Acquiring, assessing and weighing

The use of knowledge in policy advice in times of crisis

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COLOPHON:

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Content

Foreword

During crises scientific advisors play a vital role in acquiring and interpreting knowledge related to the crisis. It is then the task of politicians and administrators to assess and weigh the supplied knowledge and, on that basis, to decide how to tackle the crisis. Such a distribution of responsibilities may appear clear and logical, but in practice it is easier said than done. Three Dutch advisory councils, the Netherlands Scientific Council for Government policy (WRR), the Health Council of the Netherlands (GR) and the Council for Public Administration (ROB), held a conference on 18 February 2021 on the role of knowledge from the perspective of preparedness in light of the COVID-19 pandemic. The central question was how the government and other administrative bodies and tiers could be provided by advisory bodies with scientifically underpinned knowledge in various phases of a pandemic or another kind of crisis.

The COVID-19 pandemic has shown in various ways how important it is to consider the role and positioning of scientific advice. First, governments normally take decisions on the basis of validated knowledge. In an acute crisis, however, that is often the very knowledge that is lacking. This raises the question of how science-based policy advice is – or should be – drafted during a crisis. Second, tackling a pandemic requires drastic measures that impact society, the healthcare sector and the economy. How can those measures be substantiated by validated knowledge and how can the uncertainties be communicated transparently without forfeiting public trust. It is also important that the advice on and the implementation of the resulting measures are consistent with the democratic rule of law, in which individual freedom is a core value. Third, crises show the complexity of providing scientific advice in situations in which knowledge, the democratic rule of law and trust influence each other and are under scrutiny. During the conference academics from a range of disciplines, politicians and administrators discussed the role of knowledge during an acute, a chronic and a predicted crisis.

In this essay the authors identify and describe the tensions that can arise in times of crisis with regard to the role of knowledge in science, policy and politics. The content is drawn from the conference, the participants' position papers and relevant literature. The position papers are in Dutch and not included in the publication of this translation of the essay.

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1. Introduction

At the end of 2019 the first reports emerged of a then still mysterious and highly infectious disease. "Fears of SARS outbreak in China after emergence of mysterious lung disease" was the headline on Belgium's HLN on 31 December 2019.[1] Over a week later, the Dutch news program RTL News reported: “Mysterious lung disease appears to be new virus.” The report mentioned patients who appeared to have contracted the disease "in a fish market that also sold a lot of live animals. It was therefore possibly transmitted to humans through birds or other animals. The patients’ families have not fallen ill, so at this stage the virus does not appear to spread easily between humans.”[2] Two weeks later the city of Wuhan in China was sealed off. Twenty-five million Chinese people were placed in quarantine as the authorities tried to curb the spread of the new virus. People were ordered to stay at home, cars, buses and trains were banned, aircraft were grounded and ferries stayed in port.[3]

The world initially watched the situation in China with a mixture of surprise and disbelief. Also the Netherlands was not expected to be severely impacted.[4] But we know better now. Within a short space of time the dominant perspective on the virus shifted from an external threat to a national crisis.[5] On 31 January 2020 the first infections were detected among Chinese tourists in Italy, where, around a month later, health services particularly around Bergamo were overwhelmed. Sixteen million people in northern Italy were reportedly placed in quarantine. The media carried harrowing reports and photographs of overflowing intensive care (IC) units. It was still assumed that this would not happen in the Netherlands, but on 27 February 2020 the virus reached the country through hotspots in ski resorts and regions where carnival was publicly celebrated. On 11 March the World Health Organization (WHO) declared COVID-19 a pandemic.[6] On 13 March 2020 the Netherlands went into an ‘intelligent’ lockdown. Far-reaching measures were also introduced in other parts of the world.

These measures were nevertheless insufficient to prevent millions of people becoming infected and many died. In the first year of the COVID-19 pandemic over 130 million people worldwide were infected and around 4 million people died as a result of the virus.[7] By May 2021 an estimated 1.5 million people had been infected in the Netherlands and the deaths of over 17,000 were recorded as being due to the COVID-19 virus.[8]

Science has proved to be of inestimable value since the onset of the pandemic. On 11 January 2020 the genetic code of the virus was published on the public website of virological.org. Barely two weeks later a so-called PCR test was designed, validated and published, enabling the new virus to be detected. Work then began on vaccine research and development. The

first vaccines were developed, tested and approved within a year. That is unprecedented for a process that normally takes five to ten years. The availability of vaccines heralded a new episode in the COVID-19 pandemic.

Nevertheless, the crisis is not yet over and we face uncertainties around the world concerning the use and duration of efficacy of the vaccines, with questions surrounding production capacity, inequality in procurement and accessibility and people's vaccine acceptance. Reported side effects have brought new uncertainties about safety, leading to pauses, delays and changes in the vaccination strategy for different age groups. This has added further fuel to the debate in anti-vaccination circles and threatened to put pressure on vaccine acceptance.

The virus itself has also brought new uncertainties for the Netherlands and beyond. A resurgence and various mutations of coronavirus made it necessary to reintroduce far-reaching measures in the autumn of 2020 and at the beginning of 2021, including the closure of shops and schools and the imposition of a curfew.

Uncertainties concerning the development of the COVID-19 pandemic therefore look set to remain with us. Who would have thought that a year after the outbreak of the pandemic many of us would still be working from home and that for several months we would be unable to go outside in the evening?

Such uncertainty and unpredictability poses major administrative, scientific, political and social challenges. In order to meet these challenges, many countries have structures and preparedness plans in place to respond rapidly to an infectious disease outbreak.

Despite the crisis structures and preparedness plans in place, a crisis response poses a number of challenges in practice. In various position papers for the conference the authors conclude, supported by the literature, that lessons learned, preparedness plans and crisis manuals do not guarantee a successful crisis response.[11] Crises require far-reaching decisions to be taken under time pressure and amid uncertainty and unpredictability. A disruptive crisis such as the COVID-19 pandemic thus presents a major challenge for a wide range of actors, for example in administration, politics, science and society, around questions such as: Which measures should be taken and who will take the decisions? What knowledge is available as a basis for decision-making? Who will implement the measures and which competences and responsibilities are required?

BOX 1: Organization of crisis structure

Crisis preparedness and management are organized at local, regional, national and international level. Dedicated organizations and institutions monitor potential threats and maintain preparedness plans and crisis structures. Records of potential pandemics and the extent of countries' preparedness for emerging crises are monitored at international level.[10]

In the Netherlands, the Outbreak Management Team (OMT) and the *Bestuurlijk Afstemmingsoverleg* (Administrative Consultative Committee – BAO) are called in to deal with any supraregional infectious disease outbreak. This structure is enshrined in law and aims to ensure that, as part of the outbreak response, experts can draw on new or existing knowledge to advise administrators on practical measures to combat the outbreak. The OMT is composed by the Centre for Infectious Disease Control (Cib) of the National Institute for Public Health and the Environment (RIVM). The BAO is chaired by the Director-General for Health (DGV) of the Ministry of Health, Welfare and Sport and includes officials of the ministries concerned and representatives of Dutch local authorities. The OMT and BAO provide advice for the Ministry of Health, Welfare and Sport.[11] Final assessments and decisions are the responsibility of politicians and administrators.

Scientific advisors can make a substantial contribution to answering some of these questions and thus provide the government and parliament with advice underpinned by practical knowledge and science. But to what extent are they genuinely equipped to do so? The Dutch (scientific) advisory infrastructure is quite extensive and consists amongst others of advisory councils, planning agencies and public knowledge institutes. Different from temporarily (crisis) advisory structures such as the OMT and BAO (see **BOX 1**), most permanent advisory councils were established with a primary focus on specific areas of knowledge. The latter generally operate on the basis of extensive research, reflection and peer review. Formulating advice consequently takes time. Such methods are less suitable for providing advice during a crisis, especially during the acute phase.

The above summarizes the challenge and problems that advisory councils have faced since March 2020. Against this background three councils, the Netherlands Scientific Council for Government policy (WRR), the Health Council of the Netherlands (GR) and the Council for Public Administration (ROB), organized a conference on the subject of preparedness on 18

February 2021. The conference included a key note lecture and discussions in break-out groups with academics from a range of disciplines, politicians and administrators. The discussions were focussed on the role of knowledge in three crisis scenarios that were distinguished for the purpose of the discussion: an acute, a chronic and a predicted crisis.

In this essay we consider the role of knowledge and advice in crisis situations on the basis of the conference and the participants' position papers. From the perspective of science, policy and politics, we also consider the tensions that result from a crisis.

We start by considering the characteristics of the three crisis scenarios. We then discuss factors that always play a role in crisis policy, such as dealing with uncertainty, transparency and communication. We subsequently consider three key themes that emerged from the conference: adaptation, multidisciplinarity and distribution of responsibilities. We end the essay by placing a number of items on the agenda for future discussion.

2. Crisis definition

As we have already briefly indicated, crises come in many shapes and sizes. This essay focuses on the COVID-19 pandemic, as a model for crises that have a disruptive effect on society. In our context it is useful to refer to the work of Mishra (1996) and Boin (2020), who describe a crisis as a threat to physical safety and other widely shared values relating to social equality and economic status.[12] Crises are complex and the response can involve conflicting action strategies that require choices to be made. A lockdown can help to protect vulnerable groups, while at the same time threatening the welfare or livelihood of other groups. Rapid action thus appears to be an urgent requirement. At the same time legitimacy is crucial, particularly given the far-reaching implications of the policy choices that such action entails. The legitimacy of policy depends among other things on choices being substantiated by relevant knowledge. Since the threat is new and unfamiliar, however, uncertainty and unpredictability are constant factors. Furthermore, existing crisis structures and available resources are often insufficient in such a situation. Every crisis also has its own dynamics, so there are always differences in the role of science, policy, politics and administration and the impact of the crisis on society. [13] Compare, for example, the credit crisis, the climate crisis, an epidemic and a pandemic.

2.1 A crisis as a fluid and functional concept

The reality of every crisis and crisis response is unique and complex, so it is not easy to produce a clear-cut classification of crises. When preparing the conference we chose to distinguish between an acute, a chronic and a predicted crisis. This distinction helped us to differentiate between the various issues that come to the fore, depending on the type of crisis. During the conference it immediately became clear that our classification was based on an ideal-type distinction. In each session the discussion initially focused on the definition and significance of these situations: what is an acute, chronic or predicted crisis? And where do we classify the coronavirus crisis?

Acute crisis characterized by urgency, uncertainty and unpredictability

The developments outlined on the first pages of this essay certainly fulfil the characteristics of an acute crisis: urgency, uncertainty and unpredictability. Despite the availability of preparedness plans and the existing crisis organization, in March 2020 we immediately faced various practical challenges, such as hospital admission capacity and shortages of personal protective equipment, for which there was suddenly enormous demand worldwide. In the

first instance everything was aimed at curbing the spread of the virus. The government introduced a lockdown, advising people to avoid travel, work from home and minimize personal contact. This lockdown reduced the opportunities for the virus to spread but also led to distressing pictures of elderly and disabled people suffering from loneliness due to the visiting bans and of patients whose treatments had been postponed.

The first months of the coronavirus crisis in the Netherlands were nevertheless characterized by broad support for the containment measures, an almost non-politicized approach to the measures in the House of Representatives, the prioritization of science and knowledge as the basis for the measures and a strong sense of solidarity.

The policy measures were initially focused on personal hygiene (such as frequent hand-washing) and social distancing (where possible working from home and keeping 1.5 metres apart). In the meantime, more knowledge about the virus became available. Despite the increased knowledge and resulting adjustments to the measures, however, virus flare-ups continued. It was difficult to determine whether this was due to the measures being ineffective themselves or people's lack of compliance with them. Many questions and uncertainties remained with regard to the virus. After the summer the infection rates increased again and measures were reintroduced: 'non-essential' retail was shut down and hospitality, sport and event venues had to close. These turned into a succession of measures prescribing when (curfew), where (at home, outdoors or in public spaces) and with whom (households, vulnerable people, potentially infected people) we were allowed to have contact. The longer the crisis continued, the more difficult it became for many people to adhere to the measures.

Chronic crisis requires wider assessment

After more than a year of scaling up and winding down the measures, there was increasing talk of a chronic crisis situation. Whereas the initial crisis response was focused on measures to halt the virus, the subsequent, chronic phase was increasingly dominated by economic and social factors resulting from the measures. The type of crisis we are currently experiencing is therefore less 'clear-cut' because in this situation acute deteriorations are still liable to occur at any time.

During the conference the chronic scenario was defined as a situation in which the acute phase is that a unilateral focus on health or other risks comes under pressure and the calls for a wider assessment grow increasingly dominant. This means that multiple types of knowledge have to be obtained, integrated and assessed. There is also a greater role for

politics and policy in this phase, because different values and interests have to be weighed against each other.

It was already foreseeable in the acute phase that these interests would play a role, as the closure of hospitality and retail outlets logically leads to economic problems and the closure of schools means students fall behind with their education, but these effects were not yet 'visible', so they were less urgent than the acute pressure on healthcare.

As mentioned above, a chronic crisis still includes acute aspects. It is repeatedly necessary to respond to new (local) outbreaks, overflowing hospitals, people flocking to parks to enjoy fine weather, anti-coronavirus demonstrations and non-compliance with the measures. A characteristic of the chronic scenario, however, is that, aside from the acute aspects, questions are increasingly raised about the longer-term impact of the crisis on society and the economy.

Scope to prepare for a predicted crisis is limited

Finally, the conference considered the scenario of predicted crises to visualize how a government could prepare for a crisis that will probably arise in the future. This type of crisis also involves a number of characteristics and challenges. For example, prevention can be extremely important in a predicted crisis, and yet little attention is paid to prioritizing effective measures because the urgency is not yet tangible. We see this, for example, in the climate crisis.

During the conference it was suggested that a predicted crisis can also be understood as an 'ordinary', albeit complex, social problem. After all, some predicted crises do not ultimately materialize. Indeed, is it still a crisis if you can see it coming a long time in advance? In light of this discussion the predicted crisis was deemed to be of a different character than an acute or a chronic crisis. This also led to different discussions. For example, a predicted crisis was described as an event that can be fully or partly averted as long as the right preparations or measures are in place. With this type of problem it is clear from the outset that it will arise, but there is also an awareness (at least to some extent) of what can be done to avert or control it. The 'millennium bug', for example, did not ultimately lead to a crisis. The question, however, was whether this was due to preventive measures or because the problem had been overstated.

This highlights a second characteristic of a predicted crisis. If a predicted crisis does not ultimately materialize (or not yet), this can be attributed to the success of preventive measures, but it can also be labelled a hoax. The same phenomenon can be seen in the

discussion on climate change. A predicted crisis can thus also take on strongly political overtones.

A third characteristic of predicted crises is that every prediction is inherently uncertain. Epidemics and pandemics occur constantly through history. In the last two decades, for example, we have already had to contend with the SARS virus, the Mexican flu virus, the MERS virus and Ebola. The arrival of a new epidemic or pandemic was predictable and experts had already identified some aspects of the COVID-19 pandemic.[14] The pandemic nevertheless caught us off guard at the beginning of 2020.

A predicted crisis therefore requires preparation on the part of the government in order to prevent or combat it (either fully or partly). The element of uncertainty, however, means that preparation can never be perfect or complete. For example, treatments and vaccines can only be developed once it is known which virus is in circulation. Action must also be taken rapidly when an acute crisis arises. Hence a prediction cannot eliminate the need to also consider acute and chronic crises.

Fluid boundaries between acute, chronic and predicted

The definition of a crisis is overlaid by many different political and normative aspects. Every crisis is different, with its own dynamics and different issues faced by politics and society. The definition of a crisis (for example as acute, chronic or predicted) can also involve the prioritization of different political and normative choices and considerations. Take, for example, the tension caused by an acute and a chronic crisis. On the one hand virologists, epidemiologists and health care professionals emphasize the acute nature of the health crisis on the basis of daily infections, hospital and IC bed occupancy, shortages of specialist nursing staff and the number of deaths. On the other hand, from a psychosocial and pedagogical perspective, it is pointed out that the chronic nature of the crisis means people will no longer adhere to the measures and that young people will fall behind with their education and become increasingly unhappy with their lives. Such a divide arose not only between the various 'professional groups' but also led to tensions within the government.[15]

But there are more political and administrative tensions. An acute crisis situation requires a structure in which certain actors and institutions are given extraordinary executive powers, for example to take rapid decisions and legitimize actions (such as measures that restrict freedom). The acute phase of the coronavirus crisis had characteristics of a technocratic or autocratic type of governance with scientific facts and interpretations being translated more or less directly into policy. This is interesting from a knowledge perspective, because this is precisely the phase in which a lot of knowledge is still lacking. The longer a crisis persists and

gradually adopts chronic characteristics, the greater is the importance of and emphasis on proper democratic processes. The argument that an acute crisis demands rapid action carries less weight in a chronic crisis. Acute phases can still occur at any time during a chronic crisis, but at the same time the technocratic impulse shifts to a more democratic form of governance. However, that shift makes decision-making not less, but even more complex, because (intended) measures become subject to politicization. That means there is more room for doubt about the measures taken and more room for political debate. The members of the independent and unofficial Red Team (comparable to the so-called Independent Scientific Advisory Group for Emergencies, or independent SAGE in the United Kingdom), representing a range of different expertise, were quite vocal in the summer of 2020, making sure, for example, that parliamentary parties and mayors also heard their advice on the tackling of coronavirus.[16]

While there is more scope for rapid and technocratic action during the acute phase of a crisis compared to the more chronic phase, the distinction between the two phases is also political: who determines whether the crisis is acute and when it enters a chronic phase? Dutch laws and regulations on this subject, the so-called Emergency Acts, are outdated, insufficiently discriminating and democratically deficient, for example in terms of the allocation of powers and responsibilities.[17] Partly for that reason, the Dutch government has not used these acts during the COVID-19 pandemic.

In short, the boundaries between an acute, a chronic and a predicted crisis are fluid and cannot be defined in a clear-cut or wholly objective manner. Nevertheless, each scenario includes features that characterize a crisis as typically acute, chronic or predicted. The distinction is useful because it foreshadows the type of issues that will become more or less dominant. We will discuss these in greater detail under the themes of adaptivity, multidisciplinarity and distribution of responsibilities. First, however, we will discuss a number of constant factors and preconditions that are important in all types and phases of crises: uncertainty, transparency and communication.

2.2 One thing is certain: uncertainty

Uncertainties about the scientific state of affairs existed right from the outset of the coronavirus crisis: uncertainty about the origin of the virus, its spread, the complications of the infections and their treatment. Scientific knowledge is essential in the fight against the pandemic. In a television address on 16 March 2020 Dutch Prime Minister Mark Rutte said: "And it is important that we continue to navigate according to that compass of scientific

knowledge and reliable facts. That is the only sensible way to continue taking the necessary steps."[18]

But what constitutes a reliable fact depends on one's perspective. For example, the public perception of a reliable fact may be that it never changes, whereas from a scientific perspective reliability lies precisely in the potential mutability of a fact. Science is characterized by the development of progressive insight: hypotheses are investigated, confirmed or rejected. In the case of a pandemic, such as that caused by SARS-CoV-2, this evolution of scientific knowledge was clearly visible because political decisions were based directly upon it, particularly at the outset. What was 'true' yesterday would not necessarily be 'true' tomorrow, because the speed of development of scientific knowledge was unprecedented (**BOX 2**).[19]

Changing scientific insights on the one hand point to advancing understanding but on the other hand may increase the uncertainty in society and undermine trust in politicians. Certainly, the longer a crisis persists, the more difficult it is for society to cope with recurrent and fresh uncertainties and unpredictability. In short, uncertainty also impacts the perspective that people have on life after coronavirus. There were recurring doubts, for example, about the effect of the measures (whether they would work and which were most effective), and fresh uncertainties came to the fore about the side effects of the vaccines and the emergence of new virus variants. But the uncertainty was also wider: it extended, for example, to the support measures (and their duration) required to mitigate the detrimental effects of the control measures and the uncertainty about society's backing for measures such as curfews. During the crisis this kind of uncertainty fuelled debates and differences of opinion, for example among politicians and safety experts on the curfew.

BOX 2: Exponential rise in coronavirus publications

The number of publications on coronavirus has increased enormously since the start of the COVID-19 pandemic (**see figure**). The Pubmed database already lists over 100,000 publications on different aspects of the SARS-CoV-2 virus and the COVID-19 disease. A search on Google Scholar yields over 160,000 hits.[20] This research produced important insights that were useful in combating the virus. The number of publications on the virus and the disease, diagnosis and testing remained fairly constant after May 2020, whereas the number of publications on topics such as mental health increased from that time. This trend reflects the widening of the discussion.

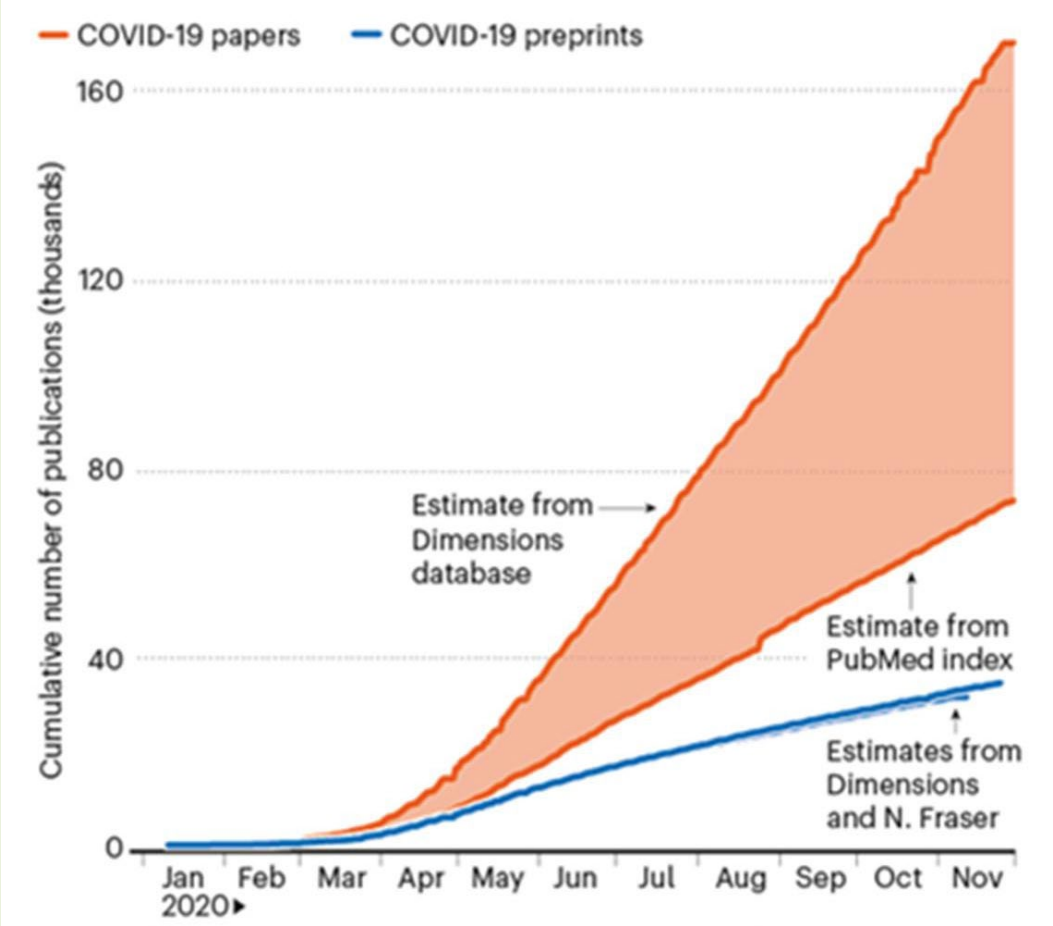

Figure The number of publications and preprints on coronavirus and related aspects increased exponentially in 2020. The estimates vary depending on the search terms and databases used and the definitions of what should be considered a scientific publication. Some preprints were published simultaneously on different websites. Based on: Nature, Primer and Fraser.

At the same time the generation of so much knowledge leads to problems. Scientific publications usually go through a peer review process, in which colleagues review the work. Many articles have not yet gone through that process but are nevertheless available as preprints. That has an advantage but also a disadvantage. The advantage is that data and analyses are available sooner, while the disadvantage is that the research may be of lower quality.[21] Nevertheless, despite all the research, knowledge gaps remain – see the discussions on matters such as infectivity and the outdoor spread of the virus or the question of whether vaccinated people can still transmit the virus.

2.3 Transparency and communication are essential

Many people find it hard to cope with uncertainty, but the extent to which that uncertainty impacts their daily lives varies.[22] While many people are keen to return to the office or go on holiday, others face more substantial uncertainties, extending to work and income. 'Coronavirus fatigue' results not only from the persistent uncertainty about when 'normal' life will return (at least in part), but also from the uncertainty about possible prolonged impacts and the continuing unpredictability of events.

Politicians and policymakers must take decisions based on the available knowledge. Communication on the uncertainties and decision-making criteria is vital in this regard: what do we know, and what do we not (yet) know? Openness and explicit identification of risks and uncertainty help to maintain transparency and trust but also entail a degree of fragility. If the uncertainties persist, or if the advice constantly changes and its expected effect fails to materialize or is disappointing, trust can turn into mistrust.

Accountability and transparency help make clear which scientific insights political leaders are following and which other factors play a role in decisions.[23] Such openness may make administrators more susceptible to criticism, but it also contributes to a culture in which there is acceptance that choices sometimes have to be amended later, rather than a culture focused on risk control. In addition to communication, it is important to involve the public in this process, including at regional and local level. The government's learning capability was a recurrent theme during the conference and in the position papers. Learning during a crisis makes other demands on the government, policymakers and politicians. Paradoxically, clear statements about uncertainty, margins and unknown variables can enhance the authority of those in power and hence compliance with the measures in force. Learning capability also requires adaptivity, a broader view and an awareness of one's own knowledge and role. This brings us to the central themes or lessons of the conference.

3. Central themes of the conference

During the conference three central themes relating to knowledge and scientific policy advice in times of crisis emerged as key lessons: the desirability of adaptive governance and advice, the importance of multidisciplinarity in advice and the monitoring of the boundaries of responsibility. These partially overlap with similar themes mentioned with regard to preparedness in international literature.[24] We discuss three key lessons below, also in relation to the role of scientific advisors.

3.1 Adaptivity

Flexibility and an ability to adapt to the situation are important in order to be able to act in a situation of uncertainty and unpredictability. Crises require adaptive capability on the part of all those involved. This essay mainly concerns knowledge that is available to administrators and politicians. We therefore focus on the adaptive capability of politicians, administrators and scientific advisors.

Crises moving from an acute phase to a predominantly chronic phase, possibly with acute flare-ups, require consideration of broader issues beyond public health and the safety of society. Besides healthcare, such issues concern the well-being of society and the importance of the economy. This should all lead to interaction between science, administration, politics and society.[25] But the transition between crisis phases is not always recognized and acknowledged. An acute phase requires a different assessment of interests than a chronic phase. Decisions on coronavirus policy in the Netherlands, for example, were dominated by the numbers of infections, hospital admissions and IC beds. It is not easy to change this dominant thinking. A participant in the conference suggested that we were apparently stuck in a mindset focused on acute measures that are socially untenable in the long term but nevertheless risk becoming chronic. The prevailing mindset in an emergency may justify strict measures to halt the virus, but these measures are difficult to maintain if their side effects cause ever greater socioeconomic damage. It was therefore argued that we should change our thinking and look at "the steps we need to take to abandon that mindset, because otherwise it will keep us locked up for another year".

The first lesson is therefore that a crisis not only requires thinking through the steps needed to exit the crisis, but also thinking through the steps needed to exit mindsets and communication patterns. A focus on timely reconsideration and, where necessary, adjustment of a particular thought pattern is important in part because the reflex in times of

crisis is usually one of risk avoidance. In this context the conference participants used the term 'risk society', coined by the German sociologist Ulrich Beck, in which risks are avoided and the resulting harmful effects are tolerated.[26] After the Netherlands largely 'reopened' just before the summer of 2020 another wave struck in the autumn and it was predicted that a subsequent wave would arrive around Christmas. The government then became increasingly reluctant to ease the restrictions on society, partly out of fear of the possible health risks. In various position papers the conference participants highlighted the risk of political decision-makers adopting a one-sided view, guided, according to one of the authors, by driving forces such as 'safety first', 'administrative liability' and 'fear of the fearful citizen'[27], whereas the effects and side effects of the crisis are wider and require a multidisciplinary view (**BOX 3**).

BOX 3: Risk assessment as a balancing act

Many people find that the strict measures aimed at protecting the health of vulnerable groups have been kept in place for far too long. This situation appeared to change at the end of April 2021 when the government decided to lift various restrictions, against the advice of the Outbreak Management Team (OMT). On the lifting of the measures, Rutte said: "It won't happen without taking risks, but the risks must be acceptable. That is and will remain a balancing act for now. And we need to be very careful and cautious."[28]

In this example, adaptation and changing mindsets therefore involve a balancing act in which risks have to be taken carefully and cautiously. Whereas in the acute phase the dominant tendency was one of risk aversion, the press conference of 20 April 2021 showed different values and interests coming to the fore: a readiness to take risks, greater freedom of movement for individuals and businesses (lifting of the curfew, more scope for home visits, opening of pavement cafés, etc.). Hence it appears that greater heed was paid to civil society (business owners, mayors, private individuals) and less to the advice of the OMT.

Adapting to the situation requires input not only from administrators and politicians but also from scientific advisors. These usually provide demand-driven advice following a carefully formulated and well-considered request from the government. The result of the research is then presented to the government and an official government response follows. This model has a relatively long lead time and is not geared to the needs of politicians and policymakers in crisis situations. Advice in times of crisis therefore requires different standards. The Health Council of the Netherlands, for example, has scaled up its activities and, besides providing advice on fundamental issues, has begun offering the possibility of urgent advice. The government has made extensive use of such advice during the coronavirus crisis.

Scientific advisors can also be adaptive in other ways in times of crisis. For example, they can proactively ask questions that have not (yet) been raised but which are likely to be asked, and then formulate answers (an example being the coronavirus think-tank of the Social and Economic Council of the Netherlands, SER).[29] Scientific advisors can also provide advice rapidly – or more rapidly – on the basis of synthesized knowledge that explicitly identifies existing uncertainties in the scientific literature. During the conference various participants recommended outsourcing such synthesis work to academics. After all, the academic world can connect to the wider network of international knowledge and experience.

This leads on to a second lesson: that more internationally co-ordinated advice can result in more efficient use of time and resources by governments and greater unity, for example, in European policy and a European approach. On the other hand, translating such knowledge syntheses into policy jargon and policy reality is classic scientific advisors' work at national level, especially since in some respects the Netherlands applies different values and standards than, for example, Belgium, Germany or Italy. The importance of integrated knowledge, which can be deployed faster during crises in order to provide direction-setting advice while leaving sufficient room for manoeuvre to anticipate new knowledge or political opportunity, is the third lesson.

Yet another form of adaptivity arises with regard to collaboration. Various conference participants found that their closer cooperation with colleagues from other advisory councils enabled knowledge-based advice to be strengthened by interdisciplinarity and multidisciplinarity. This brings us to the second core theme of the conference: multidisciplinarity.

3.2 Multidisciplinarity[30]

Whereas in the acute phase of the COVID-19 pandemic the emphasis can and perhaps should be on a scientific and technocratic approach to the problem, such dominance is more questionable in a chronic phase. We have already cited various reasons for this, such as the wider well-being of the population or economic interests. The chronic phase therefore requires wider consideration, not through a cluster of complementary disciplines (epidemiology, medicine) but through interdisciplinary collaboration between disciplines that do not necessarily speak each other's 'language' or share each other's logic (for example, economics, law, psychology and ethics in addition to medical science). In a multidisciplinary approach a crisis is considered on the basis of various disciplines, each with its own methods, concepts and theories. Although those different disciplines share the same

research object, their perspectives are different. For example, to an epidemiologist COVID-19 is a viral disease that passes through a population in a specific way, whereas for a virologist COVID-19 is an infectious disease caused by the coronavirus SARS-CoV-2 and an economist sees the virus as a threat to the economy because a lockdown halts not only the virus but also the circulation of money, goods and services. The combined perspectives do not result in a perfectly fitting jigsaw, but they do highlight differences of insight that merit attention, call for compromise and mandate consideration of how disparate goals and interests can be facilitated.[31] A lesson for scientific advisors could be that as part of their advice they should illustrate and explain multidisciplinary and sometimes also normative differences of insight, thereby showing which lines of reasoning the government could adopt, not only to make difficult assessments and choices but also to legitimize them.

According to the conference participants, multidisciplinarity also touches on another aspect: the connection between theory and practice. The former Minister of Medical Care & Sport, Bruno Bruins, gave some examples during the conference. He stressed the importance of strengthening links between healthcare and public administration in the region, because insights drawn directly from practical experience can help improve administrative decision-making. As well as scientific insights, it is therefore important to incorporate social and practitioner perspectives and experiences in decision-making on crisis measures, for example through citizen participation, dialogue tables or hybrid forums.[32]

There is no scientific formula for determining the right balance between different disciplines, or for weighing health damage against bankruptcy or depression (which, indeed, may be interrelated). Different value systems may compete and conflict with each other during crises. A number of participants, including Roel Coutinho, former director of the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM), stressed the importance of highlighting these conflicts: “You need unconventional thinkers.” The conflicts may be between economic and health interests, between safety and freedom or between the health interests of different groups. All these values should be factored into decisions taken in times of crisis, according to the essay ‘Coronamoe(d)’ (‘Coronavirus Fatigue and Coronavirus Courage’) by the Council of Public Health & Society (RV&S), because such values keep our society vital and resilient over the long term.[33] Over time this becomes an ambiguous problem that involves both uncertainties in knowledge and conflicts in values and ceases to be the sole preserve of scientific experts.[34] The lesson from this is that it is useful to obtain input from a wide range of individuals, professionals and organizations on the way in which a crisis is tackled.

Multidisciplinary working is no panacea, however. It is a challenge that entails many pitfalls and obstacles. First, there is a risk that multidisciplinary bundling or combining of knowledge will result in an advisory 'hotchpotch' that lacks focus and gives rise to myriad conflicts. Focus and consensus therefore appear desirable but can also pose a second risk, according to conference participants. A kind of 'super OMT' that produces integrated advice drawing on a wide range of scientific and other disciplines could make it very difficult for administrators and politicians to disregard advice, because – put simply – the consideration of facts and values is generally assigned to the political and administrative domain.

The third risk is that scientific knowledge itself may be politicized, precisely because researchers from different disciplines produce different analyses and solutions and argue on the basis of different normativity frameworks: economists reason on the basis of the perspective and importance of the economy, whereas medical experts focus on the objective of minimizing deaths. Those different guiding values also illustrate different interests. The value and lessons of multidisciplinary, scientific policy advice may lie precisely in this fact: that as a result of all those different, partially overlapping and hence also opposed perspectives, it places all those interests on the table. Multidisciplinary policy advice imbued with the latest scientific knowledge thus becomes a prerequisite for informed political decisions on complex matters such as a pandemic.

Precisely how the scientific advisory bodies can shape multidisciplinary policy advice is an empirical question that needs to be further investigated and tested in the years ahead. We did, however, gather a number of suggestions during the conference. On several occasions the participants referred to the Scientific Advisory Group for Emergencies (SAGE) in the United Kingdom; SAGE integrates and analyses knowledge, highlights commonalities and conflicts, and sets out possible actions and consequences. It is left to politicians, however, to make the final assessment. In the Netherlands the SER has established a dedicated coronavirus think-tank representing a wide range of scientific and other advisory organizations. A third example is the Dutch Pandemic & Disaster Preparedness Center (PDPC), which opened shortly before this essay was published. Here researchers from Erasmus Medical Center and Erasmus University in Rotterdam as well as the Technical University Delft investigate virus outbreaks and disasters with a view to better preparedness in future.[35]

Another question for the future is how multidisciplinary knowledge can be organizationally embedded in Dutch crisis management. This could be achieved through a classic model of an advisory structure in which an existing advisory body (possibly jointly with other advisory bodies) selects, invites and supports a group of experts at the request of the

government. Another possibility is a flexible, open model in which a wide forum of alternating experts formulates ad hoc consensus-based advice.[36] But there may also be a role for multidisciplinary and scientifically embedded crisis management before a crisis. The first question is which bodies in the Netherlands are already dealing with crisis management. A third model for embedding multidisciplinarity in crisis management could be the establishment of a committee with members drawn from the existing crisis structures to address the issue of preparedness in a broad sense. This could also involve advisory bodies.

Finally, given the importance of transparency and communication underlined above, a crisis management structure, whatever its form, must be "based on a number of principles: multidisciplinarity, topicality, neutrality and openness".[36]

3.3 Distribution of responsibilities

As we have already indicated a number of times, tasks and responsibilities are distributed between science, advice and decision-making. Professor Pearl Dykstra said during her lecture at the conference: "Policy advice benefits from clarity concerning three different responsibilities. The first is delivering knowledge from science. The second is translating that knowledge into policy recommendations. The third is the final decision-making."[37]

Clear terms of reference also include a distribution of responsibilities: scientists and planning agencies acquire knowledge, the scientific advisors synthesize and interpret that knowledge, and politicians and administrators evaluate and weigh the options. That distribution of responsibilities needs to be monitored. At the same time, as became clear during the conference, these matters are not always black and white; they can shift over time.

Some people consider that policy advice not only concerns the responsibility for presenting the facts as the state of the art or as different scenarios, but also involves highlighting the associated values. This can be done by articulating how virus control and the value of life-saving actions can temporarily push other values into the background. The discussions surrounding the opening of schools, the permitted number of home visitors and curfews are examples of this. Scientific advisors could perhaps therefore do more in the way of interpretation and evaluation. There is a fine line, however, between this and the political evaluation of knowledge, which is a task that must be left to politicians. At the same time, Prime Minister Mark Rutte referred to the status of OMT advice as a "compass" for decisions, because it was based on "scientific knowledge" and hence on "reliable facts". This illustrates a tension between the need for facts and the interpretation of knowledge. As

noted earlier, scientific facts tend to change over time and it is more realistic to speak of knowledge or the scientific state of affairs.

Politicians are sometimes inclined to rely on scientific facts rather than an explicit assessment of the different factual and normative aspects. Or they are inclined to state explicitly which factors or aspects they consider more important than others. Hence the practice of management and decision-making in times of crisis does not always explicitly match the distribution of responsibilities between scientists, advisory bodies and democratic bodies. Facts and values are intertwined and can flow seamlessly into one another.[38] Scientists are sometimes also tempted to link normative conclusions to their research results, possibly under pressure from media or politicians. In some cases that is also necessary or even desirable. Science is not devoid of values and in some disciplines, including jurisprudence, normative evaluation of knowledge is actually part of the discipline. But the dividing line is fine and under constant tension. That is true particularly in times of crisis and when far-reaching decisions have to be taken rapidly. This raises questions such as: where does the boundary lie between knowledge synthesis, observance of administrative signals and requirements and preparation for certain decisions that ultimately belong on the political level? A key lesson is that in such a complex reality the independence of advisory councils must be and remain guaranteed, even under immense political and time pressure. This is not necessarily at odds with normativity, provided that normative evaluation is underpinned by science.

The provision of crisis advice remains a difficult task, however, with the need to steer a middle course between autonomy and policy relevance. Facts and values are fluid and the responsibilities and boundaries of science, advice and policy are constantly at issue. By explicitly defining, where possible, what the advice is or is not intended to achieve (function and purpose), scientific advisors can ensure that knowledge, advice and decision-making do not become too much intertwined.[39] The lesson we draw from this is that scientific advisors, advisory councils and knowledge institutions can also contribute to crisis advice by clearly setting out the hypotheses, underlying values and choices from a multidisciplinary perspective so that science and politics can adhere to the responsibilities and competences defined by their roles. This becomes particularly vital the longer the crisis persists and the more chronic it becomes, because the role of politics and governance then becomes more prominent.

4. Conclusion

In this essay we have examined the role of knowledge in times of crisis. We have defined the characteristics of crises, namely uncertainty and unpredictability and the importance of transparency and communication. We have also discussed three central themes related to knowledge and scientific policy advice in times of crisis: the desirability of adaptive governance and advice, the importance of multidisciplinarity in advice and the monitoring of the boundaries of responsibility.

These crisis characteristics and themes complicate the work of scientific advisors but also offer them openings to configure their knowledge base and infrastructure in such a way that we are better prepared for disruptive crises in the future. That is not easy to achieve, however, because the problem of disruptive crises is that they arise unexpectedly and their nature is unknown, particularly in the initial stage. The challenge posed by such a predicted but at the same time unpredictable crisis is to ask and answer the question of how we can be well prepared.

On the basis of this essay we can at least provide part of an answer to this question. The desired preparedness can be achieved by building in the potential for adaptation, multidisciplinarity and distribution of responsibilities *now* in case another existential crisis arises *later*. The Netherlands was not unprepared for the COVID-19 pandemic; a crisis structure was in place and when the crisis struck all kinds of organizations and advisory councils were able to spring into action and scale up their activities. We were nevertheless caught off guard by the situation. By creating platforms and links on different levels outside times of crisis, we can ensure that a better organization is in place to assess incomplete and uncertain knowledge, and (sometimes unknown) interests, during times of crisis.

We have noted that fluidity is a key characteristic of crises. Some issues are more dominant, and others less dominant, depending on the type of crisis, i.e. acute, chronic or predicted. But we have also noted that the distinction between types of crisis is not rigid and may have political or normative overtones. The conference participants stressed that, precisely for that reason, scientific advisors need to proactively formulate questions that could become urgent at any time. These could include not only questions that help in identifying routes out of the crisis but also questions on the patterns of thought and communication deployed in a crisis and when these need to be adjusted.

Another suggestion concerned cooperation – or closer cooperation – between advisory bodies. Multidisciplinary policy advice provides more opportunities to analyse the different perspectives on values, interests and potential solutions. The aim is not to present a 'complete picture', but to present partly overlapping perspectives, which sometimes result in conflicting advice. This requires practice and experience. It would therefore be advisable to initiate a learning process for multidisciplinary cooperation in regular, cross-domain policy assignments. That will make it easier to access existing networks during a new crisis and provide experience of a multidisciplinary style of policy advice.

In practice it is difficult to adhere rigidly to the modernistic distribution, i.e. knowledge acquisition for scientists, knowledge synthesis and interpretation for scientific advisors and assessment of interests and decision-making for politicians. Politicians regularly hide behind scientific 'facts' and scientists do not always stay in ivory towers of complete objectivity. The distribution of responsibilities therefore relies not only on a clear delineation of advice but also on the transparency that scientific advisors maintain in their evaluation or normative assessment of knowledge and the explicit definition of the purpose of the advice.

More than previous crises, the coronavirus crisis has given us a glimpse into the development of scientific knowledge and the related advice. We have clearly seen the power and importance of scientific knowledge. An example is the rapid development of tests and vaccines. But we have also seen limitations, such as the persistent uncertainties, the unpredictability and the regular lack of clear advice on the action to take. This is clearly illustrated by the national differences in approaches to combating the (effects of the) coronavirus in the European Union (EU). At the same time, we have also witnessed and experienced the importance of the social component in combating the crisis. Without resilience, support and perspective, there is little benefit in scientific 'facts'.

A distribution of responsibilities in which both scientific knowledge and values are explicitly able and permitted to play an equal role could be a first step towards an anticipatory capability in times of crisis. In other words, scientific knowledge needs a welcoming context in which value is attributed to that knowledge. In other contexts, scientific knowledge alone will not be sufficiently persuasive, as can be seen from the presence of groups in the Netherlands and abroad who deny the reality of the coronavirus.

In order to be better prepared for a new crisis in the future, we must assume that another crisis will strike. Being prepared therefore means not only doing everything in our power to prevent a crisis, but also being aware that the next crisis will surely come. We cannot know

how, what and when, and that is precisely why the three lessons discussed here – adaptation, multidisciplinarity and distribution of responsibilities – are so important. They offer the prospect of coping better with that disruptive disaster. Precisely how we must do so is more a question of experimentation than of blueprints or bulky reports. Continuous evaluation and weighing of the required disciplines, their roles and tasks and the most appropriate interventions during a period characterized by uncertainty, unpredictability and fluidity is perhaps the main message that emerged from the conference on how to cope with new crises.

ENDNOTES

1 HLN (2019) 'Vrees voor SARS-uitbraak in China nadat mysterieuze longziekte opduikt', HLN.be, 31 December 2019.

2 RTL nieuws (2020) 'Mysterieuze longziekte lijkt nieuw virus', RTL nieuws, 9 January 2020.

3 Volkskrant, de (2020) 'Wuhan zit op slot en vol met angst: 'waar mensen bij elkaar komen is gevaar op besmetting', Leen Vervaeke, *de Volkskrant*, 24 January 2020.

4 Volkskrant, de (2021) 'Dat coronavirus? Niets om je zorgen over te maken, vond Nederland', Maarten Keulemans column, *de Volkskrant*, 19 April 2021.

5 See the analysis of Dutch newspaper reports in the first half of 2020 by Wilderom, Broërs and Van Rijsewijk (2021) 'Van geheimzinnig buitenlands virus naar binnenlands systemisch risico: een studie naar de veranderende frames over COVID-19', *Tijdschrift Sociologie* 2.

6 WHO (2020) *WHO Director-General's opening remarks at the media briefing on COVID-19*, 11 March 2020.

7 WHO Coronavirus (COVID-19) *Dashboard*. URL: https://covid19.who.int/. Visited on 13 May 2021.

8 Government of the Netherlands Coronavirus Dashboard. URL: https://coronadashboard.rijksoverheid.nl/landelijk/sterfte. Visited on 13 May 2021.

9 Haddon, C., T. Sasse and A. Nice (2020) *Science advice in a crisis,* Institute for Government, 18 December 2020; Allen, K., T. Buklijas, A. Chen et al. (2020) *Tracking global evidence-to-policy pathways in the coronavirus crisis: a preliminary report*, International Network for Government Science Advice, Auckland, New Zealand; Brauner, J.M., S. Mindermann, M. Sharma et al. (2020) 'Inferring the effectiveness of government interventions against COVID-19', *Science* 371(6531).

10 Global Health Security Index. URL: www.ghsindex.org (visited on 13 May 2021)

11 RIVM (2020) Landelijke advisering bij infectieziektedreiging en -crises, Bilthoven: National Institute for Public Health and the Environment.

12 Mishra, A.K. (1996) 'Organizational responses to crisis: The centrality of trust', pp. 261-287 in: R.M. Kramer and T.R. Tyler (Eds.) *Trust in organizations: Frontiers of theory and research*, SAGE Publications; Boin, A., M. Ekengren and M. Rhinard (2020) 'Hiding in plain sight: Conceptualizing the creeping crisis', *Risk, Hazards & Crisis in Public Policy* 11.2: 116-138.

13 Seabrooke, L. and E. Tsingou (2018) 'Europe's fast- and slow-burning crises', *Journal of European Public Policy* 26(3): 468-481; Hart, P. 't and A. Boin (2001) 'Between Crisis and Normalcy: The Long Shadow of Post-Crisis Politics', pp. 28-46 in U. Rosenthal, A. Boin, and L. C. Comfort (Eds.) (2001) *Managing Crises: Threats, Dilemmas, Opportunities*, Springfield, IL: Charles C. Thomas.

14 Sridar, D. (2020) 'COVID-19: what health experts could and could not predict', *Nature Medicine* 26(12): 1812.

15 RTL Nieuws (2020) 'Aanpak corona leidt tot ruzie en verdeeldheid in kabinet', RTL Nieuws, 9 November 2020.

16 Volkskrant, de (2020) 'Wie vormen dat RedTeam, dat burgemeester Halsema adviseert over mondkapjes en waarover premier Rutte het heeft?', Dion Mebius, for *de Volkskrant*, 30 September 2020. For more information on the UK Independent Scientific Advisory Group for Emergencies (SAGE), see: https://www.independentsage.org/.

17 Parliamentary Papers II 2017-2018, 29668, no. 48; Position paper: Luc Verhey, Council of State; Vink, Jos (2020) 'Het Nederlandse staatsnoodrecht. Wat te doen met de EHBO-trommel die niet op orde is?', *Nederlands Juristenblad* (8 May): 1308-1316.

18 Government of the Netherlands (2020) *Television address by Prime Minister Mark Rutte of the Netherlands*, Government.nl, 16 March 2020. URL: https://www.government.nl/documents/speeches/2020/03/16/television-address-by-prime-minister-mark-rutte-of-the-netherlands. Visited on 13 May 2021.

19 Latour, B. (2010) *The making of law: An ethnography of the Conseil d'Etat*, Cambridge: Polity Press.

20 Else, H. (2020) 'How a torrent of COVID science changed research publishing – in seven charts', *Nature* 588(7839): 553.

21 Quinn, T.J. et al. (2021) 'Following the science? Comparison of methodological and reporting quality of COVID-19 and other research from the first wave of the pandemic', BMC *Medicine* (2021) 19: 46.

22 See for example the various reports, memoranda and alerts issued by the Netherlands Institute for Social Research (SCP) on this subject. URL: https://www.scp.nl/onderwerpen/corona/samenleving. Visited on 13 May 2021.

23 Forman, R., R. Atun, M. McKee et al. (2020) '12 Lessons learned from the management of the coronavirus pandemic', *Health Policy* (2020): 577-580.

24 See for example the advice of the Group of Chief Scientific Advisors to the European Commission, https://ec.europa.eu/info/sites/default/files/research_and_innovation/groups/sam/jointopinion_improvingpandemicpreparednessandmanagement_november-2020.pdf

25 Van Reybrouck, D. (2013) *Against elections: the case for democracy*, London; Jasanoff, S. (2005) *Designs on nature: Science and democracy in Europe and the United States*, Princeton, NJ: Princeton University Press.

26 Beck, U. (1992) *Risk Society: Towards a New Modernity*, translated by M. Ritter, London: SAGE Publications.

27 Position paper: Ira Helsloot, Radboud University.

28 Government of the Netherlands (2021), Letterlijke tekst persconferentie minister-president Rutte en minister De Jonge (20 April 2021). URL: www.rijksoverheid.nl/documenten/mediateksten/2021/04/20/ letterlijke-tekst-persconferentie-minister-president-rutte-en-minister-de-jonge-20-april-2021. Visited on 13 May 2021.

29 The SER 'think tank corona crisis' was established in March 2020 to obtain and exchange knowledge on economic and societal developments and to identify issues and potential solutions. Besides social partners and SER members, a broad range of representatives from other (scientific) advisory councils and from ministries are part of the think tank (Source: www.ser.nl/nl/actueel/Nieuws/denktank-coronacrisis).

30 We have adhered to the chosen terms used during the conference. We draw no distinction here between interdisciplinary, transdisciplinary and multidisciplinary.

31 Mol, A. and A. Hardon (2020), 'What COVID-19 may teach us about interdisciplinarity', *BMJ Global Health* 2020, 5, e004375.

32 Callon, M., P. Lascoumes and Y. Barthe (2009) *Acting in an uncertain world: An essay on technical democracy*, Boston: MIT Press.

33 RV&S (2020) *Coronamoe(d). Essay by the Council of Public Health & Society*. URL: https://adviezen.raadrvs.nl/coronamoed. Visited on 13 May 2021.

34 See for example Bijker, W.E., R, Bal and R. Hendriks (2009) *Paradox of Scientific Authority. The role of scientific advice in democracies*, Boston: MIT Press.

35 Erasmus MC (2021). Opening van het Pandemic & Disaster Preparedness Center. Erasmus nieuws, 21 May 2021. URL: https://amazingerasmusmc.nl/actueel/opening-van-het-pandemic-disaster-preparedness-center/. Visited on 25 May 2021.

36 Position paper: Roel Coutinho, former director of the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM).

37 Key note: Pearl Dykstra, Erasmus University Rotterdam, former Deputy Chair of the European Commission's Group of Chief Scientific Advisors. Her lecture was based on the a joint report of the Group of Chief Scientific Advisors to the European Commission and the European Group on Ethics in Science and New Technologies (EGE) titled 'Improving pandemic Preparedness and management: Lessons learned and ways forward'.

38 Latour, B. (1993) *We have never been modern*, Cambridge: Harvard University Press.

39 Position paper: Arjen Boin, Leiden University & Crisisplan.

Acquiring, assessing and weighing

The use of knowledge in policy advice in times of crisis

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