

COVID-19 Pandemic: Tackling ‘Infodemics’ Through an Integrated One Health–Social Science Approach

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Abstract

The novel coronavirus disease 2019 (COVID-19), which was first identified in Wuhan city, China, in late December 2019, has now spread globally with over 43 million people infected and about 1.16 million deaths as of 30 October 2020. COVID-19 is a novel and highly transmissible disease where little is known, which is why health authorities and the public alike have reasons to be concerned. With the spread of the disease, there has been an ‘infodemic’, which is defined as an influx of all kinds of information, including authentic information and also rumours, misinformation and conspiracy theories about the origin, prevention and treatment of the disease. With the growth of infodemics over social media and mass media, prejudicial and xenophobic acts became more evident, presenting additional challenges for health authorities. Effective control of pandemics such as COVID-19 thus requires large-scale, multifaceted response measures including risk communications. A transdisciplinary collaborative One Health approach has been increasingly advocated as an effective strategy to address diseases that occur at the human-animal-ecosystem interface. Similarly, the role of social science in risk communications in recent epidemics such as Ebola has been widely acknowledged. Timely interdisciplinary reviews, including a social and behavioural sciences lens, are needed to optimise the pandemic response through effectively combating communication challenges associated with infodemics and many other challenges in future epidemic responses.

Keywords: infodemic, coronavirus, pandemic, misinformation, One Health, whole-of-government pandemic plan, social science, risk communications

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Introduction

Several cases of severe acute respiratory syndrome (SARS) were first reported in Wuhan City, Hubei Province, China, in late December 2019. The causative agent was soon identified as a novel coronavirus. It was called severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and is a new strain of coronavirus not previously identified in humans. Coronaviruses are a group of viruses that can cause illnesses ranging from a common cold to more severe diseases such as SARS and Middle East respiratory syndrome (MERS) (World Health Organization, 2020a). The SARS-CoV-2 virus that causes the novel coronavirus disease

2019 (COVID-19) spreads from person to person primarily through respiratory droplets from an infected person. Epidemiological evidence collected from the initial patients in Wuhan indicated links to a large seafood and wild animal market, suggesting that the virus may have emerged from an animal source (Zhu et al., 2020). Within days of first identification in Wuhan, the COVID-19 outbreak spread to other parts of China and several other countries. Outbreaks and clusters of the disease have since been observed in over 200 countries and territories, with over 43 million cases and 1.16 million deaths as of 30 October 2020 (Figure 1) (World Health Organization, 2020c).

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The World Health Organization (WHO) declared COVID-19 a pandemic on 11 March 2020. In Queensland, the first case of COVID-19 was reported in late January 2020. The total number of confirmed cases has since risen to 1171, with six deaths in Queensland as of 30 October 2020 (Figure 2) (Queensland Health, 2020).

As fears of COVID-19 grew, so did information about the virus – some of it authentic and reliable – but also the false, the fabricated and the folk theory

information that was deliberately deceptive (BBC News, 2020; Thomas, 2020). During the early days of the epidemic, the disease was variously called the “Chinese coronavirus” or the “Wuhan coronavirus”, which was prejudicial and discriminatory towards Chinese people (Shu, 2020). On 11 February 2020, WHO gave a formal name to the disease – coronavirus disease 2019 or COVID-19 – without referring to a place or the ethnicity of its origin (World Health Organization, 2020e).

Figure 1. Number of global COVID-19 cases, and cumulative number of cases and deaths.

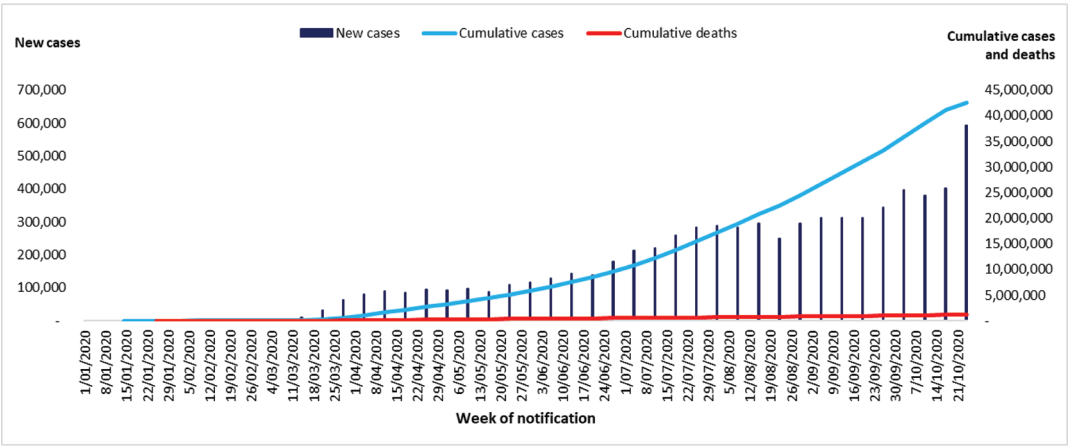
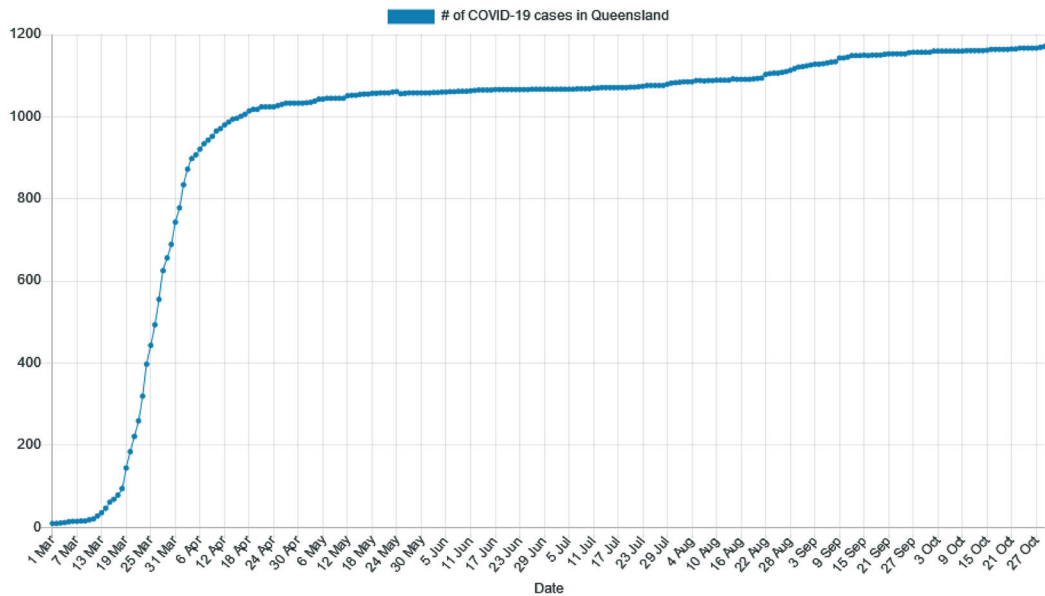


Figure 2. Cumulative incident cases of COVID-19, Queensland, Australia.



The ethnic stereotyping linking the origin of the virus, along with limited knowledge and uncertainties about the disease, fuelled rumours and misinformation, escalating fear, panic buying, social unrest and substantially impacting global financial markets (BBC News, 2020; United Nations Development Programme, 2020). Health authorities in many countries thus faced challenges on two fronts: controlling the spread of the disease; and addressing the growing rumours, misinformation and associated social and economic impacts. The scale and magnitude of misinformation spread worldwide have prompted WHO to set up a new information platform called WHO Information Network for Epidemics (EPI-WIN) to counter the misinformation surrounding COVID-19 (World Health Organization, 2020d). As WHO Director-General Dr Tedros Adhanom Ghebreyesus said, “We’re not just fighting an epidemic; we’re fighting an infodemic” (Zarocostas, 2020). The term ‘infodemic’ is defined as the rapid spread of information of all kinds, including rumours, gossip and unreliable information (World Health Organization, 2018). In this article, infodemic refers to rumours and misinformation about the origin and spread of COVID-19.

Infodemics in General Health Emergencies

During an epidemic, people tend to develop their own hypotheses about the origin and mode of transmission of the disease (Stadler, 2003). Often misinformation spreads more rapidly than the disease itself – thanks to the prolific use of smartphones, the internet and social media. Other than sharing unverified facts, internet-based infodemics may also include genuine misunderstanding of facts, and equally they may be a result of deliberate deception (Zhang et al., 2015). Speculation fomented from not only lack of information but also unclear or conflicting information from multiple sources. Unlike formal media such as television, radio and official internet websites, messages spread through informal media, such as internet blogs and social media, are prone to misinformation as it is difficult to verify the authenticity of the information received (Sunstein, 2014). In times of health emergencies, while most false rumours stem from an absence of reliable data, or unclear information from a trustworthy source, they may also be due

to inappropriately or infrequently communicated public health messages (Sunstein, 2014). There are instances where rumours may also generate from a state of panic, especially when it is caused by a novel pathogen. For example, HIV/AIDS was long speculated to be a foreign disease in some regions in the absence of a strong and effective public health communication (Stadler, 2003). Similarly, there was a notion that Ebola was a laboratory-generated virus (Loukatou et al., 2014). During the influenza (H5N1) epidemic in 2004, WHO identified 40 different rumours in circulation, only nine of which were verified to be factually correct (Samaan et al., 2005). Rumours pose significant challenges to the effective communication of evidence-based information, which is crucial for the adoption of recommended health actions by the public (Luth et al., 2013).

Infodemics Surrounding COVID-19

As COVID-19 crossed international borders, panic started to grow amid an influx of information from numerous sources including government health authorities, international organisations such as the WHO, and public media such as radio and TV. Messages were also outpouring through various internet websites, blog posts and social media regarding the source of the virus and the methods of its transmission. Alongside authentic information from competent authorities worldwide, various false claims and conspiracy theories also emerged and spread through social media (Thomas, 2020). Following the emergence of SARS-CoV-2, and at a time when no specific animal species had been identified as a definitive point-source of the virus, a YouTube™ video showing a Chinese woman eating bat soup emerged and was widely circulated through the internet media, suggesting bats were the source of the outbreak (Figure 3) (YouTube, 2020). The video, which was originally filmed in 2016, prompted outrage among some users of online social media, with some people believing that Chinese eating habits had caused the outbreak (BBC News, 2020). The video was unavailable at the time of submission of this paper.

Although past evidence suggests that animals such as civets, camels, bats or pangolins are the reservoirs of coronaviruses, the exact source of COVID-19 is yet to be determined. Yet

rumours, misinformation and conspiracy theories were spreading rapidly while officials around the world were fighting to contain the disease (BBC News, 2020). Lately, there have been claims that COVID-19 was manufactured at a Chinese laboratory (Andersen et al., 2020), or it was linked to the rollout of 5G telecommunications networks in Australia (Wood, 2020). These claims have no scientific basis and were dismissed by scientists and competent authorities worldwide (Andersen et al., 2020; Australian Radiation Protection and Nuclear Safety Agency, 2020).

Figure 3. An internet video clip showing a Chinese woman holding up a cooked bat.



The Impact of Infodemics on COVID-19

The ramifications of the COVID-19 pandemic on individuals, society and the global economy are enormous, and are partly exacerbated by infodemics which have led to irrational public behaviour such as panic buying and stockpiling of food products, toilet paper and hand sanitiser. In a small number of extreme cases, physical fights fuelled by extreme anxiety have occurred in retail stores over toilet paper and other domestic essentials (Lucy, 2020). False rumours have also resulted in xenophobic behaviour and racial vilification of Chinese nationals in foreign countries (Rendall, 2020). Businesses run by individuals of Chinese origin were particularly hit by a spate of racially motivated abusive behaviours and attacks, and calls for avoidance of their businesses (Rendall, 2020). Although there was no evidence that Chinese nationals were at higher risk of having the

disease than other people, deceptive messages have the potential to damage the social fabric and community harmony at a time when societal unity and coherence are needed more than ever.

Deliberately deceptive or fabricated information can also damage the credibility of important public health messages communicated by health authorities during an epidemic. For example, in late January 2020, a fake Media Release, said to be issued by the Queensland Government Department of Health, emerged and spread through social media, allegedly advising people to limit non-essential travel to Wuhan, China, as well as several local areas in Australia with high ethnic Chinese populations (Figure 4) (Rendall, 2020). The use of the official logo of the Department and its web address made the statement appear credible, although a simple verification of this statement with the Department's official website showed this to be fake news. Misinformation or lack of reliable information may have caused many patients with other health conditions to avoid accessing healthcare services for fear of contracting COVID-19 (Mackee, 2020). There were reports of drastic falls in attendance at hospital emergency departments in Australia, the UK, Europe and Canada (Jennings, 2020).

Figure 4. Fake, racist statement on social media targeting Chinese residents.



Since the disease was first detected, unprecedented control efforts have been undertaken by health authorities worldwide. Whilst there is

significant evidence of global sharing of knowledge about the disease, as well as massive scientific effort and innovation such as development of an effective vaccine against the SARS-CoV-2 virus (The Lancet, 2020), there are also reports of shortcomings in many aspects of response measures including dealing with infodemics (Weismueller et al., 2020). Furthermore, there are widespread criticisms of political leadership in many countries for over-politicising (Chappell, 2020; Weismueller et al., 2020) or underestimating the threat of the pandemic due to poor health literacy, which itself is an underestimated public health problem (Paakkari et al., 2020). Adding to these challenges is the fact that current advances in communication technologies can present risks as well as benefits. Reliable health and behavioural messages can spread rapidly, but so too can misinformation and fake news.

It is therefore extremely important that health experts and political leaders work together on sharing evidence-based information and devising appropriate risk communication strategies to deliver accurate and reliable information to counter infodemics, which have the potential to undermine response initiatives (Stadler, 2003). Public health authorities, both nationally and globally, should therefore consider inclusive and well-structured response measures incorporating diverse disciplines and sectors beyond their respective professional and cultural silos. To this end, a One Health (OH) approach has emerged as a holistic framing to bring together disciplines such as public health, veterinary medicine, environmental and ecological health to tackle health problems that stem from environment-human-animal interactions and epidemics.

An Integrated One Health–Social Science Approach

There has been an increased realisation that the health of humans is intrinsically linked to the health of animals and the ecosystems in which they reside (van Helden et al., 2013). The origin, transmission and impacts of infectious diseases are influenced or strongly shaped by many factors, such as environmental, physiological, social and cultural conditions. Effective control of infectious disease epidemics such as COVID-19 therefore require a broad-based, holistic One Health (OH) approach, which recognises the interconnectedness

between the health of people and the health of animals and our shared environment (One Health Commission, 2020). The OH paradigm emphasises cooperation and interdisciplinary collaboration to promote health and wellbeing among people, animals and the environment (Woodward et al., 2018). The OH approach thus emphasises collaboration between multiple disciplines and institutions – working locally, regionally, nationally and globally – for the benefit of the health and wellbeing of people, animals and the environment (One Health Commission, 2019). Although the fundamental concept of OH is not new, its formal recognition and systematic use have been evident only in recent years in diverse areas, such as combating antimicrobial resistance (Robinson et al., 2016), zoonoses (Woodward et al., 2018) and ensuring food safety (Institute of Medicine, 2012). The traditional OH approach to disease prevention and control typically integrates those broad sectors and disciplines that are directly linked with disease ecology and the transmission and treatment of diseases. However, to date there has been limited use of other non-health disciplines, such as social science and communications, within an OH framework to deal with psycho-social aspects surrounding an epidemic or pandemic (Khan et al., 2018), although the role of social science in risk communications, not necessarily as part of an OH approach, was widely advocated during the West African Ebola epidemics (Dhillon et al., 2015; Sumo et al., 2019).

There has been growing attention to the social dimension of infectious disease emergence and transmission (Wolf, 2015). The need for social science interventions and contributions in epidemic, pandemic and other health emergency response measures is thus widely acknowledged and applied (Craddock et al., 2015; Shah, 2020; Woldehanna et al., 2015; World Health Organization, 2017b). Alongside scientific measures such as laboratory testing of pathogens, immune response, and vaccine research and development, public health measures focusing on prevention and protection should adopt an enhanced One Health–social science integrated approach (the ‘integrated approach’) to strengthen the control measures against pandemics. The traditional OH approach advocates for collaboration between public health, veterinary health and environmental or ecological health because of their interconnectedness in the

emergence and progression of diseases that occur in the human-animal-environment interface. However, due to many uncertainties and the complexity of dealing with pandemics caused by novel pathogens such as SARS-CoV-2, the scope of the traditional OH approach needs to be broadened by incorporating other related disciplines and sectors. To this end, we propose an integrated OH approach where social and behavioural sciences and other related disciplines can be incorporated into the traditional OH model. Within the framework of the proposed integrated approach, the inclusion of health educators, communication specialists, social scientists, psychologists and social media experts is essential alongside physicians, veterinarians, public health officials and laboratory scientists to foster much greater cooperation and inclusiveness, and thereby improve risk communication outcomes within the community.

Incorporating Risk Communication into the Integrated Approach to Deal with Infodemics

Risk communication is both an art and a social science, and is integral to epidemic responses (Vaezi et al., 2020). During an epidemic, the message to be communicated should be science based, culturally appropriate and easy to understand for all members of the affected communities, including those with low literacy (Good Calculators, 2020). Methods of communication should be innovative, interesting, and targeted to hard-to-reach people, e.g. remote or marginalised communities. Another equally important aspect of risk communication is an understanding of community risk perceptions and an appreciation of why a community perceives something in a particular way. However, risk communication is increasingly becoming a major challenge in combating emerging diseases in today's globalised world. It is essential that the authority initiating risk communication gains community trust and confidence about the health messages it delivers. Building trust and engaging with affected populations is one of the most important steps in effective risk communication (World Health Organization, 2017a). During the West African Ebola epidemic in 2008–2009, lack of community participation and failure to tackle misinformation were blamed for causing a combination of community mistrust, non-cooperation and lack of confidence in government responses

to the epidemic (Hayden, 2019). Government response measures were characterised as a top-down and siloed approach with limited involvement of relevant disciplines and communities (Ntumba et al., 2019). Thus, the need for breaking down the traditional siloed approach has never been greater or more urgent. Effective and timely communication is crucial to the success of epidemic control measures, and risk communication is increasingly acknowledged as an essential element of response to health emergencies (Cipolla et al., 2015). The International Health Regulations (2005) identified risk communication as one of the 13 core capacities all countries must attain (World Health Organization, 2005). Effective risk communications and community engagement have proven to be integral to the success of responses to major public health events such as SARS, MERS, the influenza (H1N1) pandemic and Ebola (World Health Organization, 2020f). However, the risk communication and community engagement strategies applied to these and other epidemics varied markedly, and while there are no standard risk communication strategies that can be practically possible to implement across all epidemics and pandemics due to their unique nature and circumstances, identification of common areas where the proposed integrated approach can be applied could effectively harness the overall response initiative across a spectrum of control measures ranging from enhanced surveillance, including rumour surveillance (Samaan et al., 2005), to media management including social media monitoring (Fung et al., 2015) and risk communications (Sell, 2017). Table 1 illustrates the proposed structure of an integrated approach to risk communications to deal with infodemics. The proposed structure is built upon the WHO guidelines for risk communication (World Health Organization, 2017a).

During an epidemic, community distrust makes disease control measures extremely difficult, potentially resulting in the persistence of the disease (Dhillon et al., 2015). The OH integrated approach would focus on achieving community and civil society engagement to counter or dispel any negativity towards the response initiative. For example, during the West African Ebola epidemic in 2015, response teams reportedly faced an enormous challenge in gaining community trust as the affected

community tended to hide the sick and conduct funerals and related rituals in secret, against public health advice, making effective epidemic response extremely difficult (Dhillon et al., 2015). Thus, social barriers such as this, which could potentially hamper the control measures for COVID-19, need to be addressed through a combination of social science, including communication specialists, and epidemiological and medical expertise.

Against the backdrop of the emerging global human catastrophe of the COVID-19 pandemic, it is reasonable and indeed normal for the public to search for information about the origin of the virus that caused the disease. The provision of timely and accurate identification of the source and information on modes of disease transmission would help enormously in the prevention, containment and control of future pandemics.

Table 1. Risk communication measures to counter infodemics using the integrated approach with lead roles of communication specialists, social scientists and psychologists.

Action	Scope	Methods
Identify Issue identification Source identification	Infodemics in circulation: <ul style="list-style-type: none"> • Disease characteristics. • Cause or source of disease. • Modes of transmission. • Symptoms. • Seriousness (hospitalisation, recovery or death). • Treatment options. • Government response. Sources of the infodemics: <ul style="list-style-type: none"> • Mass-communication media (TV, radio, newspapers, internet). • Social media. • Scientific journals. 	Risk identification Monitoring of community perception and behaviour through formal and non-formal media including social media.
Respond Develop Disseminate	Accurate, science-based, easy-to-understand messages for the public. Public and private networks including government agencies, health authorities, scientific bodies, professional associations, clubs and communication organisations.	Risk communication Targeted: <ul style="list-style-type: none"> • Mythbusters. • Frequently asked questions. Non-targeted: <ul style="list-style-type: none"> • Periodical updates of events including daily situation reports. General topical information: <ul style="list-style-type: none"> • Brochures, pamphlets, internet resources. Media releases, public awareness campaigns in radio, TV, newspapers, internet websites and social media.
Evaluate Assess	Effectiveness of information management and risk communication.	Surveillance and evaluation Systematic surveillance through an authoritative platform to assess: <ul style="list-style-type: none"> • trend of infodemics; • how public health information is communicated and its effectiveness; and • any changes to community perception.

Systematic surveillance and response to infodemics as part of a comprehensive communication strategy within an authoritative platform have proven benefits in the current COVID-19 pandemic. For example, the Queensland Government's whole-of-government pandemic plan, which is built upon the Australian Health Sector Emergency Response Plan for Novel Coronavirus (COVID-19) (Australian Government, 2020) and the WHO Pandemic Influenza Risk Management Guide (World Health Organization, 2017c), is a comprehensive approach to pandemic prevention, preparedness, response and recovery, with multi-dimensional strategies. Its communication strategy is built upon the principles of trust, empathy, consistency, integrity and collaboration (Queensland Government, 2020). An open, transparent and inclusive structure of communication under the Crisis Communication Network is a cornerstone of the Queensland Government's crisis response to ensure that the government maintains its brand credibility as a trusted, authoritative source of accurate, reliable and timely information so that Queenslanders feel safe, supported and informed during an outbreak (Queensland Government, 2020). Another example is the WHO's authoritative information and communication strategies which include a dedicated repository of information such as holding a catalogue of COVID-19-related misinformation and resources, including 'mythbuster' facts in videos and texts in easy-to-understand language (World Health Organization, 2020b,d).

A dedicated clinical and social science-based information and communication authority within the proposed integrated approach can be useful not just in rumour surveillance and risk communication. Its application can be as diverse as active case finding, contact tracing, compliance with social distancing and quarantine orders served by health authorities to prevent person-to-person transmission of the disease, media scans and media briefings, and community engagement in response initiatives. While many of these measures may have been undertaken already by different authorities at different levels, doing so within the framework of an organised, transdisciplinary collaborative plan such as the integrated approach would help prevent any unnecessary, costly responses to deal with the double challenges of the epidemic. Enhancing the effectiveness of the pandemic response and reducing the social and

economic cost of the pandemic and the infodemic phenomenon can be achieved through strong co-ordination and collaboration among governments, coupled with clear and transparent communication strategies both locally and globally (United Nations Development Programme, 2020).

The integrated model, however, should not be treated as a 'one size fits all'. OH has faced numerous challenges in designing, and implementing transdisciplinary collaboration during real-life health emergencies (Ribeiro et al., 2019). For example, the engagement of diverse disciplines in an integrated model often leads to conflicts of focus and priority because of the diverse interests of those included. This could escalate information gaps and even co-ordination challenges, hampering the purpose of an effective and accelerated control initiative. In their qualitative study, Johnson et al. (2018) identified 'siloe'd' mentality, which they defined as "exclusive mentality that can inhibit cross-sectoral communication and collaboration", as the main barrier to OH implementation. The siloe'd mentality leads to conflicts of interest between participating sectors and disciplines, and lack of inter-sectoral trust and communications (Johnson et al., 2018) as was evident in past epidemics such as SARS and Ebola (Craddock et al., 2015; Woldehanna et al., 2015; Woodward et al., 2018). Moreover, the integrated model requires adequate provision of resources, both financial and human, to mobilise and engage for a protracted period of time, especially in a novel pandemic such as COVID-19. This may be a major impediment for low- and middle-income countries.

Conclusions

Despite acknowledged limitations, and based on the recent past and ongoing experience of Ebola (Dhillon et al., 2015) and COVID-19, respectively, a well-designed communication strategy within an integrated One Health-social science-based epidemic control regimen has great potential to enhance the effectiveness of responses to the multiple challenges of an epidemic, including dealing with those that are unique to zoonotic disease outbreaks (Ribeiro et al., 2019; Woodward et al., 2018) or those associated with novel pathogens such as the SARS-CoV-2 pathogen that causes COVID-19 (Brydges et al., 2020). Health authorities around the world need to evaluate past collaborative

approaches to other epidemics, or lack thereof, and employ a holistic view of the epidemic and accordingly devise appropriate, situation-specific communication strategies by incorporating relevant non-health disciplines into the traditional OH model. Local and nationally designed risk communication strategies with their respective integrated approaches should be harnessed with global communication and response initiatives within the framework of the International Health Regulations

(World Health Organization, 2005). Leveraging experience from the current pandemic and to better prepare for the next pandemic, health authorities around the world might consider implementing the proposed OH integrated approach to deal with infodemics while COVID-19 is still prevalent, and well before the next epidemic or pandemic, so that a dedicated cross-disciplinary team is familiar with their roles and functions, and any communication gaps can be addressed appropriately.

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Author Profiles

Noore Alam is an epidemiologist with over two decades of professional experience, including the past decade working with Queensland Health. Recently, he was seconded into the Queensland Government COVID-19 Incident Management Team. Noore has worked in various international roles in the past and on an ongoing basis with several UN agencies, including the World Health Organization. He is currently studying towards a PhD at Griffith University, Queensland. His doctoral research focuses on assessing country-level capacities to apply the One Health approach to prevent, detect and respond to emerging infectious diseases. Noore is a collaborator in the Global Burden of Disease Study.

Professor Cordia Chu AM, Director, Centre for Environment and Population Health, Griffith University, has a background in medical anthropology and sociology with expertise in ecological public health, reproductive health, health promotion and integrated health planning. She is committed to ensuring that research is useful, usable and used through translational research and capacity building, particularly in linking the environment, health strategies and sustainable development. Her recent focus has been on building a research consortium for One Health, global health security, climate action and sustainability. Professor Chu has published five books, over 220 journal articles and chapters, two policy guidelines, four research communication booklets, 16 training manuals, five documentaries films, 24 international consultancy reports and one WHO regional guideline.