EDITORIAL

Global systemic risk and resilience for novel coronavirus in postpandemic era

1 | INTRODUCTION

In the recent two years, the COVID-19 pandemic has cascaded to affect all global systems including industry, economy, education and beyond, as well as individual lives. It has brought major societal adaptations in many areas. With an increase in effective vaccinations, the epidemic spread may slow down, and the global economy could enter a postpandemic era. In the postpandemic era, the threats and crises facing human society will exhibit new complexities, with changing characteristics and dimensions. Scientific accounting for the losses and lessons of global disasters such as the pandemic, and effectively assessing the effects of relevant measures taken for the healthcare and other systems and sectors, will help risk professionals who are anticipating future disasters. In this direction, the breadth of the Society for Risk Analysis is advantageous for public health practitioners, infrastructure owners/operators, and policymakers to coordinate global and local, context-specific interventions, with expanded access to health information and services (Wu et al., 2021; Bonato et al., 2021; Collier et al., 2020; Donnan et al., 2020; Wang et al., 2021).

A first special issue introduced the topic (Wu et al. 2021). This second special issue collects from scholars a sample of insights and viewpoints regarding risk and resilience analytics for policy making and operations of large-scale systems into a post-pandemic era. Three articles in this issue, investigate the impact of the pandemic on the economics and industrial sectors and assess the response strategies from the government. Two articles explore risk perception in relation to political orientation and pandemic risk perception scale. Two articles are in relation to the preparedness for response to the pandemic. Two articles build mathematical models to find optimal investment strategies to mitigate the risks of epidemic. The remaining articles address aspects of systemic risk and resilience in global pandemics. This collection of 13 articles thus addresses a breadth of risk sciences represented across the Society for Risk Analysis: (i) assessing response strategies and impact of the pandemic; (ii) risk perception; (iii) preparedness evaluation in pandemic; (iv) risk and resilience; and (v) investment strategies.

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2.1 | Assessing response strategies and the impact of the pandemic

Kim et al. (2021) investigate the impact of emergency coordination teams on information communication and resource coordination within two interorganizational networks during the public health emergency response. They use the Middle East Respiratory Syndrome (MERS) coronavirus in South Korea in 2015 as a research case study. They identified an emergency team comprised of government officials and public health experts, commanding and coordinating the organization at the center of the response network. Their work finds that emergency groups have a positive contribution to effective information exchange, but have no effect on the efficiency of the resource network. This is because ad hoc entities fill the gaps in the relationship in the information network, but are redundant in the resource network.

The COVID-19 pandemic has caused a serious impact on the output of various sectors, international trade, and labor employment, ultimately generating great losses to most counties. Tan et al. (2021) describe a quantitative-based approach of assessing the potential impact of the COVID-19 pandemic on the economic system and the sectors taking China as the base case. Their work proposes a hypothetical scenario and then adopts the Computable General Equilibrium (CGE) model to calculate the comprehensive economic losses of the epidemic from the aspects of the direct shock on the output of seriously affected sectors, international trade, and labor force. The empirical results show that assuming a GDP growth rate of 4%—8% in the absence of COVID-19, GDP growth in 2020 would be $8.77\%$ to $12.77\%$ after the COVID-19. Companies and activities associated with transportation and service sectors are among the most impacted, and companies and supply chains related to the manufacturing subsector lead the economic losses. At the end of their work, they put forward some suggestions on the labor force, transportation sector, service sectors, and disaster emergency rescue work in highly sensitive sectors.
Wang et al. (2021) select 13 countries for quantitative assessment and provide a correlation analysis of the response measures adopted by countries and epidemic trends since the emergence of COVID-19. They select a trusted model to fit the epidemic trend curves in segments and catch the characteristics based on which they explore the key factors of COVID-19 spread. Through correlation analysis, they find that a significant negative correlation between the epidemic trend characteristics and the government response measure scores given by experts. More stringent government response measures correlate with fewer infections and fewer waves in the infection curves. Stringent government response measures have curbed the spread of COVID-19, limited the total number of infections, and shortened the time it takes for the total number of cases to reach its peak.

2.2 Risk perception

Using public response to the COVID-19 pandemic, Ju and You (2021) investigate risk perception in relation to political orientation. They test a risk perception model of how political orientation affects the perception of risk for emerging infectious diseases and how it mitigates other effects. Two national online surveys in South Korea (\(N = 2,000\)) show that conservatives have a higher risk perception of emerging infectious diseases, and political orientation can even alleviate the impact of perceived risk characteristics on risk perception. In addition, the frequency of media use is positively correlated with higher risk perception.

Vieira et al. (2021) propose a pandemic risk perception scale. Their scale consists of two structures, fear risk and personal exposure, divided into five dimensions: infection risk, emotional health risk, health system risk, financial risk, and alimentary risk. Using multidimensional item response theory, confirmatory factor analysis, and structural equation modeling on two samples of interviewees, their results show that alimentary risk, health system risk, and emotional health risk are the main dimensions of COVID-19 pandemic risk perception. In addition, Infection Risk has less impact on pandemic risk perception, which indicates that there are different dynamics between personal risk perception and general risk perception of the COVID-19 pandemic.

2.3 Preparedness in pandemic

Choudhury et al. (2021) evaluate the preparedness of Indian states and union territories (UTs) against the COVID-19 pandemic. They consider 10 pikarameters related to demographic, socioeconomic, and healthcare aspects and apply the fuzzy analytic hierarchy process to evaluate the performances of 27 states and three UTs. They ascertain the relative importance of decision criteria as well as sub criteria Considering the opinions of medical experts. Their work shows that Kerala and Bihar are the best prepared and worst prepared states, respectively, to combat COVID-19 pandemic. Karnataka, Goa, and Tamil Nadu have very good preparedness whereas Chhattisgarh, Jharkhand, and Bihar have very poor preparedness. Maharashtra, the most affected state in India, has average preparedness.

Another work in relation to preparedness is given by Derbyshire (2021) who considers how plausibility-based scenario planning can increase preparedness for extreme events like a global pandemic, thereby reducing overconfidence in continued business-as-usual in their face, and emphasizing precaution in their wake. In so doing, Derbyshire’s work contributes to “type B,” “generic and fundamental” risk science, which is concerned with identifying better ways to present and communicate uncertainties. In focusing on plausibility-based scenario planning, the work highlights a method seldom previously discussed in relation to risk science, yet one that can contribute much to this type B component of it.

2.4 Risk assessment and analysis

Logrosa et al. (2021) present a method that integrates risk management tools into health care decision-making processes to enhance the understanding and utilization of risk-based thinking in public health decision making. The risk assessment consists of the identification of the key risk factors of the COVID-19 contagion via bow-tie diagrams. Second, the safety controls for each risk factor relevant to the Davao City context are taken into account and are identified as barriers in the bow tie. The dynamics of COVID-19 management initiatives were explored using these priorities and a system of ordinary differential equations. The results show that reducing the number of COVID-19 fatalities should be the top priority of the health authorities. The work also predicts that the COVID-19 contagion could be controlled and eliminated in Davao City in three-month time after prioritizing the fatalities.

To study transmission from hospitals and communities, Sardar and Rana (2021) develop a mechanical model with a lockdown effect. The study uses daily COVID-19 case data from six states and overall India to estimate several important parameters and estimates of effective (RT), basic (R0), community (RC), and hospital (RH) reproduction numbers. The work predicts the reported cases of COVID-19 in five different lockdown situations in seven locations from May 3 to May 20, 2020. The results also predict that hospital-based transmission may trigger a larger COVID-19 outbreak. In most locations, model predictions from May 3 to May 20, 2020 indicate that the cumulative number of cases has tripled compared to the total number of cases observed as of April 29, 2020. Based on these results, the authors proposed a containment policy that may reduce the threat of larger COVID-19 outbreaks in the future.

Qazi et al. (2021) use national-level data sets related to humanitarian crises and disasters to explore the key factors that influence COVID-19-related hazards and exposure, vulnerability, lack of response capacity, and overall risks in individual countries. The work helps determine the relative
importance of multidimensional factors related to COVID-19 risk in a probabilistic network environment. It provides policymakers with unique insights into determining the key factors affecting the risk of COVID-19 and their relative importance in the online environment.

Apps have access to data on timing, duration, and Bluetooth attenuation. Wilson et al. (2021) layout a framework for optimizing the reduction in disease transmission per day of quarantine recommended using the decentralized protocol of the Google/Apple Exposure Notification (GAEN) Application Programming Interface (API). This work suggests that public health authorities can either set a threshold on initial infection risk to determine 14-day quarantine onset or on the conditional probability of current and future infectiousness conditions to determine both quarantine and duration.

2.5 | Investment strategies

Niu et al. (2021) develop a game-theoretic model in which existing and incoming ventilator manufacturers compete in two dimensions in terms of production investment and sales. The authors test the profitability of existing manufacturers with and without knowledge sharing by formulating trade-offs between supply expansion, increased competition, the increased production efficiency of entrants, and reduced demand variance. The work shows that free knowledge may be harmful to entrant manufacturers, but incumbent manufacturers benefit from knowledge sharing when market competition is fierce, or market competition is mild but production and investment efficiency is uneven.

Huang et al. (2021) build a mathematical model to optimize investments into two types of measures for mitigating the risks of epidemic propagation: prevention/containment measures and treatment/recovery measures. The new model clearly illustrates the characteristics of personal networks as a key element in the spread of epidemics. Subsequent analysis showed that, in order to combat pandemics that could have a significant negative impact, the best investment in any category would increase with higher levels of connectivity and inherent loss, but only to a small fraction of the total potential loss. However, when fixed and limited mitigation investments are allocated between the two measures, when the investment limit increases, and when network connectivity decreases, the optimal ratio for preventing and containing investment increases. The results can be used to interpret what happened in past pandemics, as well as to clarify future and ongoing events, such as COVID-19.

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