








Global health crises are also information crises: A call to action

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Abstract

In this opinion paper, we argue that global health crises are also *information* crises. Using as an example the coronavirus disease 2019 (COVID-19) epidemic, we (a) examine challenges associated with what we term “global *information* crises”; (b) recommend changes needed for the field of information science to play a leading role in such crises; and (c) propose actionable items for short- and long-term research, education, and practice in information science.

1 | INTRODUCTION

Our concept of *global information crises* is derived from the concepts of public health and global health (Beaglehole & Bonita, 2010; Koplan et al., 2009). Using as an example the ongoing coronavirus disease 2019 (COVID-19) crisis, we argue that any global health crises are also *information* crises that require serious attention in the information science field. COVID-19 originated in Wuhan, the capital of Hubei Province in central China; it has spread to 29 countries outside of China, with 79,331 confirmed cases globally (77,262 in China) and 2,618 reported deaths globally (2,595 in

China) as of February 24, 2020 (World Health Organization, 2020). While this is still “an emerging, rapidly evolving situation” (Centers for Disease Control and Prevention, 2020), COVID-19 has already exposed numerous serious problems. Its long-term impact may not be fully realized until years later. In the midst of this crisis, however, many questions of direct relevance to the information science field can be asked. We start with this motivating question: What specific things can information scientists do to help individuals and society as a whole survive global health crises like COVID-19, deal with the aftermath, and be better prepared for the next crisis?

2 | CHALLENGES

Keeping in mind that answers to our motivating question are important to not only this one particular crisis—COVID-19—but also any global health crisis, we ask that the information science field reflect on a few questions—and challenges associated with them:

1. How might information science pay more attention to information behaviors and environments during global health crises?

Some researchers have studied information behaviors in natural disasters (Pang, Karanasios, & Anwar, in press; Rahmi, Joho, & Shirai, 2019); crisis informatics has also focused on natural disasters (Liu, Palen, & Giaccardi, 2012; Palen, Hiltz, & Liu, 2007; Palen & Hughes, 2018; Soden & Palen, 2018). Global health crises are unique in that they can spread far, and fast, and have global impacts. We ask: How can we characterize information environments in global health crises? How might information environments and human information behaviors in global health crises differ from those in other types of crises? What information science theories, methods, policies, standards, and practices might be necessary to examine, describe, interpret, model, and predict information environments and behaviors in global health crises?

2. What information science theories, methods, policies, standards, and practices might be necessary to understand and deal with information behaviors and environments in global health crises when information flow is intentionally regulated?

Although global health crises share common characteristics across national contexts, each country has its unique political and social systems that affect information behaviors and environments. This includes countries where information flow is censored, as we have seen in COVID-19 in China. From the perspective of information science, what strategies might be useful to facilitate information transparency in global health crises?

3. How can we identify relevant and factual information during global health crises within the sea of constant messages (that may also contain misinformation/disinformation)?

In global health crises, there is no shortage of digital information, which spreads fast, especially via social media. Such information may fill in gaps by providing information that authoritative organizations may not be able to share, thus benefitting the public (Stephens, Li,

Robertson, Smith, & Murthy, 2018) and health professionals alike (Xie et al., 2019). However, misinformation/disinformation may also spread. It is important to automatically identify and label relevant and factual text and images (vs. misinformation/disinformation) shared through social media, on which the growing body of research on machine learning and artificial intelligence approaches should shed light (O'Neal et al., 2018).

4. How can we prepare our students to function in global health crises?

Current information science curricula focus on preparing our students to be information professionals mostly in daily activities under normal circumstances. With 21st-century information professionals more embedded in all aspects of human society, it is important that our students have sufficient knowledge about how to function in global health crises.

5. How might information science reach out to promote interdisciplinary collaboration to advance science and practice in global health crises?

Other academic fields have been on the frontline in information dissemination and communication during global health crises and natural disasters (e.g., global health, information management in business schools, computer science research on using crowdsourcing and cyberphysical systems during disasters). Many of them have corresponding professional organizations and journal outlets (e.g., the Society for Disaster Medicine and Global Health and its journal the *Disaster Medicine and Public Health Preparedness Journal* and the *International Information Systems for Crisis Response and Management conferences and proceedings*). Recognizing that global health crises are also *information* crises, information scientists must be integrated into crisis management, prediction, and prevention and have appropriate outlets to share and disseminate our scholarly work.

3 | RECOMMENDATIONS

3.1 | Our reflections on these challenges have led us to the following recommendations:

1. Misinformation/disinformation particularly during global health crises

In rapidly developing situations, misinformation due to inaccurate descriptions or interpretations of the situation and

deliberately falsified disinformation are easily generated and spread quickly. As disinformation/misinformation has become a hot topic and is studied in a wide range of disciplines and fields, we urge information scientists to examine: (a) how information science might assist the use of trustworthy social media information while avoiding misinformation/disinformation, (b) systematic ways to automatically detect and stop the spread of misinformation/disinformation on mass media and social media, and (c) strategies to help authoritative organizations in using social media to communicate with individuals and intervene when health misinformation/disinformation spreads.

2. Health literacy—including eHealth literacy

Much research is needed to understand individuals' information behaviors in global health crises, including their abilities to discern good versus bad information from various information sources (traditional mass media, digital, interpersonal, etc.). Based on such an understanding, we can then develop interventions to improve individuals' health literacy, which must include eHealth literacy in today's world (Norman & Skinner, 2006), that is, the ability to access, assess, and use digital health information to make informed decisions. This is important in global health crises where information flow via social media is especially overwhelming and rapidly evolving.

3. Information behavior during lock downs

In global health crises, an entire city (of over 10 million population) may be locked down for an extended time period. In such a situation, cellphones may become the most likely (and, in many cases, only) means to obtain essential information. Much research is needed to understand the abilities of individuals (including residents, local government officials, and community leaders) to use mobile applications (apps) to obtain information, app features that might be most needed, and the types of interface design most applicable in these situations. Furthermore, a user may use multiple mobile apps, platforms, and online groups simultaneously. Coordination and interoperability across online platforms will be critical.

4. Vulnerable populations—a case for accessible and usable solutions

In any crises, people who are most likely to suffer, and are in most need of help, are often those who are already in vulnerable positions. When much of the information and resources are disseminated digitally, individuals who are on the wrong side of the digital divide, for example, older adults, will continue to be ignored. Such a

disadvantage may put older adults in double jeopardy: Older adults are more likely to be infected by the virus and have worse recovery; however, they are also vulnerable because they may not know how to obtain information about food and supplies online. Information scientists should work with government agencies, for-profit and nonprofit organizations, and community volunteers to reach vulnerable populations, including ensuring the accessibility and usability of (high-tech and low-tech) solutions.

5. Information dissemination, sharing, and integration among multiple forms of digital data

Information dissemination mechanisms and infrastructure should be established by information professionals and organizations (e.g., public libraries, national health organizations, professional associations) to deliver timely high-quality information during global health crises. In COVID-19, we have seen many cases where desperate clinicians (and patients alike) cry out via social media begging for protective supplies and other essentials (Buckley, Wee, & Qin, 2020). Information science can contribute to the distribution of credible information between hospitals, clinicians, and patients and their families and connect their needs with volunteers and organizations who are willing and able to help. Social media plays an important role in crises, but typically, there are multiple social media platforms—for example, WhatsApp, WeChat, Facebook, and Twitter (Stephens et al., 2018). The interaction and interoperability among different social media platforms and their role in global health crises is worth studying. Any sensible modeling, interpretation, and prediction using social media data need to consider these factors holistically to yield better insights and improve decision making at all levels.

6. eHealth tools

Telemedicine has been used to consult, often in real-time via video, with a healthcare provider for individual-level clinical care. Recently, eHealth and mobile health (mHealth) have been adopted, including using a smartphone or tablet-based technology tools to facilitate individual- or population-level care (e.g., clinical decision support, sharing of information, and creation of dashboards or other population-level data sharing). In global health crises involving contagions, eHealth tools' major advantage is that they allow people to connect without personal contact. This makes it an ideal approach to help screen, track, and care for individuals who may not need to go to a hospital (where they might become infected by other patients) but still need care during the crisis.

Information science can contribute to the design, implementation, and adoption of eHealth tools for use in global health crises.

7. Predictive methods

Emerging retrospective research suggests that results from mining social media data could have accurately predicted the H1N1 swine flu pandemic in 2009 up to 2 weeks before the U.S. Centers for Disease Control and Prevention (CDC) was able to confirm it (Signorini, Segre, & Polgreen, 2011). Real-time tracking and mapping have been increasingly used (Yasinski, 2020). Still, much work is needed: Research in social media mining should be further developed to predict the onset of a future global health crisis. It is also important to develop measures to avoid “false alarms.” In countries where social media activities are censored, special methods (e.g., machine learning algorithms, digital preservation, and archiving methods) may be needed to document and analyze the data.

8. Digital archiving

In global health crises, comparing the current crisis with previous ones with similar characteristics can yield valuable insights on the origin, development, and consequences. As such, timely, comprehensive, and accurate storage of digital information is critical. However, it appears that there is no specific website or official information system dedicated to storing information about Severe Acute Respiratory Syndrome (SARS), the closest comparison one might think of to COVID-19. Information science should lead the effort in archiving and storing digital information, especially social media information generated by the public, as an important part of our history—that may be of use in the prevention and management of future crises.

9. Ethical considerations

While we understand the need to disclose personal information in global health crises, we also urge information scientists to help protect the privacy of patients, suspected patients, and close contacts to the extent possible. It is useful to think about where to draw the line between transparency and privacy and how to integrate it into the design of information systems and interfaces. Information science should also contribute to the fight, globally, against negative stereotypes and hostile behaviors toward innocent people who may not even have anything to do with the spread of the virus (e.g., hostile

behaviors against immigrant Chinese people as we have seen in COVID-19; D’Urbino, 2020; Iqbal, 2020).

4 | ACTIONABLE ITEMS

Producing positive impacts on the real world requires committed faculty and students working together to address these growing challenges. We propose specific actionable items:

1. Form special interest groups within professional associations; specifically, using this paper as a platform, information scientists should meet to develop a “formal” shared research/training/policy/implementation agenda centered around the application of information science to global health crises and then meet with global health (clinical, research, and policy) colleagues to share and refine this agenda and make it the most relevant and impactful;
2. Information science journals, for example, *Journal of the Association for Information Science and Technology*, devote special issues about these topics; also consider collaborating with/jointly publishing with global health journals to reach broader audience and to bring the science and practice of information science more to the “front lines”;
3. Discuss how to measure our work’s real-world impact. Clinicians such as doctors and nurses, who work with patients on the frontline, are valued by the direct impact they have on the patients, as it should be. Perhaps we, as “information clinicians,” should also be, in part, assessed by how much our work contributes to positive changes on the frontline of information crises.
4. Draw more attention to global health literacy and eHealth literacy, in addition to information literacy, in information science research and education. Information scientists and educators can help improve the public’s abilities to identify misinformation/disinformation and use of mobile apps, social media, and information system in crises. This is especially important for vulnerable populations that may require special attention and intervention.
5. COVID-19 brings to light challenges associated with not only a global health crisis but also a global *information* crisis. Promoting interdisciplinary collaborations with a broad range of perspectives and fields is key to developing solutions for further public information crises. For example, information scientists could work with clinicians to develop ways to obtain the best and most current information from agencies such

as the World Health Organization, the CDC, and non-governmental agencies that can assist with accurate information dissemination and treatment plans. Furthermore, global health pandemics tend to disproportionately affect countries with weak local healthcare delivery systems. It is imperative for information scientists to also work closely with local governments, for example, state-/county-/district-level Ministries of Health/public sector healthcare delivery systems.

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