

Perspectives

Communication strategies and media discourses in the age of COVID-19: an urgent need for action

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Summary

Identified in December 2019 in China, the coronavirus 2019 (COVID-19) has been declared a Public Health Emergency of International Concern (PHEIC). Pandemics share features that increase fear. While some fear can stimulate preventive health behaviors, extreme fear can lead to adverse psychological and behavioral response. The media play a major role shaping these responses. When dealing

with a PHEIC, the authorities' communication strategies are embedded in a multilevel governance and a highly hierarchical system, which adds another layer of complexity. Carrying out more 'real-world research' is crucial to generate evidence relating to the psychosocial and behavioral aspects involved during the COVID-19 pandemic and how it is shaped by authorities and media discourses. Interdisciplinary research and international collaborations could contribute to improve our understanding and management of risk information. Emerging from a socio-ecological perspective, future research must integrate multilevel analytical elements, to ensure triangulation of evidence and co-constructing robust recommendations. A mixed-method approach should be privileged to address these issues. At the micro-level, a population-based survey could be conducted in various jurisdictions to assess and compare psychosocial issues according to sociocultural groups. Then, a quantitative/qualitative discourse analysis of the media could be performed. Finally, a network analysis could allow assessing how official information flows and circulates across levels of governance. The COVID-19 represents an opportunity to evaluate the impacts of information/communication strategy and misinformation on various cultural and socioeconomic groups, providing important lessons that could be applied to future health emergencies and disasters.

Key words: COVID-19; pandemic; psychosocial impacts; behavioral response; risk perception and communication

BACKGROUND

First reported in December 2019 in China, the coronavirus 2019 (COVID-19) was declared a Public Health Emergency of International Concern (PHEIC) under the International Health Regulations by the World Health Organization (WHO) on 30 January 2020; the main concern being the potential for severe impact on low to middle-income countries (WHO, 2020a). COVID-19 has rapidly spread globally, with a total of 54 763 730 confirmed cases, 1 323 392 deaths, and 217 countries (or territories) affected, plus 2 international conveyance (i.e. Diamond Princess cruise ship harbored in Yokohama, Japan and the Holland America's MS Zaandam cruise ship), as of 15 November 2020.

With the evolution of the pandemic first wave, fear has permeated societies across the world, exacerbating social tensions and affecting marginalized populations. World experts, including those attending the COVID 19 PHEIC Global Research and Innovation Forum held in Geneva in February 2020, noted how effective risk communication strategies are critical during a health crisis, with social sciences placed squarely in the forefront of public health responses (Grant, 2017; WHO, 2020b).

The WHO Thematic Platform for Health Emergency and Disaster Risk Management and its research network acknowledged to date the needs of subpopulations (e.g. less educated, low-income people) and health literacy as a priority research theme (Kayano *et al.*, 2019). More specifically, the need to strengthen risk communication approaches to meet the requirements of the local community was identified.

In this commentary (based on a funded research protocol of a Canadian Institute of Health Research Operating Grant), we argue that epidemiological responses to COVID-19 must be followed by evidence-based multi-level societal responses, with information and communication playing a leading role. This is crucial for public health, academic research and most importantly for the community and global health. An interdisciplinary and international research agenda is essential. This comment seeks to fulfill this gap.

FEAR, (MIS)INFORMATION AND DEFIANCE DURING HEALTH CRISIS

The demand for valid information during the COVID-19 pandemic is central for populations and governments, as shown by the various data-related debates, particularly during the early stages of COVID-19. According to an online survey conducted by Ipsos (a multinational market research) from 7 to 9 February 2020 among 8001 adults in 8 large countries, a majority of people perceived the COVID-19 as a high or very high threat whereas 86% mentioned they have seen, heard, or read about the outbreak (Ipsos [a marketing research specialist firm], 2020). Fear among the public is a complex phenomenon during infectious disease outbreaks, and the nature of the information as well as the way it is delivered (and received) by the public is central to understanding such fear (or lack of thereof). In the early stage of a large-scale outbreak, several factors can increase fear, including confusion, misinformation and uncertainty (e.g. time, place, virulence, availability of

vaccines, medications, and protective equipment; Pappas *et al.*, 2009). Fear might also have more dramatic impacts that the actual health event (Witte and Allen, 2000), which seems to be the case with COVID-19 (Ren *et al.*, 2020).

IMPACTS ON PSYCHOLOGICAL AND BEHAVIORAL RESPONSES

While some fear can stimulate action in the form of preventive health behaviors (PHB), extreme fear can lead to adverse psychological and behavioral response (Yong and Lemyre, 2019) or inadequate political and social responses (Witte and Allen, 2000; Eichelberger, 2007; Kinsman, 2012). Observations from acute outbreaks such as Severe Acute Respiratory Syndrome (SARS) to gradually evolving pandemics such as AIDS, have revealed various psychological and behavioral reactions, leading to a new set of problems on top of a current crisis (Pappas *et al.*, 2009). Within weeks of the emergence of the COVID-19 in China, misleading rumors and conspiracy theories about the origin, fearmongering, denial, racial discrimination, avoidance behaviors, shunning daily activities, mass purchase of face masks and panic buying have all been reported (Depoux *et al.*, 2020; Shimizu, 2020). Sadly, but truly, an estimated 11–37% of adults (according to countries) avoid contact with people of Chinese origin or appearance to protect themselves against COVID-19 (Ipsos, 2020). These are some of the social consequences of information and communication failure during large-scale outbreaks, a phenomenon also found with other types of major emergencies and disasters (Généreux *et al.*, 2014, 2019b).

Cultural, educational, gender, economic and geographic determinants must also be considered in a pandemic (Galarce *et al.*, 2011; Gostin, 2014; Flowers *et al.*, 2016). Beliefs, social norms, assets and historical context (especially previous experiences of outbreaks) within different publics influence risk perceptions, decision-making processes, and psychological and behavioral responses (Pappas *et al.*, 2009). A comprehensive psychosocial approach to risk communication strategies must consider these variations (Yong and Lemyre, 2019), as risk information is not received and understood equally, especially in the context of multi-level governance involving multiple local, national and international actors (Wilson, 2004). Refining our understanding of how the public, and its different subgroups, perceive risks and react to them is not only vital to improve risk communication strategies, but also to mobilize assets within a community in order to support public health action during outbreak and other

emergencies (David and Carignan, 2017; Généreux *et al.*, 2018; Aung *et al.*, 2019; O'Sullivan and Phillips, 2019). This is especially important as multiple communities and health actors, at multiple levels, are involved.

THE ROLE OF MEDIA

The media play a major role in the social construction of risks (Giddens, 1999; Carignan, 2014). Numerous studies have highlighted the relevance of considering communication for risk management during outbreaks and epidemics (Postel-Vinay and Chemardin, 2004; Laügt, 2010; Bazouche and Bousta, 2016; Grenier, 2019). During rapidly spreading large-scale outbreaks, such as COVID-19, it can be more challenging to reassure those who are worried than to convince people and stakeholders of the risk they are exposed to (Regan *et al.*, 2016; Johnson *et al.*, 2017). Widespread fear develops from a complex interplay of social factors, one of them being the mainstream and social media that shape people's psychosocial and behavioral response to what is presented as significant threats (Pappas *et al.*, 2009). Mainstream media reports do not often communicate science effectively, and this may largely contribute to public misinformation, misunderstanding, fear and maladaptive responses (Lancet, 2014). Typically, messages conveyed by these media tend to report death tolls and growing number of cases, instead of focusing on messages issued by official authorities, such as PHB to adopt.

The era of social media adds another layer to the complex processes through which (mis)information, social norms and risk perceptions diffuse across populations (Neely and Nading, 2017; Wang *et al.*, 2019) and the interinfluences of stakeholders. Social media analytics tools (<https://www.symplur.com/>) strongly suggest that, with over 5 000 000 #Coronavirus tweets, and a daily tweet activity fluctuating between 50 000 and 150 000 from 9 to 15 March 2020, the monopoly on news messages to the mainstream media is over. Anyone on social media platforms can express an opinion or share information, either valid or mistaken, which are shared concomitantly with evidence-based public health information. Distinguishing between accurate and inaccurate information has become more challenging. Information gaps can therefore be readily filled with rumors and myths, which can contribute to further marginalization of populations (which is currently the case with Asian populations during COVID-19; Chung and Li, 2020).

Public health organizations must seize the opportunity within the media sphere to share information

bidirectionally, update recommendations in a timely manner, but also analyze social media traffic and rapidly detect and counter emerging myths, rumors, theories of conspiracies or simply misunderstood concepts (Khan *et al.*, 2019a). Scaling up the positive discussion online could remove boundaries between public health authorities and the public and give everyone a voice and an opportunity to contribute (Lancet, 2014). This is a challenge that academic research should also undertake.

THE ROLE OF AUTHORITIES

When dealing with a PHEIC, the authorities' communication strategies are embedded in a multilevel and diffuse governance structure, which introduces additional challenges. The WHO has long recognized the importance of communication and information management as key to effective global health governance (Hyer and Covello, 2005; WHO, 2008, 2020b; Blouin-Genest, 2015; Dye *et al.*, 2016; Vayena *et al.*, 2018). This is especially important when it comes to the current COVID-19 outbreak, as the objective of the WHO is to 'communicate critical risk and event information to all communities and counter misinformation' (WHO, 2020a).

Our understanding of information diffusion (both by authorities at multiple levels and by the media) and consequent psychosocial and behavioral changes in the context of large-scale outbreaks is still in its infancy. Most studies investigating the spread of health-related information and behavioral changes are theoretical, failing to use real-life media data (Verelst *et al.*, 2016). Carrying out research in natural settings to generate evidence relating to the psychosocial and behavioral aspects involved during large-scale outbreaks and other emergencies is crucial to effective emergency preparedness and response efforts (Robson and McCartan, 2016; Carter *et al.*, 2018; Généreux *et al.*, 2019a; Kayano *et al.*, 2019).

It is vital that research related to cross-boundary outbreaks transcends the national level and is carried out on a multinational scale for several reasons. First, the COVID-19 pandemic has been declared a PHEIC, involving de facto a chain of reactions at multiple levels of governance. Second, it has spread to Asian countries and other countries with transport links to China. Third, outbreak-related (mis)information is part of an international dynamic, and finally, there is limited evidence of the similarities and differences between countries (with various governance modes and cultural contexts) in diffusion, reception and use of risk information.

A RESEARCH AGENDA IN THE MAKING

Interdisciplinary and international studies could contribute to improve our understanding and management of risk information regarding the COVID-19 pandemic (how it is delivered by authorities and media, and how it is received, understood and used by the public). Such knowledge is urgently needed to support the widespread social measures already in place to encourage PHB and mitigate the negative psychological and behavioral consequences of the COVID-19 pandemic. Research involving public health, communication and political sciences fields, for instance, should foster the identification of promising communication strategies that would support this important aspect of the pandemic response (Kayano *et al.*, 2019). In light of this, our team proposes several questions to be answered:

- How are various population groups understanding and reacting to the COVID-19 pandemic?
- How is the media discourse (news media and social media regarding the COVID-19 pandemic) evolving and what is its influence on people's understanding of and reactions to the pandemic?
- How are health information and key messages being delivered and received by the public, which is influenced by stakeholders and multilevel governance, including transnational actors such as the WHO?

Fostering a better understanding and consideration of sociocultural dimensions of information sharing during the COVID-19 pandemic in various settings is a critical step toward managing and recovering from the current crisis. Improving our comprehension of these elements will assist with developing effective communication strategies at different governance levels aimed at promoting PHB and mitigating adverse psychological and behavioral responses arising from this crisis. Emerging from a socio-ecological perspective (Bronfenbrenner, 1979), a future research agenda must integrate micro- to macro-level analytical elements, to ensure triangulation of evidence and issuing of robust recommendations.

MICRO-LEVEL: RISK COMMUNICATION AND THE PUBLIC

Modern communication is multi-directional and complex. In previous pandemics, communication to the public would involve pushing information out, whereas in the case of COVID-19, the public is actively involved in creating and sharing messaging. In this social media era, however, the various groups targeted by communication strategies and media discourses can both receive and create content. This creates a dilemma for public health

professionals and changes the way they must do their work (Khan *et al.*, 2019b). Surveillance and active social media participation by public health authorities is not optional in modern times, and must be part of the communication strategies. This is an important strategy to meet people in the places where they gather, including social media (Kickbusch, 2019).

Conducting research with the public should be a priority at the micro-level (Sellnow *et al.*, 2015). A classic way of giving a voice to the public is through surveys conducted among large and representative samples. Social sciences have developed over time a strong expertise in large-scale observational methods such as survey research. Its sampling methods can allow researchers to produce a representative sample of the population (e.g. a country, a state or some other subgroups) and to compare these subjects to other subjects recruited in a similar manner. In the current context, population-web or telephone-based surveys could be simultaneously conducted in various jurisdictions, sociocultural contexts and with different degrees of impacts from the COVID-19 pandemic. These surveys could be based on the Knowledge–Attitude–Practice model (Bettinghaus, 1986; Renuka and Pushpanjali, 2014), through which several aspects could be assessed and compared according to different sociocultural groups, including:

- understandings (e.g. high-risk groups, PHB to adopt);
- risk perceptions (e.g. level of threat posed to the world, one's country, one's community, one's family, or personally);
- positive attitudes (e.g. awareness, resilience, sense of coherence, health literacy);
- negative attitudes (e.g. denial, stigmatization, pervasive stress, insomnia, anxiety, depression, post-traumatic stress);
- adaptive behaviors (e.g. PHB, compliance with recommended social distancing measures, mutual aid, healthy coping strategies);
- maladaptive behaviors (e.g. massive purchase of protective equipment, compulsive buying, unhealthy coping strategies).

Other aspects could also be examined, including demographics (e.g. age, sex, education level, household status, immigration status, being an essential worker), information accessibility regarding COVID-19 and the different channels of communication (traditional, digital and interpersonal) used and valued (Coombs and Laufer, 2018). Such surveys may help to reveal misconceptions or misunderstandings arising from distribution of confusing communication or misinformation.

MESO LEVEL: RISK COMMUNICATION AND THE MEDIA

The meso level (i.e. the complex interaction process of communication strategies and media discourses, between the receivers and transmitters) is also a key research area that should be explored in order to grasp the complexity of population responses to COVID-19 (Quinn, 2018). In a recent Canadian study, media coverage was identified as important and actionable indicators to support public health emergency preparedness (Khan *et al.*, 2019b).

A better understanding of the role of the news media could be developed by analyzing journalistic coverage of the issues posed by COVID-19. Journalistic discourse reflects social reality while helping to build it (Paltridge, 2012; Carignan and Huard, 2016). The news media have significant influences on public perceptions of the most pressing issues of the day (Berry *et al.*, 2007). Accordingly, mixed method research could integrate the qualitative components of the journalistic coverage of COVID-19, while generating a statistical portrait of the phenomenon.

Moreover, the scope and roles of coronavirus-related social media networking sites (SNS), including the Facebook pages of the WHO (4.8 million followers), as well as its Twitter and Instagram accounts (respectively, 5.7 and 2.7 million followers), and of the official national authorities could be assessed and compared through a sociotechnical analysis (Proulx, 2012). Based on mixed methods, this approach can provide a composite understanding of the technical architecture of the platforms, the structuring of social interactions taking place over them, the experience of the SNS users and the level of quality of the contribution of the SNS users (Champagne-Poirier and Ben-Affana, 2016).

The knowledge gained by research undertaken through this meso level could help optimize official public health messages and facilitate better sharing of information in a context where literacy highly influences the reception of messages by the public and high-risk groups (Roberts and Veil, 2016; David and Carignan, 2017).

MACRO LEVEL: MULTILEVEL GOVERNANCE, TRANSNATIONAL ACTORS AND PUBLIC HEALTH INFORMATION

Research at the macro level (i.e. WHO and related transnational actors) is also an important area for interdisciplinary pandemic research. Network analyses could, e.g. examine how the information is gathered by performing a critical assessment of the communication strategy

produced and disseminated by the WHO through distribution lists and news/social media. It is also important to examine how information is received and used at the state level, and the type of actors reached. To do so, cartography of the WHO communication network under PHEIC and using the current COVID-19 pandemic could be carried out, through a health-related network analysis (Hoffman and Clarke, 2018; Luke and Harris, 2007; Schoen *et al.*, 2014). Data sources could include WHO Headquarters and regional offices, media briefings, Global Outbreak Alert and Response Network, and Global Public Health Intelligence networks.

Multi-level governance analyses (Lyall and Tait, 2004; Wilson, 2004; Stephenson, 2013) of communication strategies and information flow could also be conducted through case studies in various jurisdictions, based on interviews with public health officials. Some issues that could be explored through discourse analysis include the translation process from WHO technical advice to national emergency policies and the framing of national health policy. Identification of the learning processes [or unlearning (Schiffino *et al.*, 2015; Blouin-Genest, 2015)] and multi-level governance tension in knowledge translation/transmission (Lyall and Tait, 2004; Wilson, 2004; Stephenson, 2013) could then be evaluated.

CONCLUSION: LEARNING FROM COVID-19 WHILE IT HAPPENS

The research recommendations suggested here will contribute to scientific knowledge and creation of robust and concrete recommendations to improve actual and future communication strategies that will better take into account sociocultural aspects of large-scale outbreaks (Grant, 2017; Sellnow *et al.*, 2019). COVID-19 represents a unique opportunity to evaluate the impacts of communication strategies and (mis)information diffusion on population health through a multi-level and a mixed-method analysis, and to assess its evolution over time (learning process), responding as such to the priority themes identified by the Sendai Framework for Disaster Risk Reduction (UNISDR, 2015).

Finally, let us recall that interdisciplinary and international teams holding a wide and complementary range of both content and method expertise (e.g. public health, health promotion, psychosocial and behavioral health, disaster risk reduction, risk and crisis communication, multilevel governance, epidemiology, discourse analysis, network analysis) are critically needed to materialize such complex research agenda. These disciplines, all different but important, allow for integration of different

perspectives and methodologies and for identification of effective and tailored interventions to counter the spread of health-related misinformation.

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REFERENCES

- Aung, P. L., Tepanata, P., Than, N. S., Burgess, J., Menezes, L. J., Kyaw, M. P. *et al.* (2019) Health education through mass media announcements by loudspeakers about malaria care: prevention and practice among people living in a malaria endemic area of Northern Myanmar. *Malaria Journal*, 18, 362.
- Bazouche, F. and Boust, R. (2016) *La Polyphonie Linguistique Dans le Discours Journalistique: cas D'épidémie D'Ebola Dans le Quotidien EL-Watan*. Mémoire de maîtrise, Université Akli Mohand Oulhadj [In French].
- Berry, T. R., Wharf-Higgins, J. and Naylor, P. J. (2007) SARS wars: an examination of the quantity and construction of health information in the news media. *Health Communication*, 21, 35–44.
- Bettinghaus, E. P. (1986) Health promotion and the knowledge-attitude-behavior continuum. *Preventive Medicine*, 15, 475–491.
- Blouin-Genest, G. (2015) World Health Organization and disease surveillance: jeopardizing global public health? *Health: An Interdisciplinary Journal for the Social Study of Health, Illness and Medicine*, 19, 595–614.
- Bronfenbrenner, U. (1979) *The Ecology of Human Development: Experiments in Nature and Design*. Harvard University Press, Cambridge, MA.
- Carignan, M. E. (2014) *La Modification Des Pratiques Journalistiques et du Contenu Des Nouvelles Télévisées. Du Quotidien à la Situation de Crise: Analyse France/Québec*. Thesis, University Aix-Marseille [In French].
- Carignan, M. E. and Huard, P. (2016) (Re)construction sociale de la réalité par les médias. Adaptation du projet « Television around the world ». In Luckerhoff, J. (ed.), *Médias et Société: La Perspective de la Communication Sociale*. Presses de l'Université du Québec, Québec, pp. 171–190 [In French].
- Carter, H., Gauntlett, L., Rubin, G. J., Russell, D., Généreux, M., Lemyre, L. *et al.* (2018) Psychosocial and behavioural aspects of early incident response: outcomes from an international workshop. *Global Security: Health, Science and Policy*, 3, 28–36.
- Champagne-Poirier, O. and Ben-Affana, S. (2016) Construction sociotechnique du web 2.0: la tribune de tout le monde en parle. In Luckerhoff, J. (ed.), *Médias et Société: La Perspective de la Communication Sociale*. Presses de l'Université du Québec, Québec, pp. 131–150 [In French].

- Chung, R. Y. N. and Li, M. M. (2020) Anti-Chinese sentiment during the 2019-nCoV outbreak. *The Lancet*, **395**, 686–687.
- Coombs, W. T. and Laufer, D. (2018) Global crisis management – current research and future directions. *Journal of International Management*, **24**, 199–203.
- David, M. D. and Carignan, M. E. (2017) Crisis communication adaptation strategies in the MM&A train explosion in Lac-Mégantic downtown: going back to field communication. *Corporate Communications: An International Journal*, **22**, 369–382.
- Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A. and Larson, H. (2020) The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of Travel Medicine*, **27**.
- Dye, C., Kidist, B., Vasee, M. and Kieny, M. P. (2016) Data sharing in public health emergencies: a call to researchers. *Bulletin of the World Health Organization*, **94**, 158–158.
- Eichelberger, L. (2007) SARS and New York's Chinatown: the politics of risk and blame during an epidemic of fear. *Social Science & Medicine (1982)*, **65**, 1284–1295.
- Flowers, P., Davis, M., Lohm, D., Waller, E. and Stephenson, N. (2016) Understanding pandemic influenza behaviour: an exploratory biopsychosocial study. *Journal of Health Psychology*, **21**, 759–769.
- Galarce, E. M., Minsky, S. and Viswanath, K. (2011) Socioeconomic status, demographics, beliefs and A(H1N1) vaccine uptake in the United States. *Vaccine*, **29**, 5284–5289.
- Généreux, M., Maltais, D., Petit, G. and Roy, M. (2019a) Monitoring adverse psychosocial outcomes one and two years after the Lac-Mégantic train derailment tragedy (Eastern Townships, Quebec, Canada). *Prehospital and Disaster Medicine*, **34**, 251–259.
- Généreux, M., Schluter, P. J., Takahashi, S., Usami, S., Mashino, S., Kayano, R. *et al.* (2019b) Psychosocial management before, during, and after emergencies and disasters—results from the Kobe expert meeting. *International Journal of Environmental Research and Public Health*, **16**, 1309.
- Généreux, M., Petit, G., Roy, M., Maltais, D. and O'Sullivan, T. (2018) The Lac-Mégantic Tragedy seen through the lens of the EnRiCH community resilience framework for high-risk populations. *Canadian Journal of Public Health*, **109**, 261–267.
- Généreux, M., Petit, G., Maltais, D., Roy, M., Simard, R., Boivin, S. *et al.* (2014) The public health response during and after the Lac-Mégantic train derailment tragedy: a case study. *Disaster Health*, **2**, 113–120.
- Giddens, A. (1999) Risk and responsibility. *Modern Law Review*, **62**, 1–10.
- Gostin, L. O. (2014) *Global Health Law*. Harvard University Press, Cambridge, MA.
- Grant, R. (2017) Public health professionals urgently need to develop more effective communications strategies. *American Journal of Public Health*, **107**, 658–659.
- Grenier, C. (2019) Étude de la couverture médiatique associée aux épidémies de chikungunya et de zika en Guyane, juin 2013-Mars 2017. *Santé Publique et Épidémiologie*, **54p.** [In French].
- Hoffman, S. J. and Clarke, B. C. (2018) Defining the global health system and systematically mapping its network of actors. *Globalization and Health*, **14**, 38.
- Hyer, R. N. and Covello, V. (2005) *Effective Media Communication during Public Health Emergencies: A WHO Handbook*. <https://apps.who.int/iris/handle/10665/43511>.
- Ipsos. (2020) *Most Say the Coronavirus is an on-Going Threat; Only 1 in 5 See Virus Contained*. Ipsos. <https://www.ipsos.com/en/most-say-coronavirus-going-threat-only-1-5-see-virus-contained>.
- Johnson, J., Bharath, H., van der Maaten, L., Hoffman, J., Fei-Fei, L., Zitnick, C. L. *et al.* (2017). Inferring and executing programs for visual reasoning. <https://arxiv.org/abs/1705.03633>.
- Kayano, R., Chan, E. Y. Y., Murray, V., Abrahams, J. and Barber, S. L. (2019) WHO thematic platform for health emergency and disaster risk management research network: report of the Kobe expert meeting. *International Journal of Environmental Research and Public Health*, **16**, 1232.
- Khan, Y., Brown, A., Gagliardi, A., O'Sullivan, T., Lacarte, S., Henry, B. *et al.* (2019a) Ready or not? The development of performance indicators for public health emergency preparedness using a modified Delphi approach. *PLoS One*, **14**, e0226489.
- Khan, Y., Tracey, S., O'Sullivan, T., Gournis, E. and Johnson, I. (2019b) Retiring the flip phones: exploring social media use for managing public health incidents. *Disaster Medicine and Public Health Preparedness*, **13**, 859–867.
- Kickbusch, I. (2019) Health promotion 4.0. *Health Promotion International*, **34**, 179–181.
- Kinsman, J. (2012) A time of fear: local, national, and international responses to a large Ebola outbreak in Uganda. *Globalization and Health*, **8**, 15.
- Lancet. (2014) The medium and the message of Ebola. *The Lancet*, **384**, 1641.
- Laügt, O. (2010) La représentation du fait spatial dans la presse quotidienne nationale française en 2006. *Communication*, **28**, 207–225 [In French].
- Luke, D. A. and Harris, J. K. (2007) Network analysis in public health: history, methods, and applications. *Annual Review of Public Health*, **28**, 69–93.
- Lyall, C. and Tait, J. (2004) Foresight in a multi-level governance structure: policy integration and communication. *Science and Public Policy*, **31**, 27–37.
- Neely, A. H. and Nading, A. M. (2017) Global health from the outside: the promise of place-based research. *Health & Place*, **45**, 55–63.
- O'Sullivan, T. and Phillips, K. (2019) From SARS to pandemic influenza: the framing of high-risk populations. *Natural Hazards*, **98**, 103–117.
- Paltridge, B. (2012) *Discourse Analysis: An Introduction*. Bloomsbury Publishing, London.
- Pappas, G., Kiriakou, I. J., Giannakis, P. and Falagas, M. E. (2009) Psychosocial consequences of infectious diseases. *Clinical Microbiology and Infection*, **15**, 743–747.

- Postel-Vinay, N. and Chemardin, J. (2004) La communication sur le SRAS: Un outil essentiel de santé publique. *Revue Des Maladies Respiratoires*, **21**, 1061–1065. [In French].
- Proulx, S., Milette, M. and Heaton, L. (2012) Enjeux éthiques et politiques. *Médias Sociaux: Enjeux Pour la Communication*. Presses de l'Université du Québec, Québec [In French].
- Quinn, P. (2018) Crisis communication in public health emergencies: the limits of legal control and the risks for harmful outcomes in a digital age. *Life Sciences, Society and Policy*, **14**, 4.
- Regan, Á., Raats, M., Shan, L. C., Wall, P. G. and McConnon, Á. (2016) Risk communication and social media during food safety crises: a study of stakeholders' opinions in Ireland. *Journal of Risk Research*, **19**, 119–133.
- Ren, S. Y., Gao, R. D. and Chen, Y. L. (2020) Fear can be more harmful than the severe acute respiratory syndrome coronavirus 2 in controlling the corona virus disease 2019 epidemic. *World Journal of Clinical Cases*, **8**, 652–657.
- Renuka, P. and Pushpanjali, K. (2014) Effectiveness of health belief model in motivating for tobacco cessation and to improving knowledge, attitude and behavior of tobacco users. *Cancer and Oncology Research*, **2**, 43–50.
- Roberts, H. and Veil, S. R. (2016) Health literacy and crisis: public relations in the 2010 egg recall. *Public Relations Review*, **42**, 214–218.
- Robson, C. and McCartan, K. (2016) *Real World Research*, 4th edition. John Wiley & Sons, New York, USA.
- Sellnow, D. D., Lane, D., Littlefield, R. S., Sellnow, T. L., Wilson, B. and Beauchamp, K. (2015) A receiver-based approach to effective instructional crisis communication. *Journal of Contingencies & Crisis Management*, **23**, 149–158.
- Sellnow, D. D., Sellnow, T. L. and Martin, J. M. (2019) Strategic message convergence in communicating biosecurity: the case of the 2013 porcine epidemic diarrhea virus. *Communication Reports*, **32**, 125–136.
- Schiffino, N., Taskin, L., Donis, C. and Raone, J. (2015) *Organizing after Crisis: Public Management and Learning Processes*. Peter Lang, Series Public Action, Bruxelles.
- Schoen, M. W., Moreland-Russell, S., Prewitt, K. and Carothers, B. J. (2014) Social network analysis of public health programs to measure partnership. *Social Science & Medicine* (1982), **123**, 90–95.
- Shimizu, K. (2020) 2019-nCoV, fake news, and racism. *The Lancet*, **395**, 685–686.
- Stephenson, P. (2013) Twenty years of multi-level governance: where does It come from? What is it? Where is it going? *Journal of European Public Policy*, **20**, 817–837.
- United Nations Office for Disaster Risk Reduction (UNISDR). (2015) Chart of the Sendai framework for disaster risk reduction 2015 – 2030. https://www.preventionweb.net/files/44983_sendaiframeworkchart.pdf.
- Vayena, E., Dzenowagis, J., Brownstein, J. S. and Sheikh, A. (2018) Policy implications of big data in the health sector. *Bulletin of the World Health Organization*, **96**, 66–68.
- Verelst, F., Willem, L. and Beutels, P. (2016) Behavioural change models for infectious disease transmission: a systematic review (2010-2015). *Journal of the Royal Society, Interface*, **13**, 125.
- Wang, Y., McKee, M., Torbica, A. and Stuckler, D. (2019) Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine* (1982), **240**, 112552.
- Witte, K. and Allen, M. A. (2000) Meta-analysis of fear appeals: implications for effective public health campaigns. *Health Education & Behavior*, **27**, 591–615.
- World Health Organization. (2008) *World Health Organization Outbreak Communication Planning Guide*, 2008 Edition. World Health Organization: Geneva: Switzerland.
- World Health Organization. (2020a) WHO, *Novel Coronavirus (2019-nCoV)*. *Situation Report*, p. 158. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports>.
- World Health Organization. (2020b) WHO, *2019 Novel Coronavirus (2019-nCoV): Strategic Preparedness and Response Plan*. Geneva: Switzerland.
- Wilson, K. (2004) The complexities of multi-level governance in public health. *Canadian Journal of Public Health*, **95**, 409–412.
- Yong, A. G. and Lemyre, L. (2019) Getting Canadians prepared for natural disasters: a multi-method analysis of risk perception, behaviors, and the social environment. *Natural Hazards*, **98**, 319–341.