde-Garbanati, 2013; Taylor & Thompson, 1982). Research shows that when an audience is absorbed in a narrative, this reduces the audiences’ capacity to form counterarguments against messages contained in the narrative (Deighton, Romer, & McQueen, 1989; Green, Brock, & Kaufman, 2004; Igartua & Barrios, 2012). Research on public health messaging has demonstrated that messaging focused on narrative and rhetoric (form) tends to yield better persuasive outcomes than messaging that focuses on facts alone (*i.e.*, content) (Bryan, Yeager, & Hinojosa, 2019; Gilkey, Grabert, Malo, Hall, & Brewer, 2020; Liu & Yang, 2020). While scientific narratives need to convince, or at least be persuasive, misinformation narratives are successful if they simply create doubt (Oreskes & Conway, 2010). It is difficult to “un-ring” the bell once it has been rung by a piece of misinformation. Moreover, sometimes by directly addressing a piece of misinformation, even more attention is paid to that particular narrative (Chan, Jones, Hall Jamieson, & Albarracín, 2017).

In the current infodemic, how individuals receive information (channel), who it is coming from (source), and how it is framed can have an important effect on COVID-19 related mitigation behaviors. Social media channels such as Facebook, YouTube, and Instagram have amplified misinformation with negative consequences such as greater vaccine hesitancy (Baldwin, Tiro, & Zimet, 2023). Messages spread by particular political leaders encouraged the adoption of harmful behaviors like taking unapproved COVID-19 treatments (Wallace, Paul, & Schwartz, 2022). Indeed, some would argue that misinformation has significantly contributed to death and disability during the COVID-19 pandemic (Palomo, 2021).

In light of the challenges presented by the infodemic, Dear Pandemic (DP), a cross-channel (Facebook, Twitter, Instagram) social media and web source, was created to directly address persistent questions related to COVID-19 and other health topics in the online environment (Albrecht *et al.*, 2022). Despite the abundance of pandemic-related information (both true and untrue) present online, many individuals struggled to interpret that information and apply it to their daily life. Given the politicization of the pandemic, trusted messengers who were independent from government or other institutions were also needed to interpret and spread this information.

Between 2020 and 2022, DP sought to directly address these issues and to provide evidence-based content about the COVID-19 pandemic across several social media platforms. The effort began in March 2020 led by a volunteer team of women scientists who banded together to collectively answer questions from family and friends on Facebook in order to provide accurate information on a platform where mis- and disinformation flourish. Its readership quickly grew, to over 200,000 readers (hereafter referred to as “DP readers” or “readers”) across various social media platforms. During the two years studied here, several dozen contributors volunteered their time, with disciplinary expertise including nursing, infectious disease epidemiology, demography, health policy, mental health/psychiatry, and medicine. The team created over 2,000 factual, easy-to-read posts and was featured by the popular press and by scientific institutions including the World Health Organization and the National Academies of Medicine.

DP employs therapeutic communication principles from nursing and embraces a harm reduction framework in its practical suggestions about pandemic living (Ritter *et al.*, 2021). The team utilizes two-way communication (*i.e.*, soliciting and responding to our reader questions) to address the information needs of our readers. This narrative style, of question and answers, where answers are also given in a narrative rather than purely factual list, speaks to readers because it responds to them using a form that matches the type of inquiry they have made. For example, inquirers would ask questions that often told a descriptive story. Details would emerge about their family or friends that shaped the question itself. Dear Pandemic posts sometimes reference the author’s own family or personal network, are written in plain language, and often use the same rhetoric or colloquialisms as if the author was telling a story. In some instances, the reader’s initial question is an explicit part of the DP reply. Further details about DP’s

communication design principles and operations are available in a series of case studies (Albrecht et al., 2022; Leininger et al., 2022; Ritter et al., 2021).

Early on, the DP team answered questions DP readers posted within the comments on each Facebook post. However, this process quickly became unmanageable as the number of posts, topics, and readers expanded. On August 24, 2020, Dear Pandemic launched the Question Box to collect questions from its community of readers. The purpose of the Question Box was to identify common themes across questions submitted from readers efficiently while also encouraging readers to visit the Dear Pandemic website, where answers to questions that had already been posted were archived. The Question Box was Dear Pandemic's principal method for "listening" to readers' questions and concerns. Themes and specific questions were used to help plan upcoming content posted across Dear Pandemic's social media platforms. Functionally, the Question Box was created as a simple Google Form which collected readers' questions using a long format text entry field.

Study Objective

Ad hoc interventions to reach individuals in need of fact-based, effectively communicated information, like the team Dear Pandemic created, have become critical in the context of the current infodemic. Examination of the informational needs of DP readers can offer insight into the possible information that individuals are exposed to and why a platform like DP may be effective in reaching their target population. This study used questions submitted to the DP Question Box to identify the self-defined informational needs of readers and explore the common topics and themes present, particularly those related to misinformation. We use this analysis to identify the role DP filled for readers in addressing their informational needs and the implications for science communication moving forward.

Materials and Methods

This is a qualitative analysis of 3806 questions that were submitted by DP readers to a question box on the DP website between August 30, 2020 and August 29, 2021. Submitted questions were de-identified and three members of the research team first reviewed a random subset of 200 questions to identify the reason the reader submitted the question (i.e. seeking clarification, trying to understand another news source, seeking personal advice). Each reviewer independently generated a list of reasons readers submitted their questions resulting in twelve total reasons. These twelve reasons were then synthesized into four inclusion criteria. Based on that initial review, four submission reasons were selected to be applied as inclusion criteria to the rest of the questions in the sample: (1) reference to underlying concerns about trust or truth in science, media, or policy decisions, particularly those related to specific topics where abundant mis/disinformation was known to be present; (2) request for clarification about another source of information; (3) comments related to concerns about misinformation existing

or spreading; or (4) request for more information to feel comfortable in decision making, for instance in topics such as attending family gatherings, where a conflict existed between public health recommendations and social, inter-familial, and media pressures and influences. We chose this sampling frame in order to focus on questions related to mis- or disinformation, as combatting mis- and disinformation was a key function of the Dear Pandemic platform. The remaining approximately 3600 questions were then each reviewed by a member of the research team to identify if they met this inclusion criteria. 471 questions met criteria for inclusion. Questions that did not meet the inclusion criteria were not included in this analysis.

Coding and Synthesis

After identifying the analytic sample of 471 questions, the questions meeting the sampling criteria were uploaded to the Dedoose qualitative coding software. Dedoose is a collaborative and web-based application that supports qualitative and mixed methods research data management and analysis. The research team applied Saldaña's first-cycle and second-cycle coding method to individual questions (Saldaña, 2015). Each question was coded by two researchers in an open coding scheme based on the pre-identified inclusion criteria. A third coder was available to resolve discrepancies in coding and add additional perspective when necessary. A codebook was generated that followed the framework of the four original inclusion criteria and included a variety of sub-codes. As coding continued, the coding team added additional inductive codes to the codebook. Codes were then aggregated and examined relationally to identify themes. From the coding schema, themes were identified using a grounded theory approach to identify meaningful patterns.

Results

Overall Sample for Analysis

The three reviewers identified a total of 471 questions that met the criteria for inclusion in the analytic sample. When each reviewers' questions were pooled, we identified nine duplicates, and therefore we analyzed 462 questions. A complementary, quantitative manuscript (Golos et al. 2023) in which the analytic sample was not limited to these inclusion criteria provides more information on all topics readers brought to Dear Pandemic.

Informational Needs Identified

The themes we identified were: the need for clarification of other sources; lack of trust in information; recognition of possible misinformation; and questions on personal decision-making. Below we explore each of these four needs.

Clarification of Other Sources

We explored the reasons readers came to Dear Pandemic to ask questions in the first place. In many cases, readers referred to word of mouth information about which they needed clarification. In some instances, readers sought assistance in engaging in respectful dialogue with a family member or friend. Many posts referenced the

specific person who shared the information or the specific source of information that they were asking Dear Pandemic about. The most commonly referenced sources of information were a member of the person's offline social network, a clinician either offline or online, and other individuals on social media. For example:

"My brother is constantly sending me articles where someone, a non-scientist, has analyzed the "data" to prove that either the coronavirus isn't that big of a deal or safety measures are actually ineffective. I'm trying to be loving, but I'm tired of the same conversation about why I trust scientists to tell me about the science. I have a degree in molecular biology but even I'm starting to feel like a crazy person after seeing all these articles (like, is he right? Am I not being critical enough of the data?). What advice do you have on this? How do you cope and lovingly explain, again, that scientists know what they're talking about?"

Some readers were looking to directly refute or explain something to a family member who was expecting relevant citations. "As another reader put it:"

"I have a vaccine hesitant family member whose current concern over the mRNA vaccines is his belief that the mRNA instructs EVERY cell in your body to produce the spike protein, including cells in your lungs, which can be problematic. It was my understanding that this only occurred near the vaccine injection site, however I cannot find any sources to refute his concerns. Or even anything explaining why this would be problematic if it were the case. Do you have any sources that address these concerns? He's someone who NEEDS to see the sources"

Other readers pointed to specific sources of information that had been shared with them that they were unsure whether to trust. In these cases, readers at times shared a link along with their question to the question box and asked for DP feedback:

I have been talking with my sisters and they shared the following senate hearing videos and are convinced that there are treatments that are not being considered that could save lives

Readers came to DP to fill the informational need of validating or invalidating the COVID-related informational content received through their personal networks.

Lack of Trust in CDC/Healthcare System

There was an inherent lack of trust in traditional sources of information expressed in a variety of questions. For example, several inquiries insinuated that the reader did not trust the Centers for Disease Control (CDC) recommendations or "the government" and also questioned the motivations of those in the healthcare system.

Distrust, especially in the CDC, seemed to evolve over the study period as scientific findings, recommendations, and numbers of cases and deaths changed. For example:

I keep seeing a quote that the CDC this week quietly lowered death counts. That only 6% were actually covid deaths, 9,210 deaths total. Can you help explain this and why the 180,000+ deaths is still the right number?

"As another reader put it:"

What is up with the CDC's recommendation that vaccinated people can just willy nilly congregate when we KNOW they can still get *and* share COVID-19?

And as another put it:

Can we trust the CDC with all these reversals? Is the governing body forcing these recommendations, or is it actually science driven?

Readers also had a demonstrated need for a trusted science communicator, which many inquirers would refer to in their question. Many inquiries expressed legitimate confusion about an issue where there was conflicting or uncertain science. In these instances, Dear Pandemic served as an arbitrator of the state of the evidence. For example, one inquirer said:

"Most of my friends deny the benefits of mask wearing. I often point to studies but I would love it if someone (especially someone with extensive public health knowledge) would put together an ongoing resource page with links to peer reviewed papers/articles and reliable studies that we could reference when someone is claiming that "masks have been debunked," "masks don't work," & "masks are dangerous."

As another reader put it:

I have been hearing growing concerns amongst parents regarding the Covid vaccine and it's potential impact on fertility. As a pediatric NP, I want to understand where this concern originated and how to counsel my patients and their families when the time comes for younger kids to get the vaccine

"Can you explain the death certificate issue? Many people I know "have a friend" who works in healthcare who supposedly saw a car accident victim's death attributed to covid-19. They are hijacking legitimate posts with these anecdotes. I was reading up to try to understand, and it does seem that this might happen sometimes, if the person had been diagnosed. Then when the 6% number came out, they all became even more aggressive. I know other people are saying deaths are undercounted. How are death certificates controversial?"

"A friend recently told me that a physician she knows at Mass General thinks that once people get vaccinated they should stop wearing masks because he is seeing "a concerning rise of other viruses/bacteria as our immune systems have not been exposed for so long (with mask wearing), specifically in kids. Is there any truth to this? It seems that this opinion negates the other hundreds of physicians advocating for continued mask use. It doesn't sit right with me so I thought I would bring it to the experts. Also, what is a polite way to further engage in this conversation without being a know it all without an epidemiology degree?"

Readers came to DP to fill the informational need that actually arose from reviewing traditional science communication; they sought DP's opinion over other governmental or healthcare communicators.

Possible Misinformation

Several questions contained a description of another piece of information, an interpretation of that information by the reader, and then an ask to Dear Pandemic in reference to that information. While the question to Dear Pandemic typically seemed to suggest the reader did not support the prior interpretation, at times, it seemed the reader was not sure what to believe, and may have been swayed by the information, demonstrating the doubt-mongering effectiveness of misinformation even in subjects who may be more highly informed and inclined to trust official or presumed-authoritative sources. For example, one question stated:

The article [on the relationship between a vaccine and an injury event] is clearly sensational fear-mongering, but it tries to explain how this would happen. Is there even the slightest chance that could occur? I'm assuming not and would love to provide her an explanation of how/why it's wrong

Another asked,

one of my former students linked me to an article about how COVID cases have dropped a month after the mask mandate was lifted. Obviously this is a case where correlation doesn't mean causation, but my Googl[ing] shows Texas' vaccination percentages as way too low for herd immunity, and I can't find any other data to suggest what the real cause might be

Some readers referenced potential misinformation that was shared by trusted sources of health information, including clinicians:

Recently a relative told me two of her friends had a parent who developed shingles a few weeks after the vaccine. One had it on his scalp, the other behind her eye. One of their doctors said it was from the vaccine. Both doctors have reported it to VAERS. What does one say to all of this... After all, the doctor said it was caused by the vaccine and reporting it to VAERS was like it was a holy bible.

I have a friend who insists that the vaccines will alter our immune systems forever which will not allow us to fight off other viruses, and hence, will eventually kill us. Her information is coming from an oncologist. She also believes this is a conspiracy to reduce our population.

I take COVID very seriously, and I am working hard to educate myself (with experts like you) so my understanding is based in science and data (and not gut feelings or preferences). I've seen populations of people who downplay COVID or dismiss COVID implications point to The Great Barrington Declaration as a mantra. It's confusing to me, because it was created by and signed by many in the medical profession

Readers came to DP seeking validation and clarification of a possible piece of misinformation; their informational need was to alleviate confusion for themselves and possibly for others.

Personal Decision-Making: Understanding Short and Long-Term Consequences

The initial inclusion criteria focused on instances where a reader was demonstrating an explicit informational need in order to make a health decision. In selecting items for inclusion, the study team did not exclusively focus on specific content areas or topics. Of the questions included in the analytic sample, beginning in September 2020 and throughout the duration of the study time period, vaccination was the most common question topic identified within the analytic sample (Golos et al. 2023). This is consistent with another analysis conducted by the DP Team. Related to vaccination, the focus on long-term consequences of vaccination and fertility-related issues became more common as the study period went on. Specific inquiries had to do with safety of vaccination, side effects, ingredients, effectiveness, long-term consequences, particularly for vaccination of children and fertility-related concerns (together accounting for over one-third of all vaccine related questions). For example, one individual stated:

Could you please share research on impact with fertility and the vaccine? This is a big reason some of my family and friends are scared of the vaccine, and I cannot find anything to educate them with.

Similarly, others raised concerns related to side effects if they were pregnant, breastfeeding, or thinking about becoming pregnant:

Is there any new research regarding breastfeeding mothers and how [the vaccine] effects their nursing babies (all vaccines included). I was all for getting the vaccine but heard a story yesterday about a 5 month old who got a severe rash and died next day right after his mother received the second dose of the vaccine. They said baby was diagnosed with Thrombotic thrombocytopenic purpura & elevated liver enzymes. Is this possible? Does the vaccine pass through breast milk or just the antibodies? Please shed some light for those of us struggling to understand and make best decision

Is there no evidence of risk from vaccines to pregnant or breastfeeding people because institutions haven't looked very hard for it, or because they've been able to study it and found none?

In some instances, fertility related concerns overlapped with concerns about long-term consequences of vaccination, for example when individuals inquired about the potential risks not to their own fertility but to that of their children. As one person wrote:

My concern about the vaccine is that in 10+ years there may be an unforeseen effect, then what? My concerns for my children are that 2 have not started puberty and one has just begun. Their bodies are constantly changing. How do we know the vaccine won't have some sort of long term effect? If the vaccine has been studied in this age group only recently, how can doctors say it won't affect a 14 year old girl's ability to get pregnant? I am looking for something that will make sense and make me want to change my mind about the vaccine.

Additional topics of interest included herd immunity, usefulness of restrictions enacted by governments, mask wearing, the

severity of COVID-19 at an individual and population level, and personal and household hygiene practices. There were very few questions related to testing ($N=9$) which may indicate this may be a less controversial topic or less provocative area for misinformation, or that testing was of less importance to this readership group at this point in the pandemic.

Readers' fourth general informational need was to understand the short and long-term implications of a personal health decision; in these instances DP was serving as a health counselor.

Discussion

The purpose of this study was to use questions submitted to the Dear Pandemic question box to identify possible areas of misinformation exposure and self-expressed informational needs of DP readers over the course of the COVID-19 pandemic. This is a unique data set that allows for characterization of topics for which people were actively seeking informational guidance over the course of the COVID-19 pandemic. By identifying the informational needs that readers came to DP with, we show the voids that readers hoped DP would fill. Other studies examining prominent misinformation topics have used infoveillance methods, such as characterizing the topics and sentiments expressed in a sample of tweets (Abd-Alrazaq, Alhuwail, Househ, Hamdi, & Shah, 2020; Chipidza *et al.*, 2021; Nuzhath *et al.*, 2020). Others have used national samples or google trends data to paint a broad picture of topics searched by individuals seeking further information (Lachlan, Hutter, Gilbert, & Spence, 2021; Mangono *et al.*, 2021). Our study builds on these methods by describing the question topics related to misinformation that were generated by the DP readers using a two-way communication approach and user-directed content. Previous studies describing information-seeking have identified general themes of inquiry such as health insurance coverage or unemployment options due to COVID-19, travel restrictions and shutdowns, or vaccination. However, such studies did not provide examples of the specific questions asked or the background or description of the context of the question, particularly those that were related to misinformation. We structure our discussion as it relates to the three key dimensions of communication we identified in the beginning of this paper—channel, source, and content.

Channel

Recognizing that mis-disinformation is present online, Dear Pandemic's existence primarily in the online space where individuals already seek information is helpful — being able to connect with Dear Pandemic on Facebook, for example, may streamline the comfort and ease of connectivity with the channel. Meeting individuals where they are in their information consumption behaviors is critical for risk communicators, and a component of the current information environment that is less understood at present.

Source

The reader's desire for DP to serve the role of countering or explaining information, either as a trusted navigator of other sources of information or as an independent arbitrator of information, was reflected in language used in the questions, including the familiar or sororal greetings seen in many questions. For example, readers came to Dear Pandemic to question how they should vet other sources of information. In these cases, Dear Pandemic readers would reference other sources of information and directly ask for feedback on those sources, reflecting that Dear Pandemic's perspective on those other pieces of information was a trusted perspective for readers. DP was viewed in a different light than traditional risk communication outlets such as mainstream media or CDC because DP was being asked to fact check these sources (see second informational need). Though it is speculative, this may be because throughout the pandemic, DP maintained its core function as a primarily volunteer organization of informed, compassionate, and committed women who were unsponsored and financially untethered to an academic or governmental institution beyond community donations for operations, implicitly suggested to readers that there were no financial conflicts of interest to disclose, or that a superiority in position or prestige was being presumed. This lack of affiliation and conflict of interest may have increased readers' trust in the group and the information disseminated.

Content

The sub-sample of questions included in this analysis was selected based on four criteria: (1) questions that referenced underlying concerns about trust or truth in science, media, or policy decisions; (2) questions that sought clarification about another source of information; (3) comments related to concerns about misinformation existing or spreading; or (4) questions expressing the need for more information to feel comfortable in decision making, in most cases relating to vaccination. We used this sampling frame in order to focus on questions that may be related to mis- and disinformation. Questions related to COVID-19 vaccines began to appear as early as September 2020 and continued to be a dominant topic throughout the inclusion period. Many of the inquiries across topics included questions about how the initial inquirer should speak to their own social network about the topic. Readers were looking for posts, evidence, or fact-checks that could be passed on to others. The inquiries seemed to express a desire for assistance addressing misinformation in their own social circles, and in some instances a vulnerability to misinformation themselves.

One set of questions that met inclusion criteria but stand out as potentially unique was questions about pregnancy and fertility (part of fourth informational need). These questions in particular highlight an area of potentially legitimate concern that require ongoing communication because of the limited information on the relationship between vaccination and these outcomes. The safety culture that is prevalent in research, institutionalized in the deliberations of Institutional Review

Boards and the medical culture of “first, do not harm,” along with broader misogynistic/paternalistic currents in medicine and society together result in the exclusion of women as research subjects generally, and pregnant people in particular (Taylor et al., 2021). When women are systematically excluded from research in clinical medicine and public health, issues that disproportionately affect them are not addressed and the research infrastructure fails to protect them. Because data about the COVID vaccine and pregnancy were extremely sparse, and predictions of absence of harm by medical professionals or other authorities, could be perceived as simple appeals to authority, could be perceived as simple appeals to authority at a time when scientific authority had become suspect (Saeb et al., 2022).

Though concerns about fertility/pregnancy can certainly be founded, there is historical evidence that the narratives focused on these topics have been consistently successful for the anti-vaccination movement, dating to before the COVID-19 pandemic (Dredze, Broniatowski, & Hilyard, 2016; Dubé, Vivion, & MacDonald, 2015). The fertility/pregnancy narrative plays to the vulnerabilities related to pregnancy and childbearing, a window of opportunity that is widened by the continuing tendency toward systematic exclusion of people of childbearing potential from clinical trials, despite the acknowledged negative impact this has on all areas of health research (American College of Obstetricians and Gynecologists, 2016). Both founded and unfounded fears of pregnant individuals are often preyed on by pro and anti-science information, during this particularly vulnerable time of the life-course. A prior study found that most pregnant people will make vaccination decisions for their unborn child while pregnant, before ever having discussed childhood vaccinations with a clinician or pediatrician (Danchin et al., 2018).

Limitations

There are limitations to this analysis. The results shown here only reflect inquiries that came to Dear Pandemic that met the four inclusion criteria described here. Methodologically, we also used iteratively developed criteria for inclusion in the analytic sample and therefore questions related to other topics or types of misinformation may have been inadvertently excluded. Additionally, there is a critical fourth piece of communication science that maximizes information delivery—understanding of the audience. At present, we do not have information about the audience beyond their geographic location, although we are examining the public pages that share DP content and the types of posts that were shared. More specific message tailoring may be effective depending on local context. Finally, additional areas of inquiry and themes may have emerged in the time since the analytic sample was obtained, as the Dear Pandemic question box remains open and continues to receive inquiries.

Conclusions

In this manuscript we highlight how DP can address informational needs that arose during the COVID-19 infodemic. The results presented here demonstrate how a science-driven, multi-

channel informational source that is able to engender trust via engaging in two-way communication can be a powerful tool to address informational needs. DP was able to serve as a sounding board and validating source even when initial content was coming from one's personal network. DP was also asked to weigh in on traditional science communicators. Academic experts that are not politically or otherwise affiliated have a role to play in science communication and this must be recognized and supported in the ongoing infodemic.

It is critical to recognize that while DP's approach may have been valuable to readers and an effective means through which to communicate, there are challenges to academic value, sustainability, and integration into mainstream public health work. A recent study by Parker et al. investigated the opinions of scientists and science communicators about responding to misinformation, acknowledging the ongoing systemic failure of publishing and academia to recognize their influence on lay audiences and responsibilities in science communication (Parker, Byrne, Goldwater, & Enfield, 2021). DP, like many other individuals and groups who responded to the misinformation crisis, was not institutionally incentivized and was rewarded by plaudits and dissemination of the information rather than financial resources. Academics who value public engagement have pointed out for decades that their work is institutionally marginalized and ill-suited to the academic currency of high-impact publishing, grant-funding, and citation indices. Attempts to shift the values of academia such as England's Research Excellence Framework have met with limited success (Manville et al., 2021). The elephant in the room related to this and similar efforts is that a volunteer-initiated response to a global crisis is neither sustainable nor sufficient, yet was necessary during this public health crisis. Hopefully DP and other efforts will contribute to a conversation about reversing the continuing attrition of public health professionals and infrastructure in the United States and bolstering the workforce available to counter misinformation (Maani & Galea, 2020).

Many career researchers do not have the luxury of thinking about their work past the point of publication in academic journals, and training in effective dissemination, public engagement, and the creation of visual and digital messaging is not seen as essential to the mission of science. Increasing the availability and urgency of training in these skills and providing the institutional space to practice them is an essential part of creating an environment where clinician-researchers, epidemiologists, public health experts and their professional and lay allies can work together to seize the virtual Broad Street handle from those who poison and pollute the digital discourse about health and medicine (Tulchinsky, 2018).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by The Leverhulme Trust.

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