EPFL

COVID-19:
# A risk governance perspective

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One effect of the COVID-19 crisis has been to require policymakers to go through the various stages of the risk governance process under conditions of high stress and compressed timescales. In this article we use our risk governance framework to outline the key stages of the evolution of the crisis, and ask what lessons might be learned for the immediate future.

The coronavirus outbreak that has caused upheaval across much of the world was neither unpredictable nor unforeseen.[1] Many organisations warned about the vulnerability of our increasingly tightly interconnected world to the spread of infectious diseases.[2,3] In 2010 we wrote about infectious diseases as part of our work on emerging risks, noting that "a key to understanding, detecting, characterizing, and responding to the risk of emerging infection is the nexus of interactions among animals, humans, and infectious organisms."[4] Ten years later, this nexus is at the root of the most severe pandemic in a century. Reservoirs of coronaviruses in animal populations have long been identified as a problem.[5] So too have the "wet markets" which appear once again to have been responsible for zoonotic transmission in the case of COVID-19.[6] The result was a "time bomb" waiting to go off, but the comparatively low death tolls and limited geographic spread of recent outbreaks (SARS and MERS) may have fostered a sense of complacency.[7]

The evolution of the risk and the unfolding of the crisis
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Policymakers have been blind-sided by COVID-19's combination of SARS-like severe lower-respiratory impacts with the transmissibility of common-cold coronaviruses.[8] The result has been a rapid spread across the world. The first four cases were officially reported in Wuhan on 29 December 2019.[9] When the first WHO outbreak notification was published on 5 January 2020, it pointed to "44 patients with pneumonia of unknown etiology".[10] By the end of March there were 750, 890 global cases, of which the vast majority (668,345) were outside China, and numbers were continuing to surge (see chart below).[11] This exponential spread occurred despite the gradual introduction of unprecedented global restrictions on human travel and interaction.[12] Modelling published by Imperial College London on 26 March 2020 suggested that in the absence of policy measures, COVID-19 would have spread to infect 7 billion and kill 40 million people globally.[13] The researchers also modelled two suppression scenarios, which point to total infections of 2.4 billion and 470 million respectively, with corresponding deaths of 10.5 million and 1.9 million.[14] Needless to say, these figures are subject to great uncertainty, not least relating to the ongoing evolution of policy responses.

On top of the direct health impacts of the disease, the short-term economic impact of COVID-19 is likely to be severe, with a simultaneous shock to supply and demand set to push the global economy into recession. The initial shock to activity is many times greater than in the financial crisis of 2008, with the OECD estimating a range of around 15–35% of GDP across a group of 47 countries.[15]
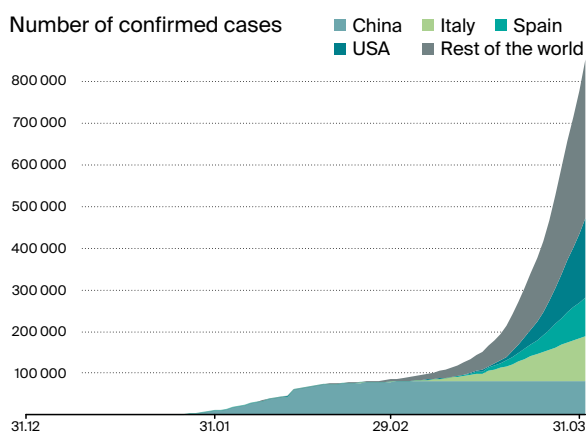
On a full-year basis, one estimate suggests that global GDP will swing from expansion of 2.3% in 2019 to a contraction of 2.2% in 2020.[16] This would be the first annual decline in global growth since World War II. Much greater uncertainty attaches to the longer-term economic impacts, but a recent study of twelve major historical pandemics (with death tolls above 100,000) argues that the adverse economic consequences of pandemics last for about 40 years and greatly exceed those of wars.[17]

Key factors that have shaped the scale of the crisis
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A number of factors have played an important role in the rapid escalation of the crisis since the start of the year. The first and most obvious of these is the pace of the disease's spread. As is illustrated by the Imperial College model mentioned above, without mitigation **exponential propagation** can swiftly engulf almost the entire population of the world. The basic reproduction number (R0) of a virus is partly a reflection of its inherent properties of transmissibility, but it also reflects the degree of contact between people.[18]

With this in mind, a second factor in the spread of COVID-19 has been the deepening of **global interconnectedness** in recent decades (not least because of the integration of China into the world economy). Air travel is a good example of increasing network densities: between 2000 and 2018 the number of air passengers each year increased from 1.7 billion to 4.2 billion.[19]

A third factor in shaping the scale of the current crisis has been **health-sector capacity**. Like flood defences threatened by a tsunami, the exponential growth in confirmed cases of COVID-19 has threatened to overwhelm limited supplies of critical healthcare resources, including hospital beds, personal protective equipment (PPE), testing materials, ventilators and specialist personnel. Zeynep Tufekci argues that a failure to grasp the complexity of the healthcare system has hampered responses to COVID-19. "Health systems are prone to nonlinear dynamics," she writes. "The flu season may be tragic for its victims; however, an additional, unexpected viral illness in the same season isn't merely twice as tragic as the flu, even if it has a similar R0 or CFR [case-fatality rate]: It is potentially catastrophic."[20] Constraints in the health sector have been exacerbated by efforts to boost short-

Number of confirmed cases   ■ China ■ Italy ■ Spain
                            ■ USA   ■ Rest of the world

The spread of COVD-19. Source: European Centre for Disease Prevention and Control data, ↗

term operational and financial efficiency, to the detriment of investment in spare capacity.

A fourth factor to consider is the role of **state capacity** more generally in responses to the spread of the virus. A proper assessment will not be possible for many months until relative performances can be judged, but particular concerns have already been raised about state capacity in weaker, poorer countries in sub-Saharan Africa if caseloads begin to mount in that region.[21] It should also be noted, however, that the erosion of state capacity (albeit from a much higher base) has also been cited to explain responses in advanced Western countries.[22]

A fifth factor is the immediacy with which **risk has cascaded** from the health system to the economy. This is for obvious reasons. Suppression of the outbreak has focused on measures (distancing, quarantine, isolation, etc.) that lead inexorably to an immediate slowdown in economic activity. In the US, for example, the weekly number of new unemployment claims was around ten times higher than had ever previously been recorded.[23]

Finally, sixth, the COVID-19 crisis has emerged at a time when the political, economic and **societal fragilities** produced by the 2008 financial crisis are still being felt in many countries and regions. It is notable that in some countries patterns of societal polarization and fragmentation appear to be shaping attitudes and responses to COVID-19.[24] In some countries, the financial crisis has also contributed directly to healthcare and other capacity constraints, as a result of the austerity measures taken over the past decade.[25]

A risk governance perspective
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The risk governance framework developed by the IRGC provides a lens through which risks and responses can be assessed. It is designed primarily as a tool for policymakers, risk managers and others to shape effective risk responses. In the case of COVID-19, we can use it as a structured way of considering the key steps that have been taken as management strategies have been designed, deployed and scaled up at great speed. In the paragraphs that follow, we focus on five components of the framework: scientific assessment, perception, evaluation, management and communication.

The process of **scientific assessment** establishes the likelihood and intensity of potential adverse consequences. It involves identifying hazards, as well as exposure and vulnerability to those hazards. In the case of SARS-CoV-2, the scientific assessment does not start from scratch, but builds on a large body of evidence and analysis relating to previous coronaviruses.[26] As mentioned above, the first WHO alert about the new virus was on 5 January 2020. The full genetic sequence of the virus was available globally within just ten days of this,[27] and the pace of scientific research into the virus since then has continued at breakneck speed. Medical preprint servers—where papers can be published prior to peer review—have been flooded with research.[28] As a result, more and more is being learned about the outbreak. Important early policy-relevant discoveries include the significant level of asymptomatic transmission of SARS-CoV-2, information that has shaped epidemiological models and management strategies.[29] There have been blind spots, however. Early evidence from Taiwan about human-to-human transmission was reportedly disregarded by the WHO because of political considerations.[30]

Significant scientific uncertainties remain about COVID-19. For example, it is unclear how many people are infected or have recovered. It is even unclear how many people have died of the disease, as reporting standards differ between countries, have been evolving within countries, and questions have been raised about the potential deliberate under-reporting of numbers. It is also unclear whether infection confers immunity, and if so for how long.[31] It is unclear how the virus will be affected as weather patterns change over the course of the year. As with previous infectious disease outbreaks, a comprehensive scientific assessment will only be possible retrospectively. This creates obstacles to designing and implementing optimal risk management strategies. So too does the even greater difficulty of assessing accurately any second- and third-order effects of the outbreak on the economy, society, domestic politics, international relations and so on.[32]

Assessing **risk perception** complements the scientific assessment by taking account of individual and societal opinions, concerns and preferences. Risk perceptions play an important role in shaping individual protective behaviours, which is of particular importance in a case like COVID-19, where protective behaviours are at the heart of most response strategies.[33] Moreover,

a number of factors may skew perceptions of COVID-19, including cognitive biases,[34] anxiety,[35,36] the unintuitive nature of exponential growth,[37] and indications that individuals pay more attention to media timelines of pandemics than to the underlying epidemiological timelines.[38] Experience of previous outbreaks – notably of SARS in 2003 – is another influence on attitudes and preparedness. Conflicting values among both policymakers and the public are another important factor in risk perceptions – for example over the balancing of health and economic impacts, or the level of isolation that it is appropriate for the state to enforce. Given the pace at which the outbreak has developed, and the fact that all but a very small number of communities appear yet to have hit the peak of infections and deaths, it is still very early to draw firm empirical conclusions about perceptions of this particular disease and responses to it. Research is under way, however. Preliminary results point to marked variation between countries on dimensions such as trust in governments' ability to protect citizens from COVID-19, and the specific behavioural changes that individuals have made.[39]

A key task facing decision-makers is the **evaluation** of a risks to determine whether they are (i) acceptable without any mitigation measures, (ii) intolerable no matter what precautions are taken, or (iii) tolerable if risk reduction measures are taken.[40]

> *THE VAST MAJORITY OF COUNTRIES HAVE IMPOSED STRINGENT RISK REDUCTION MEASURES*

This judgement should be grounded in the results of the scientific assessment and the perception assessment (as well as wider considerations such as societal values, resource constraints and trade-offs). In the case of COVID-19 there have been instances – notably in the US – where this process has broken down and policy-makers' evaluation of the risk has been at odds with the scientific consensus. However, the vast majority of countries have imposed stringent risk reduction measures, while tolerating significant residual risk rather than curtail civil liberties too completely or for too long. According to the available data, China appears to have evaluated the risk of the disease spreading as being closer to intolerable, taking comprehensive and intrusive steps to suppress the Wuhan outbreak and prevent it from spreading

to the rest of the country. At the other end of the spectrum, a small number of countries appear at times to have been willing to accept a much greater degree of COVID-19 risk, foregoing widely implemented suppression measures in order to allow the infection to spread, seemingly in the hope that herd immunity could be achieved. In the case of the UK, this evaluation appears to have rested on an under-estimation of the number of deaths that such a strategy would entail.[41] When the potential for 250,000 deaths was highlighted (in another Imperial College modelling paper [42]) the government swiftly changed course.

The **risk management** phase is where decisions are taken about the measures needed to deal with risks evaluated as tolerable. It involves designing, selecting and implementing strategies to reduce the adverse consequences associated with the risk.[43] The decisions taken in this phase are instrumental in determining how much harm a risk will ultimately cause. In the context of the current outbreak, the pace of the infection's spread has been a key constraint in the decision-making process, forcing policymakers to decide on unprecedented mass restrictions at great speed, under ongoing uncertainty and in the knowledge that the cost of failure (or even delayed success) could be very high numbers of deaths. Despite the complexity and uncertainty of the epidemiology, strong scientific consensus about key features of SARS-CoV-2 has resulted in a high degree of agreement among policymakers on the kind of measures needed to suppress it.[44] This emerging policy consensus was strengthened as increasing data became available from the earliest-affected countries, notably China and Italy.[45] Timing has therefore emerged as a key differentiator between responses in different countries—how quickly countries have moved to suppress the outbreak, and in the weeks and months ahead how quickly they will move to ease or remove the suppression measures. Thus far, two delays in particular have played an important role in determining the trajectory and scale of the global outbreak: an initial three-week delay in China after the first cases were seen, and a later delay in suppressing the virus in the United States.[46] A further source of variation in the way countries have managed COVID-19 has been the healthcare capacity constraints mentioned earlier. For example, a lack of key materials in some Western countries has hampered their adoption of large-scale testing strategies that appear to have been successful when deployed elsewhere, notably in South Korea.

Policymakers have also had to decide on further measures to manage risk-risk trade-offs—the additional risks created or exacerbated by the measures taken to manage COVID-19. In particular, huge financial commitments have been made to mitigate the potential economic harm caused by the steps taken to suppress the outbreak.[47] It is too early to judge either the cost or the effectiveness of the management strategies that policymakers are pursuing. It is also too early to judge what unintended consequences these strategies might lead to. In light of the scientific evidence about COVID-19, policymakers have had little choice but to intervene rapidly and forcefully in multiple interconnected complex systems (healthcare, economy, society, global transport, etc.). It should not come as a surprise if these interventions trigger further spillovers, including potential nonlinear effects.[48]

Risk **communication** is the process of sharing risk-related information within and between different groups, such as scientists, policymakers and the public, both nationally and internationally. It is of the utmost importance for effective risk governance,[49] particularly in the context of a crisis as far-reaching as COVID-19.[50] The transparent communication of reliable scientific data among scientists is central to reducing uncertainty and facilitating robust risk assessments. The effective communication between scientists and policymakers is crucial to the formulation (and modification where necessary) of evidence-based management strategies. And clear channels for communication between policymakers and the public are needed in order to ensure the legitimacy and durability of management strategies as disruptive and sustained as those that are currently being implemented. A large body of research has established clear guiding principles for communicating about risk.[51] By late January the WHO had already circulated COVID-19 communication guidance.[52] Inevitably, however, best practices come under strain in crisis conditions, and COVID-19 has presented policymakers in particular with numerous challenges: how to communicate the severity of the risk (particularly given the combination of exponential dynamics and asymptomatic transmission); how to instil urgency without creating panic or despair; how to communicate consistent messages to very different audiences; how to acknowledge uncertainty across multiple dimensions of the risk governance process; how to maintain confidence if changes in management strategies are required; how to tailor messages

to demographic groups who are affected very differently by COVID-19. A further challenge relates to the potential for online misinformation to disrupt or distort communication about important risks, particularly given the propensity for false information to spread online more quickly than true information.[53,54] Where there have been failures of risk-related communication in relation to COVID-19 they have been costly. The two important risk management delays noted above, in China and the US, both involved failures of communication. In the Chinese case, early risk-related information was actively supressed, notably in the case of Dr Li Wenliang who had warned colleagues about COVID-19.[55] In the US case, damaging delays flowed from key policymakers' disregard for scientific advice until it was too late to contain the outbreak. Another area of missing or confused guidance has been in relation to the benefits or otherwise of members of the public wearing masks when they are outdoors.[56]

What lessons can be learned
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It is far too early to be definitive about the lessons that should be learned from the COVID-19 outbreak. The crisis is ongoing. It has yet to peak in many countries that were among the first affected, and it is in its very early stages in some of the poorer countries where it can be expected to be do great damage. There will be years of research across numerous disciplines to understand and evaluate the events that are currently unfolding. Nevertheless, tentative conclusions can be drawn as fresh evidence about this crisis accumulates. In that spirit, we suggest that the following risk-governance lessons are among those to be learned from the early months of the COVID-19 outbreak.

1. **Deal with similar risks at source**. It remains the case that bats and other animals are a reservoir of potential infectious diseases. To prevent further outbreaks, opportunities for zoonotic transmission will need to be reduced. Among other things, this would seem to require steps to shut down transmission via the "wet markets" that have been responsible for both the SARS and COVID-19 outbreaks.

2. **Act on warnings**. A global infectious disease outbreak was predicted but not adequately prepared for. One obvious lesson is to review national and international risk assessments (or conduct new ones) and put better protections

in place for other high-impact risks that have been warned about. Societies cannot be fully prepared for every risk, but they can be more prepared for more risks—and particularly those with the potential to trigger systemic disruptions. This will have a cost (at a time when most countries' finances are being cratered), but the sums currently being spent on COVID-19 responses highlight the potential costs of inaction.

3. **Bolster the resilience of critical systems**. COVID-19 provides prima facie evidence that great gains in organisational efficiency over recent decades have resulted in a lack of resilience in some critical systems. Examples include the erosion of spare hospital-bed capacity in some countries, or the fact that access to some critical medical equipment has been vulnerable to disruptions in supply chains that have become increasingly globalised.

4. **Strengthen the science-policy nexus**. In many cases during this outbreak, the transmission of information and advice from the scientific assessment to policymakers' decisions about risk evaluation, management and communication has worked well. However, in the context of an exponentially spreading disease, when policymakers have ignored scientific advice, or delayed acting upon it, the human costs have been high. Every country should review the effectiveness of its current model of science-policy integration in light of COVID-19 experiences, and international bottlenecks should also be assessed.

5. **Do not fight the last war**. There will be a temptation to focus disproportionate resources on strengthening pandemic preparedness. While remedying key deficiencies in this area will be important, the next shocks are likely to come from other directions. What other risk warnings have not received the attention they deserve?

6. **Build state capacity**. Two global systemic risks have crystallised since 2007—dealing with such risks perhaps needs to be considered an ongoing part of normal government rather than a periodic emergency response function. The aftermath of the upheaval caused by COVID-19 may offer an important opportunity for institutional and regulatory change to strengthen future responses.[57]

7. **Understand complex systems**. The COVID-19 outbreak is a powerful demonstration of the nonlinear dynamics of complex adaptive systems. A minor initial change (the first human infection) has cascaded to the extent that global travel has almost ceased, a global recession looms and a third of the world's population is under quarantine of some sort. It may not be easy or quick to find a new equilibrium.

8. **Pay attention to risk-risk trade-offs**. Whatever steps are taken to reduce the risks of COVID-19 are likely to have unexpected consequences. With high-stakes decisions currently being taken at speed and under conditions of uncertainty, there is a danger of these consequences being overlooked. As far as possible, build these second-round effects into assessments, evaluations and management strategy decisions.

9. **Consider the role of technology**. How can powerful computing technologies be safely used to predict, identify and help respond to infectious disease outbreaks and other emergencies?[58] This is the first "smartphone pandemic". How can phones be used for contact tracing, while protecting privacy?[59] Similarly, what more can be done to leverage machine learning as a tool for pandemic assessment, preparedness and response?[60]

10. **Build trust and communicate openly**. The pace of the COVID-19 crisis has required management strategies to be chosen and implemented without the time for careful engagement with the public. In a democratic society, this requires trust to have been built up. As John Barry said of the 1918 influenza outbreak: "those in authority must retain the public's trust. The way to do that is to distort nothing, to put the best face on nothing, to try to manipulate no one."[61,62]

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