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ABSTRACT

With specific references to South Korea's response to the COVID-19 pandemic, this commentary discusses insights and problems related to the issue of how to communicate uncertainties about health risks to affected publics. First, we discuss examples of uncertainties relating to deficiencies of knowledge and divergent views among experts. Next, we summarize key findings on effective communication about uncertainty, and we suggest possible future directions for research in this area. Last, we suggest further development of theories that could explain how people process uncertainty in communication and how uncertainty leads to specific cognitive, emotional, and behavioral reactions.

In mid-February 2020, after South Korea had four days without any confirmed COVID-19 cases and only 28 total cases in the country, President Moon Jae-in predicted that the outbreak would soon disappear. At the same time, however, Jung Eun-Kyeong, Director of the Korea Centers for Disease Control & Prevention (KCDC), continued to emphasize that health and medical experts' knowledge about the magnitude and severity of the pandemic remained mostly uncertain. For the entire duration of this crisis, Director Jung has been consistently and highly trusted by the South Korean public. President Moon's divergence from expert assessments opened him up to harsh criticism from his political opposition, who characterized his optimism as a sign of uninformed and incompetent leadership. Moon's optimism also failed to reassure the public, and over one million people signed an online petition calling for his impeachment (Choe, 2020, February 27).

Although Moon eventually regained public support due to his administration's effectiveness in controlling the pandemic, this case of disparate trust in risk managers underscores how much remains to be learned about the most effective ways to communicate scientific uncertainties and disagreements to the public. Worldwide, public confusion about COVID-19 has been exacerbated by insufficient information and contradictory recommendations. The following commentary summarizes some key insights from existing research on communicating uncertainties about risks and identifies issues that warrant further investigation.

Two types of uncertainty

One common type of uncertainty that risk managers need to figure out how to communicate to the public is any lack of data or knowledge about the causes and characteristics of a risk. Researchers have referred to this as *epistemic uncertainty* (Markon & Lemyre, 2013) or *deficient uncertainty* (Gustafson & Rice, 2020). In the early stages of COVID-19, experts only gradually figured out that the cause of an apparent pneumonia outbreak around Wuhan, China, was the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). In ongoing efforts to manage the virus, another knowledge deficiency that has been especially troublesome is uncertainty about how the virus is transmitted. Initially, experts were unaware that people showing no symptoms of the virus could be incubating it and spreading it to others. Also gradual in emerging was knowledge that the virus is spread mainly via aerosol droplets emitted when people cough and sneeze (Helmy et al., 2020). Regarding how to block this spread among the general public, scientists did not have sufficient evidence about the effectiveness of face masks until more than two months after the initial recognition of the outbreak (Howard et al., 2020).

Another type of uncertainty arises when the people who are responsible for managing a risk have divergent or contradictory views. This has been referred to as *ambiguity* (Markon & Lemyre, 2013) or *consensus uncertainty* (Gustafson & Rice, 2020). When such divergences occur, people will make varying judgments about which sources of risk information are worthy or unworthy of trust. In the U.S., for example, right-wing politicians and media figures continue to raise doubts about the trustworthiness of health experts, as well as their assessments of the nature of the pandemic and the proper procedures for controlling it. Such cases raise many questions that need to be investigated about how and why people choose to trust political and media figures over scientific experts.

Consensus uncertainty may be especially confusing when divergent views are promoted *within* the cohort of experts. Again, the evolution of views on wearing masks serves as an example. During the first few months of the outbreak, experts offered different recommendations about mask use based on different justifications (see Greenhalgh et al., 2020). On one hand, even though there was limited evidence that mask-wearing could control the virus, some experts recommended the practice based on the precautionary principle that traditional safety measures should be adopted even before their

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exact effectiveness is known. On the other hand, prominent expert sources such as the World Health Organization, the U.S. Centers for Disease Control and Prevention, and the U.S. Surgeon General were recommending that people should *not* buy and wear masks unless they felt ill (Cramer & Sheikh, 2020, February 29). Such cases of expert disagreement highlight the need to figure out how much consensus uncertainty about risk management should be communicated to the public without either confusing them or losing their trust.

Communicating uncertainty: Research and practical implications

Studies on the cognitive, emotional, and behavioral consequences of communicating uncertainty show mixed results (see Gustafson & Rice, 2020; van Der Bles et al., 2019). Uncertainty can affect how people perceive a risk, how they interpret information about it, how motivated they will be to take actions in response to it, and how much they trust the people and institutions responsible for managing it. In efforts to achieve desirable outcomes while communicating uncertainty, two key factors are message features and source characteristics.

In risk communication messages, the formats used to present uncertain information (e.g., visual vs. verbal, frequency/count vs. probability) can affect people's cognitive and emotional reactions to a given risk (e.g., Hove & Paek, 2015; Johnson & Slovic, 1995). In addition, certain types of emotional appeals may be effective. According to the *WHO Outbreak Communication Guidelines* (WHO, 2005) and the U.S. Centers for Disease Control's (2020) *Crisis & Emergency Risk Communication* (CERC) manual, it is helpful to provide the public with messages that convey empathy, reassurance, and respect. Messages that convey uncertainty about health risks should not only indicate the uncertainty but also emphasize what is being done to reduce it and provide guidelines for preventive actions (Frewer et al., 2002).

Regarding the institutions and people who provide such messages, two key characteristics are *expertise*, which refers to perceptions of their knowledge and competence, and *trustworthiness*, which refers to perceptions of credibility, validity, honesty, and sincerity in their communication (for overview, see Paek & Hove, 2019). On the issue of whether openly communicating uncertainty enhances or harms public perceptions of these characteristics, findings have been mixed (Markon, Crowe, & Lemyre, 2013).

For the South Korean government, the open approach has been generally successful. Several government risk managers have been consistently transparent about their current state of knowledge, including their own uncertainties. For several weeks after January 20, 2020 when the first domestic COVID-19 patient was confirmed, the directors of the KCDC and the Central Disaster Management Headquarters held media briefings every day: one in the morning about the government's COVID-19 response strategies, and one in the afternoon about up-to-date confirmed cases, measures, and epidemiological research findings. Regularly in their briefings, officials would clearly state what they did and did not know about the virus. According to a July 2020 national survey, 90% of respondents said that they trusted the KCDC for its management of COVID-19 (Lee, 2020, July 29).

Although research on how to maintain public trust while communicating uncertainty remains limited, several effective strategies and principles have been identified. In addition to openness and transparency, they include simplicity, timeliness, and cooperativeness (e.g., Frewer et al., 2002; Johnson & Slovic, 1995; Markon et al., 2013). Simple messages help to prevent undesirable outcomes such as confusing the public, making them over- or underestimate the severity of a risk, and reducing their trust in risk managers. Discussing uncertainties with the public as early as possible is preferable to waiting until a risk has directly affected them. Also, people are more likely to accept uncertainty when it is conveyed to them as a necessary part of the scientific process, as opposed to when it results from government inaction or the lack of consensus among experts (Gustafson & Rice, 2020). When risk managers treat people as co-equal participants in the scientific process rather than passive recipients of expert control, they are more likely to earn public trust and make people feel empowered to take preventive actions (Markon et al., 2013).

To refine these general principles, more research in health and risk contexts is needed to identify, first, the elements of effective uncertainty communication and, second, the boundary conditions of effectiveness. Several empirical questions could be explored regarding how desired communication outcomes are affected by specific types of uncertainty (e.g., deficient and consensus uncertainty), as well as by various psychological, socio-cultural, and communication factors.

Also, more conceptual and theoretical work could be done to build on and elaborate existing theories of communication about uncertainty. In this area, communication scholars have developed uncertainty reduction theory, uncertainty management theory, and problematic integration theory. Brashers (2001) has recommended additional work on three specific issues: the meaning and experience of uncertainty, people's appraisals and emotional responses to it, and corresponding behavioral outcomes. Although some of this work has been done in the last two decades, most of it has focused on the first issue of how people deal with uncertainty as either a harmful or beneficial experience. Recently, some studies have made extensive efforts to conceptualize types of uncertainty and synthesize existing research on uncertainty in science communication (e.g., Gustafson & Rice, 2020; van Der Bles et al., 2019). However, more theoretical work is needed to explain how people process uncertainty in communication and how it leads to specific cognitive, emotional, and behavioral reactions.

Conclusion

A recently published modeling study projected that by March 2021 the number of COVID-19 infections worldwide will be almost 300 million, with about 2 million deaths (Scudellari, 2020). Whether this dire prediction proves correct depends, for now, on the availability of vaccines and the effectiveness of preventive measures such as distancing and mask wearing. Uncertainties about COVID-19 still abound, and effectively communicating them to the global public is an important part of managing the pandemic. Although findings in this area of health and risk communication are mixed and limited, we offer the following practical suggestions, based on

the best evidence currently available, for effectively communicating uncertainties about risks:

- When there are deficiencies of knowledge and information, stating clearly what is currently known and not known is better than saying nothing.
- When communicating uncertainty, explain the actions that are being taken to reduce it, and provide the public with the best available guidelines for preventive actions.
- When there is a lack of scientific and expert consensus, there should be at least some convergence of opinion before scientific views are communicated broadly to the general public.
- When scientific disagreements persist, explain why and in which specific contexts they are occurring.
- When communicating uncertainties during a time of crisis, one credible spokesperson should speak consistently and regularly to the public with sincerity, openness, and empathy.
- To prevent information vacuums that get filled in by unreliable lay advice and rumors, provide currently known health and risk information repeatedly and regularly. Use both traditional broadcast media channels (media briefings and press releases) and more direct channels (text message alerts and social media).

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