Technology assessment and decision making under scientific uncertainty - lessons from the COVID-19 pandemic

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Technology assessment and decision making under scientific uncertainty - lessons from the COVID-19 pandemic

EPTA Report 2021

Rathenau Instituut

Teknologirådet

In memory of Melanie Peters,

director at the Rathenau Instituut from 2015 – 2021 and an inspiration to the EPTA network.

Contents

Preface

Distinguished reader,

The COVID-19 pandemic is an ongoing balancing act for politicians and policy makers. Balancing between firm decision-making on the one hand and taking the time to properly reflect on the available evidence on the other hand. And all of that with a fair amount of uncertainty on the effect of the measures that have far-reaching consequences for citizens. Citizens who voice their opinions, wishing to steer the course of action. Under those circumstances, how do politicians and policy makers keep a cool head, weighing different interests and doing justice to important societal values shared globally?

The COVID-19 pandemic was an eminent issue for members of the *European Parliamentary Technology Assessment* (EPTA) network, whose role it is to inform politicians and policy makers on the possible impact of science, technology and innovation on societies and their citizens. This network also follows the national public debates on science and technology and advises on how citizens can best be included in those debates.

How did EPTA institutes inform parliaments and societies during the COVID-19 pandemic? How did their activities pan out in the total array of advice given to governments and parliaments? What lessons can be drawn from the way policymaking around science and technology was done during the COVID-19 pandemic?

The EPTA network undertook a collaborative action to give answers to these questions. This joint report is the result of that action, and touches on issues of scientific uncertainty, political transparency, citizen participation and democratisation. It also points at the need for more adaptable and dynamic governance structures that incorporate citizens' rights and privacy.

Next to that, the network formulates points of attention for decision-making about science and technology in a world after COVID-19. These points address the dependencies and vulnerabilities of complex sociotechnical infrastructures, the challenge of responsible digitization of work, education and health, and the need for transnational collaboration. The outcomes of this report can be a starting point to improve interactions between science and technology, governments, politicians and society, including the role of technology assessment therein, in order to build more resilient societies and face future crises.

I would like to take this opportunity to thank all the EPTA members who contributed to this report. In particular, I would like to thank Sophie van Baalen, Rosanne Edelenbosch, Yayouk Willems, Petra Verhoef (Rathenau Instituut) and Anne Siri Koksrud Bekkelund, Joakim Valevatn, Jonas Engestøl Wettre & Tore Tennøe (Norwegian Board of Technology) for compiling the synthesis of the different member contributions.

I wish you a pleasant reading!

Drs. Jeroen Heres
Head of Science at the Rathenau Instituut, the organizing unit for the EPTA Presidency held by the Netherlands in 2021, The Hague, November 2021

About this report

The COVID-19 pandemic has been a crisis for health, economy and society. At the same time, it has acted like a pressure cooker for a range of developments in society, such as the acceleration of digitalisation of education, work, and our social lives. Moreover, it has underscored the importance and challenge of democratic and evidence-based political decision-making. Politicians had to deal with scientific uncertainty and normative issues, such as taking measures that have far-reaching consequences for citizens. Science, technology and innovation (STI) have played a crucial role in this crisis. How did governments in different countries respond to the COVID-19 pandemic, and how did they use STI to combat the crisis? What are the emerging issues that need to be dealt with in a post-COVID world? In this report, we address these questions.

This report results from a joint effort of members of the *European Parliamentary Technology Assessment* (EPTA) network. Technology Assessment (TA) explores the relationship between STI on the one hand, and society on the other. Members of the EPTA network are TA institutes from Europe and the rest of the world that inform parliaments and societies on the possible impact of STI on societies and their citizens. They provide information on how to protect public values in the process of STI developments and how to include citizens in the debates on STI. The EPTA network aims to strengthen the role of technology assessment in parliamentary decision-making and to establish links between different TA institutes worldwide. This year, EPTA members describe the events, responses, and governance of STI relating to the COVID-19 pandemic crisis in their own countries. Furthermore, they report how their institute supported the parliament in their country to deal with the crisis.

This report consists of the individual contribution of 18 EPTA members and associated members, giving their unique perspectives on the pivotal role of science and technology in dealing with the COVID-19 crisis.[1] In the introductory synthesis,[2] the country contributions have been analysed to find overarching themes, differences, and similarities in the approaches of the COVID-19 pandemic in different countries and the role of TA institutes. The country reports written by the EPTA institutes can be found as a supplement to the synthesis.

The report provides:

- An international overview of the events, responses, and governance of STI relating to the COVID-19 pandemic crisis, based on contributions from 16 countries (12 from Europe[3], 4 outside of Europe[4]), and two contributions from the EU as a whole[5];
- Insights into what politicians, policy-makers, and citizens can learn from STI deployment in different countries while dealing with the COVID-19 crisis;
- Emerging issues for societies in a post-COVID world related to STI and how TA institutes, together with others, can be of assistance in dealing with these issues.

[1] The template used by the countries for their individual contributions can be found in appendix 2.
[2] The EPTA contributions were synthesised by: Sophie van Baalen, Rosanne Edelenbosch, Yayouk Willems & Petra Verhoef (Rathenau Instituut), Anne Siri Koksrud Bekkelund, Joakim Valevatn, Jonas Engestøl Wettre & Tore Tennøe, (Norwegian Board of Technology).
[3] Austria, Finland, France, Germany, Greece, The Netherlands, Norway, Poland, Russia, Sweden, Switzerland, United Kingdom.
[4] Chile, The Republic of Korea, United States, Japan.
[5] European Parliament and Council of Europe.

Synthesis

1 The crucial role of technology and science in the COVID-19 pandemic

The COVID-19 crisis was not unprecedented. Pandemics are quite normal if we look at the history of modern humanity. There was the plague in the 1300s, the Spanish flu in the early 20th century and more recently the HIV, Ebola, and SARS pandemics. As long as people and goods travel, so will diseases. However, as a crisis, the COVID-19 pandemic is different from the latest global crises and threats, such as the financial crisis or global terrorism. This is because it is a crisis with broad implications for all parts of our lives and societies, from our mental health to the global supply chains of many products.

There is another aspect of the crisis that distinguishes it from most previous crises: the crucial role that scientific evidence and technology have played to prevent or even stop the coronavirus from spreading, and to cope with the strict measures that have been put in place to reduce physical contact. This characteristic in particular makes the COVID-19 crisis an essential case for members of the EPTA network, whose role it is to inform and advise parliaments on the interrelationships between science, technology and innovation (STI) and society.

In this chapter, after providing a general overview of the impact of the pandemic in section 1.1 based on general literature and information from the country reports from EPTA members, we examine how STI were used to mitigate the COVID-19 threat (section 1.2) and to cope with the consequences of measures taken (section 1.3).

1.1 COVID-19: A multifaceted crisis

The COVID-19 pandemic is a multifaceted crisis – yet, it is most prominently **a health crisis**. There have been more than 4.3 million deaths and 202 million cases of COVID-19 confirmed globally until 10 August 2021.[1] Life years lost to the disease are highest in high-income countries, reflecting the longer life expectancy of these countries.[2]

The health effects of the pandemic are not limited to the effects of the coronavirus alone. The pandemic has, for example, led to a backlog in other health services. Surgeries, cancer treatment, and health research have been postponed due to resources being pulled towards treating COVID-19 patients or studying the spreading of the virus. Several EPTA members (STOA[3], Sweden, Netherlands, France, Poland and the UK) mention that a health backlog has built up in their countries.

The pandemic has also taken a toll on mental health. The OECD reports that COVID-19 and its consequences has led to "a significant and unprecedented worsening of population mental health".[4] Finland reports an increase of 30 percent in calls to mental health helplines and a rise in calls regarding domestic violence.

Both the disease itself and the countermeasures have made COVID-19 an **economic crisis** as well. The global economy contracted by 3.3 percent in 2020.[5] Across the EU, the Gross Domestic Product (GDP) fell by 13.9 percent in the second quarter of 2020, compared to the same quarter in 2019. Many countries have experienced significant increases in unemployment rates. EPTA members are among those: in Sweden, the unemployment rate was 10.3 percent in June 2021, compared to 6.4 percent in June 2019.

[1] https://covid19.who.int/, all webpages were last accessed on 2-11-2021
[2] https://www.imf.org/external/pubs/ft/fandd/2021/06/inequality-and-covid-19-ferreira.htm
[3] STOA: The Panel for the Future of Science and Technology of the European Parliament.
[4] OECD (2021): https://www.oecd.org/coronavirus/policy-responses/tackling-the-mental-health-impact-of-the-covid-19-crisis-an-integrated-whole-of-society-response-0ccafa0b
[5] IMF (2021) World Economic Outlook April 2021

Other countries have seen only a slight increase in unemployment rates, such as the Netherlands: from 2.9 before the crisis to 3.4 percent in May 2021.

Economic recovery seems to be on its way: the International Monetary Fund (IMF) projects the global economy to grow at 6 percent in 2021 and 4.4 percent in 2022.[6] Nevertheless, the pandemic will have a lasting negative economic impact, particularly on specific groups, such as women, youth, and lower educated workers. The IMF expects income inequality to increase, and 95 million more people to fall into extreme poverty, compared to pre-pandemic projections. The United Nations World Food Programme (UNWFP) estimates that 270.5 million people are now in a situation of acute food insecurity or at high risk of facing it, compared to 150 million people before the pandemic.[7]

Most EPTA members point to the political decision to offer financial support (or loans) to businesses or specific economic sectors. This has been a fundamental reason that mass unemployment was avoided, and a relatively quick economic recovery was possible. However the future economy seems more uncertain. For example, in the Netherlands, “experts fear a 'calm before the storm', as economic and social consequences could arise when government support ends.” In France, the “effort taken on by the State might weigh heavily on public finances and accentuate the unfavourable position of France, which is already highly indebted, in the Eurozone”. It remains to be seen what the long-term economic effects of the COVID-19 crisis will be and whether even countries that fared well economically will face a backlash. It is, however, evident that the COVID-19 has increased the uncertainty about future economic developments.

The pandemic was, and still is, also a **social crisis**. Strict lockdowns, school closures, and limited visits to nursing homes have increased polarisation and opposition between generations and societal groups in many countries. This holds especially true in countries with pre-existing weaknesses such as a weak public health care system, socio-economic inequalities, political divisions, or lack of trust in government.[8]

People with a lower socioeconomic status have, in general, been hit harder by the virus itself, as well as by countermeasures and general economic decline. For example, the report provided by France underlines that people with a low level of qualification or social integration have been affected more by a decline in the labour market. In Sweden, the closure of schools is likely to have had a more severe effect on children and youth from disadvantaged environments with a weak socio-economic background and an inadequate social safety net. Chile reports that “distance learning […] deepened the existing learning gaps” due to the “diverse social reality of our country: no or bad internet connection in some areas; varied socio-economic conditions of households and schools and the kind of different types of instructions being provided.” Not all children returned to school in Chile after the school closures. Different EPTA members fear that the rapid digitalisation of many aspects of society (work, education, and health care) has also increased socio-economic inequality.

Many countries reported that the hospitality industry, and cultural and creative sectors have been hardest hit. At the same time, as STOA writes, “the pandemic has also created opportunities for certain segments of the economy, as consumers and businesses have radically changed their behaviours.” In Poland, for example, a sharp increase in e-commerce was observed. Other positive effects were also perceived in Poland. There was an accelerated increase of access to (broadband) internet, improved road safety, and less air and noise pollution.

[6] IMF (2021) World Economic Outlook April 2021
[7] World Food Programma (2021) WFP Global Operational Response Plan 2021 Update #2, June 2021
[8] Jasanoff et al. (2021) Comparative Covid Response: Crisis, Knowledge, Politics

1.2 Mitigation: Using science and technology against the pandemic

Even though other coronaviruses that are similar to SARS-CoV-2 have circulated before, the current virus is a relatively novel threat to humans. When it first started spreading, there were many unknowns, such as how contagious the virus would be, how many people would fall ill and/or die from contracting the virus, which groups it would affect the hardest, and what treatments would be the most effective. As the virus spread across the globe, it was essential to gain and share knowledge and evidence about the virus itself, and about its effects and the countermeasures that could stop it from spreading so quickly.

The goal of "flattening the curve", to avoid overwhelming health services, became a global mantra. Of course, the ultimate goal was to develop vaccines against the virus and effective treatment against the COVID-19 disease. But until drugs were available, politicians had to rely on other measures to stop the virus from spreading. The measures put in place were mostly familiar ones to the fields of virology and public health (although never implemented on such a large scale), like keeping distance, wearing a mask, and rules for testing, isolation and quarantine, the closing of borders, schools, workplaces, and businesses, and curfews. There were also new ones, like digital contact tracing or infection status certificates to allow entry into a bar or a country. Both traditional and new measures had to be weighed against their harmful side effects on society, including the economy, education, freedom of movement and assembly, and mental health.

Vaccines and biotechnology

Vaccines against COVID-19 were developed at record-breaking speed. Coordinated efforts by international structures set up before the COVID-19 pandemic, such as the Coalition for Epidemic Preparedness and Innovation (CEPI) and the World Health Organization (WHO) R&D Blueprint, contributed to the rapid development of vaccines.[9] The European Medicines Agency (EMA) approved the first vaccines for emergency usage in December 2020. As of August 2021, 15 vaccines are in use worldwide, 110 are in clinical development, and 184 are in pre-clinical development.[10]

Several EPTA members report the efforts of researchers in their countries to contribute to the development of vaccines, medication, and other biotechnology. Both Austria and Poland report about the invention of new types of tests for detecting the virus. In France (among other countries), wastewater analysis was employed to monitor the spread of the virus. The Netherlands is home to companies that have been crucial for vaccine development, like Janssen. Russia has developed several COVID-19 vaccines, of which Sputnik-V is the most famous. STOA has evaluated the use of technologies, such as gene editing, synthetic biology, and nanotechnologies to prepare and test future vaccines, treatments, and diagnostics.

On a global scale, the *equitable distribution* of vaccines has proven harder than their rapid development.[11] On average, middle- and lower-income countries have had less access to COVID-19 vaccines.[12] Vaccination rates stood at 61.51 percent in high-income countries, compared to 3.31 percent in the middle- and low-income countries as of 22 September 2021.[13]

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[9] The Independent Panel for Pandemic Preparedness & Response (2021) *How an outbreak became a pandemic- the defining moments of the COVID-19 pandemic.*
[10] WHO Covid-19 vaccine tracker. https://www.who.int/publications/m/item/draft-landscape-of-covid-19-candidate-vaccines
[11] WHO coronavirus (covid-19) dashboard. https://covid19.who.int/
[12] https://www.economist.com/science-and-technology/2021/04/22/american-export-controls-threaten-to-hinder-global-vaccine-production
[13] UNDP Covid-19 Global Dashboard for Vaccine Equity. https://data.undp.org/vaccine-equity/

Digital contact tracing

In most EPTA member countries, contact tracing apps were developed and deployed early in the pandemic. Contact tracing apps met resistance by the public and by experts due to privacy and data security issues. The trust in the apps and usage of them have varied considerably among European countries: only 0.8 percent of the Hungarian population uses the national contact tracing app. In comparison, 49 percent uses it in Ireland. In the US, contact tracing apps are used in approximately half of the states and territories. Many countries point to privacy concerns. Furthermore, data security is so strongly protected by law that the possibility of use of the apps is somewhat limited. Moreover, data collection, to inform authorities, is very restricted. As a result, it is difficult to analyse the effect of these apps on the control of the spread of the coronavirus.

Unlike most EPTA member countries, the Republic of Korea utilised ICT in many different domains to respond to the COVID-19 crisis. For example, by promptly developing AI-based testing kits and tracing and monitoring confirmed patients with GPS and credit card statements. Furthermore, by managing and monitoring patients and people confirmed positive for the disease via mobile apps and CCTV. In addition, the Republic of Korea's government has taken preventive measures in the fight against the disease via a smart quarantine system. This enables authorities to efficiently check extensive information of travellers entering the Republic of Korea via a third country. It links passport information, countries of visit, information of inbound travellers, and data usage of international roaming services by telecom companies all together.

Digital COVID-19 certificates

The successful development of a joint EU certificate to prove COVID status is unique from a global perspective. The certificate was developed to support mobility across borders for people who can proof a negative infection status (full vaccination, negative test result, or proof of immunisation). However, it has also been met with scepticism. In contrast to the contact tracing app, the Netherlands reports that the infection status certificate or 'passport' was introduced quickly, without time for societal debate. Moreover, it was introduced under pressure from the House of Representatives, following European agreements.

In the UK, the government decided not to adopt vaccine certificates. Since the UK is no longer a member of the EU, the introduction of the EU certificate was not obligatory for the country. Hence, it is not available to most British people. In the US, digital vaccine credentials have been used in a handful of states. Some cities and businesses have also required the use of these digital health credentials for access to restaurants, sports arenas, and other facilities.

1.3 Adaptation: Technology to enable social distancing

Technology was not only used to prevent infections directly. Perhaps most prominently, it was used to help society cope with the measures to keep people physically apart. Obviously, many of the measures, such as home office, home schooling and lockdowns, would have been much more challenging, if not impossible, to implement had there not been digital tools that enabled the continuation of these activities from a distance.

Digitalisation everywhere

As schools, workplaces, public transport, and other public services closed down physically, digital tools allowed us to continue many activities. For many people, remote work has become 'the new normal'. However, there is a divide between those who can work

remotely and those who cannot or those who have well-equipped homes for digital home schooling and those who do not.

Digital appointments with health care professionals have also become more widespread. In Norway, e-consultation constituted 3 percent of all doctor's appointments in January 2020. In April 2020, 40 percent of consultations were digital, and in October of that same year, the number was still as high as 24 percent. In Germany, only 6 percent of doctors offered video consultations online in 2019, increasing to 20 percent in 2020.

Micromobility and new habits for travelling

EPTA members also report a significant effect of the pandemic on how we travel. Most countries have experienced a sharp decrease in the use of public transport. In Vienna, for example, public transport dropped from 54 percent of total transportation to 2 percent during the first lockdown. Poland reports an 80 percent drop during the total lockdown. In Norway, the use of new, individual mobility services such as car-sharing and electric scooters (collectively called 'micromobility') has grown in the first quarter of 2021, compared to 2020.

While public transport is recovering, it has not returned to pre-pandemic levels, and some local connections have been suspended. In Norway's capital, Oslo, public transport has only returned to about 70 percent of pre-pandemic levels, even though practically all restrictions have been lifted. In Poland, some public transport connections that were suspended due to the pandemic have not yet been restored. Depending on the availability of public transportation and other means of transportations, and the distancing policies of different governments, the COVID-19 pandemic could mean a longer-lasting shift in travel habits. This applies to both the frequency of travel as well as the way people travel.

Innovative efforts to mobilise knowledge and gain insights

The COVID-19 pandemic has been an unprecedented digital experiment, and some countries have used the opportunity to support new innovations.

In some EPTA member countries, comprehensive digital COVID solutions for inhabitants have been developed. In France, for example, one app combines many functions, such as contact tracing, vaccination status, the green certificate required for entering public spaces, information about the disease and about countermeasures, statistics on the epidemic at national and local level, the possibility of downloading the pre-filled certificate for lockdown and curfew, and a map of testing and vaccination centres.

In the UK, the research community has also innovated to collect health data about the pandemic from citizens. The ZOE COVID study deployed a smartphone app to report symptoms, test results, and vaccination status. The app's data and research have been shared with scientific advisory committees, governments, and health systems across the UK. Insights include changing patterns of infections, emerging COVID-19 hotspots, and the impact of immunisation on the pandemic. The app's success has led the research team behind it to expand the scope of data collection to collect information about a wider group of infectious diseases.

The Republic of Korea's government provides various datasets (such as public mask sales data and national and international confirmed cases) to local government websites and the open data portal. The open data portal has gained public interest. IT engineers and the general public utilise the data and the data have been shared nationally and globally. For example, private sector developers such as civic hackers and start-ups, or communities of developers have used open government data. This has enabled them to launch an application and web services that help the public find screening centres.

2 Challenges and opportunities for parliamentary technology assessment

When the COVID-19 pandemic struck, politicians were confronted with decisions on a vast array of scientific and (bio)technological solutions to meet the crisis. Their decisions had to be made under time pressure and great uncertainty in many aspects. Establishing a sound basis for decision-making had to be partially improvised.

Since the COVID-19 pandemic was a relatively novel threat, most countries were underprepared. In the initial phase, when countries were in a crisis mode, there was a firm reliance on scientific experts to guide policy-makers on their next action. Parliaments and regional governments were often side-lined, and much power was granted to the institutions or committees providing science advice directly to the ministries.

2.1 Science and technology advice became crucial in the crisis

To handle the surge in the need for rapid scientific advice, many countries — such as Austria, Switzerland, France, Germany, Chile, and the Netherlands — set up a specific "task force" to regularly inform and advise the government and parliament about COVID-19 related measures. This came on top of institutes that were already advising on public health and other medical issues such as vaccination.

Governments granted these COVID-specific committees the authority to provide science advice, giving them a strong position to influence decision-making. Experts that were not part of the committees had to resort to other channels, such as media, parliament, or even protests, to voice their views.

Initially, the experts consulted were mainly (bio)medical scientists, such as virologists, pulmonologists, and epidemiologists, as reported by Austria, Germany Netherlands and Chile. Some countries, such as Norway, France, Sweden, Finland, and the European Parliament, report that experts from other fields, such as social sciences, economics and humanities, were also included in official advisory bodies or committees early on.

After the direct threat of the first wave of infections waned, the debate within most countries opened up. Experts from a wider field, and voices from other parts of society, such as NGOs, businesses, and laypeople, engaged in the public debate, and parliaments became more involved in the decision-making process. This led to a more politicised, or even polarised, but also a more diverse public debate.

This state of affairs also impacted the work of EPTA institutes, depending on their institutional arrangements. While some EPTA institutes were included in the "official" science and technology advice system, others, like the ITA and the Rathenau Instituut, were not, leaving it up to their initiative to contribute their expertise on the relationship between science and technology and society.

An important challenge for governments, scientists and technology assessment moving forward, is to optimally organize and facilitate advice on technology and science in times of urgency and crisis. How can governments balance the need for rapid advice and immediate action, while at the same time including diverse perspectives in decision making? How can parliaments best be involved in decision making? How do we keep or rebuild trust in authorities, and how do we best prepare society for the next crisis?

The EPTA institutes could contribute to answering some of these questions, by building on their experience with democratic control of STI and their profound knowledge of the relationship between science, politics, and society. In the next sections, we take a closer

look at the challenges reported by the contributing EPTA member countries regarding technology assessment, and several examples of how they have been met.

2.2 Technology assessment in real time

When a highly contagious and dangerous virus starts spreading, time is of the essence. Decisions must be made in real-time. Not to decide, or to wait, is also a decision with potentially harmful side effects. It is a balancing game between action on the one hand, and reflection on the other.

This does not necessarily fit well with the scientific process, where hypotheses are formulated, data are carefully collected, evidence is interpreted, and different conclusions may be drawn. Hence, expert views on a topic may vary widely, and arguments are met with counterarguments. Over time, enough evidence may have been collected to reach a scientific consensus. However, this process can be painstakingly slow. Sometimes, decisions must be made fast, with minimal information, and they can play out differently than expected.

A challenge for governments and bodies providing science advice, including the EPTA institutes, is to find a balance between reflection – on the available evidence and the possible consequences for society – and action.

The EPTA members have a wide range of institutional arrangements for supporting their countries' parliaments. They have dealt with this challenge differently. Some EPTA members, such as ERS (Sweden), TA-Swiss (Switzerland), and TAB (Germany), leaned more towards reflection. They did not consider it their task to get directly involved in the policy discussion during the crises.

Other members have launched initiatives to help politicians clarify scientific information or advice. Some examples of these initiatives are listed below.

Rapid Response Briefs

Several members have written short and timely briefings about COVID-related technology or scientific questions.

- POST in the UK developed "Rapid response" publications, which were produced and released in days instead of months. Here, POST dissects and explains the research and scientific evidence underpinning the models and reports that inform COVID-19 policies. So far, POST have produced around 60 such reports.
- The NBT in Norway and the Rathenau Instituut in the Netherlands launched several short briefings on COVID-related topics to their parliaments. The NBT reported and briefed parliament on digital contact tracing, COVID certificates, and on the anticipated legacy of COVID-19. The Rathenau Instituut sent messages to parliament about vaccine distribution, digital contact tracing, and the need for open and inclusive debates about COVID-19-technologies.
- The GAO in the US produced a series of "Science and Tech Spotlight" reports, 2-pager descriptions of the opportunities and challenges of emerging S&T developments, on digital vaccine credentials, herd immunity, digital contact tracing, among others.

Parliament asks

In Finland, the Committee for the Future compiled a list of questions their members wanted answers to – about measures to control the pandemic, impact on social structures and crisis resilience, education, and the economy – and circulated these directly to a wider

research community of experts. As responses came in, policy-makers learned from many different perspectives, including critical ones. A follow-up initiative, developed to assemble collective statements on policy-issues from experts, compiled 300 pages worth of statement material for immediate use for the Committee. The Committee continued by singling out 20 experts to provide slightly more comprehensive reports, which were finally compiled into one lager report.

2.3 Transparency and public trust

In the face of an omnipresent threat, it can be difficult for governments to take the time, and the chance, to listen to sources outside their closest advisors. When it is of great importance that everybody follows the rules, it can also seem counter-intuitive to be open about the uncertainty that underlies all decisions.

However, political decisions cannot be based on scientific evidence alone; other political, social, economic, legal, and moral considerations also play a role. This has also been the case during the COVID-19 pandemic. Anti-COVID-19 measures, such as lockdowns, social distancing, or the introduction of tracing apps generally had broader impacts than mitigating the spread of the virus, such as social isolation and an increased demand of health services. To decide on such measures, policy makers must also weigh different values and interests. In most cases, however, this was not communicated clearly and transparently to the broader public. Policy-makers often referred to scientific evidence or experts to substantiate their decisions, without acknowledging the role of other considerations in the choices made.

Consequently, in Switzerland, “there was talk of an unworldly expertocracy”. An ITA researcher called the phenomenon “the epistemisation of politics.” Put differently, political decision-making, for a while, seemed to be exclusively based on scientific evidence, without openly paying attention to the other considerations that (should) also play a role in political decision-making. This may damage trust in measures.

Citizens came to learn about the scientific process and the evaluation of scientific research. As TAB (Germany) writes: “The way scientific evidence influences political decision-making has come under the magnifying glass by the pandemic crisis.” Sometimes this resulted in instability in political decision-making and public polarisation. In some countries, measures to mitigate the spread of the coronavirus have been strongly opposed, and trust in COVID-19 vaccines remains low. But the debates about science in the media has also contributed to more mature debates about the relationship between science and politics

A challenge faced by politicians and decision-makers was thus to be transparent and open about where scientific advice ends, and politics begins, or what political or other considerations have influenced the decisions. Not taking citizens' concerns seriously, or keeping them out of the public debate, may fuel the spread of misinformation. Furthermore, it may lead to polarisation and a decline in trust in vital institutions such as politics, science, and the media.

EPTA institutes can help by clarifying which public values and interests are fostered or put under pressure by specific applications of STI within society. This enables policymakers to be more aware of such considerations, communicate them clearly with the public, and/or include a more comprehensive set of considerations, from more sources, in their decisions. Moreover, many EPTA institutes are specifically skilled at including the public in discussions concerning STI. Below are some examples of how EPTA institutes have been able to do so during the COVID-19 pandemic.

Public, digital meetings in Parliament

- The NBT in Norway has arranged digital, public meetings where both parliamentarians and technical experts participated in the panel debates. The debates have been followed by open Q&A sessions with the audience.
- In France, the OPECST also organised nine public hearings of scientists by parliamentarians, with the possibility for the public to ask questions over the internet.

A direct channel for researchers to Parliament

In the UK, POST surveyed more than 1100 experts, who shared what kind of data or information they would like the government to release to understand more about the COVID-19 crisis and the government's response.

Crowdsourcing of science advice

In some countries, governments invited the public to participate in innovation processes, and even to give direct advice:

- The Norwegian Health Directorate administered an open Slack[14] channel for feedback from experts and public alike on the second version of the COVID-19 contact tracing app after the first one was discontinued. Anyone could ask questions, raise concerns, or give direct feedback on technical, legal, ethical, or other aspects. The model proved valuable, and was also used in the development of the Norwegian COVID (vaccine) certificate
- The German government arranged a 'hackathon' to develop digital innovations and solutions to help meet the challenges of the COVID crisis. Around 28.000 people participated. The hackathon produced a chatbot for children in emergency situations and solutions for digital streaming of music and theatre ensembles. A follow-up hackathon called "Update Deutschland", was later organised.
- The Netherlands also arranged hackathons. Seven pilot contact tracing apps were presented, and panels and the public were invited to ask questions and give comments on the proposals. The public criticized this process for carelessness, as many of the solutions did not have enough security and privacy safeguards. The government then restarted the process to develop an open-source, in-house app. Two task forces guided this process, one with coronavirus expertise and one with expertise in behavioural science. Two citizen panels contributed to an ethical analysis.

Inclusion of views from citizens, civil society, and industry

In a few countries, views and advice from citizens, civil society, and industry to governments and parliaments were formalised.

- France had a "citizens' council on vaccination," and the views of civil society were also expressed through the "economic, social and environmental council" (mostly on vaccination against COVID-19).
- In Finland, the "exit strategy and aftercare working group" also heard representatives of business, communities, and NGOs.
- In Austria, the national vaccination board also included civil servants.

[14]Slack is a digital collaboration tool for business and organisations (www.slack.com)

- In the Netherlands, another initiative was a “societal dialogue” in which citizens, companies and civil organisations, scientists, and local administrators discussed the recovery and transformation of the country after the COVID-19 crisis.

Independent evaluations of how the pandemic was handled

Governments and parliaments should learn from crises, and prepare for the next one. In Norway, the “Corona Commission” was appointed by the government already in April 2020. Its mandate is to carry out investigations and compile information about how the pandemic has been handled.

Combating misinformation

The European Science-Media Hub (ESMH) is a unit in STOA that publishes reliable, science-based information. The ESMH started a project called ‘Tackling the Infodemic’, putting together a list of relevant initiatives tackling the enormous spread of false information on various aspects of the health crisis. In addition, it regularly publishes interviews with experts on misinformation and some thematic news articles.

2.4 Preparing for the unknown: Anticipatory governance

Before the COVID-19 crisis, governments and politicians were warned about the high probability of a pandemic. In several countries, such as Norway[15] and the US[16], government bodies had even carried out scenario exercises specifically on what would happen in a pandemic[17]. A pandemic was recognised as a likely threat.

Yet, governments, in general, did not act upon this knowledge. A challenge for the future is to limit the extent to which countries are reliant on ad-hoc crisis management to confront and deal with future crises, like climate change, or perhaps the next pandemic. This means that governance structures need to be more adaptable and dynamic. At the same time, it is crucial that such governance and legislation do not infringe on citizens' rights and privacy.

In the future, the field of foresight, including scenario analyses, horizon scans, and other forward-looking techniques, could play a more critical role in making governments and countries better at anticipating the future — and acting upon this knowledge. Several EPTA members have given suggestions as to how to take on this challenge, and below are some examples from the country reports.

A crisis radar to see what might hit us next

In Germany, the Bundestag asked the TAB to carry out a project called “Crisis Radar – Improving the resilience of society, politics, and economy through crisis forecasting.” This TA project aims to investigate how a continuous and forward-looking crisis radar should be set up and institutionalised to enable early crisis warning and risk management. In the Republic of Korea, the NAFI held seminars with lawmakers to forecast social changes after COVID-19 and discuss countermeasures.

Horizon scans to put the spotlight on the political debates for tomorrow

Horizon scans were used as a tool by several countries to discover the most important post-COVID trends and debates:

[15] https://www.dsb.no/globalassets/dokumenter/rapporter/p1808779_aks_2018.cleaned.pdf
[16] https://www.nytimes.com/2020/03/19/us/politics/trump-coronavirus-outbreak.html
[17] https://www.bbk.bund.de/DE/Themen/Krisenmanagement/LUEKEX/_documents/art-luekex07.html

- In Finland, the Committee of the Future in a line of reports assessed how leading international foresight reports presented the possibility of a pandemic was presented and what other yet-unrealised risks these reports highlight.
- In Norway, the NBT compiled a horizon scan/trend report on the lasting effects of the COVID-19 pandemic.

Scenario analyses to imagine different futures

At the European Parliament, STOA has a solid commitment to using foresight for policy-makers. One of their formats is the “What-if”-briefings. These dense scenario reports have been applied to both COVID-related and other topics to help politicians imagine a broader range of future developments.

3 Looking forward: Emerging issues in a post-COVID world

The previous sections demonstrate how the global COVID-19 pandemic has affected the interrelationship between science (systems), technology, government, politics, industry, and citizens. The pandemic can be viewed as a "pressure cooker" experiment to use digital technology, and the link between science and policy making has also come under a societal magnifying glass. This momentum created by the pandemic can therefore serve as an opportunity to rethink how TA institutes can facilitate political decision-making, both institutionally and procedurally, in a post-COVID world.

The following challenges are synthesised from lessons for the future articulated by individual EPTA-members in their contributions.

3.1 Inclusive, fair, and sustainable digitalization in the future

Digitalisation has made many aspects of our lives easier in times of strict COVID-19 measures. Policymakers, employers, and the public are adapting new and more ecologically sustainable forms of social and work practice. At the same time, the past year's growing inequalities in education and the option to work from home demonstrate that digitalisation does not necessarily lead to a more inclusive society.

Societies should aim to stimulate the kind of digitalisation that is a force to safeguard social structures and cohesion, and not a rupturing one. They should promote more profound social relationships and contacts online and offline, improve the quality of care and education, and make public administration more accessible to citizens, instead of less. The even distribution of access to the Internet, computer equipment and digital skills across societies requires proactive governance. Meanwhile, negative impacts of rapid digitalisation, like enhanced infrastructural vulnerabilities (such as cyberattacks), social isolation, and exclusion, must be highlighted, researched, discussed, and prevented.

During the pandemic, the urgency of the crisis has put discussions about socially responsible digitalisation on the back burner. Big tech companies are gaining more and more power and influence and the negative and sometimes polarising effects of digitalisation become increasingly visible. Hence, the question of how digitalisation should impact societies long-term needs to be placed more prominently on the political agenda. The challenge that lies ahead of us is to fuel the development and use of those types of digitalisation that contribute to more resilient, inclusive, fair, and sustainable societies.

3.2 The telework revolution

For many people, work has moved to their homes during the pandemic. We have seen that the implications of this development are broad. First, telework transforms the home into a workplace, which enhances the need for distributed IT security and quality-checked electronic equipment in people's homes. Second, the workplace is transformed into a distributed network of nodes working remotely. This development raises questions of what appropriate post-COVID legislation in the field of work would be. What are employers' and employees' rights? Can employers demand to prove a negative infection status if employees cannot work from home? How can we prevent socioeconomic differences, and who has access to comfortable and convenient telework conditions?

Telework also raises broader economic, environmental, and societal questions, like: How should our cities be designed? What is a necessary business trip? What is the function of work and what kind of function should it maintain in our societies – that of socialisation, production, community – or a combination of those?

The pandemic has created room to discuss which combinations of physical and virtual arrangements are optimal. Similar issues also apply to other practices that have increased digitalisation, such as healthcare and education. A significant challenge our societies now face is to integrate telework as a key feature of contemporary life in an inclusive, responsible, and holistic way.

3.3 Building societal resilience to crisis

The pandemic disclosed deficits and holes in preparedness routines and systems of states. The flip side of an efficient healthcare system with just-in-time deliveries and lean staffing levels is a lack of a buffer zone. This leads to emergencies, undesirable measures, and unwanted dependencies on, for example, commercial parties. An essential aspect of this vulnerability can be observed in our global supply chains.

This calls for transnational discussions about how to bolster and ensure the resilience of those chains in times of crisis. From both an EU and international perspective, this includes access to vaccines. Furthermore, an essential aspect of this discussion is the fair distribution of supplies worldwide. Moreover, the lessons learned from vaccines' development, distribution, and governance may help govern other transnational political issues. Such as transitioning to a green economy and avoiding the climate crisis.

Parliaments of EPTA member countries can take the lead to initiate the discussion regarding these transnational political issues, supported by TA institutes and the existing international EPTA network.

3.4 Assessing the vulnerability of complex societies

Another pressing topic is the vulnerability of complex sociotechnical infrastructures. In the last two years we have seen a digital leap, and paid more attention to climate change and the vulnerability of global supply chains. Furthermore, we have become more aware of the way technology, medicine, economics, digitalisation, and society are interwoven.

The field of TA can contribute to enlightening the dependencies and vulnerabilities of complex infrastructures and the digitalisation of many aspects of society moving forward. This calls for further discussions on exactly how to do this and what to focus on. This is especially important, because different perceptions of what is politically feasible have changed during the pandemic. These views are present in the minds of the public, scientists, and politicians themselves as well, because of the far-reaching measures they were able to take to tackle the coronavirus.

EPTA-members should find ways to reflect these changing perceptions of what is politically feasible to achieve with the help of technology, and include them in future analyses and considerations.

3.5 Health data sharing and European cooperation

How can efficient and secure sharing of health data across EU borders be assured in times of crisis? Data sharing has become integral to precaution and health governance, and the pandemic has seen a further leap forward in health digitalisation such as teleconsultations. Artificial intelligence is already playing an increasingly important role in efficient disease prediction.

STOA argues that the quest to find efficient ways to share health data across the EU is “likely to be the most lasting change at the level of EU governance as a result of the pandemic”. The French Parliamentary Office for Evaluation of Scientific and Technological Assessment (OPECST) illustrates this with the attempt of expansion of the French clinical

trial “Discovery” to various European countries. They came up against several obstacles, including in the first place the regulatory specificities of each country.

The creation of the Health Emergency Response Authority (HERA), modelled on the US Biomedical Advanced Research and Development Authority (BARDA), should improve prevention, detection and rapid response to cross-border health emergencies**.** Meanwhile, questions about how to ensure national data sovereignty in this landscape remain. The EPTA network can play a role by assessing governance systems that allows transnational analysis of health data for public health purposes while safeguarding citizens’ rights, such as privacy and autonomy regarding who can use their data, and for which goals.

3.6 How to live with COVID in the long run

The COVID-19 pandemic is not over yet.[18] New variants of SARS-CoV-2 keep emerging, some of which might transmit more easily, prove resistant to protective measures like vaccines, or cause more severe illness.[19] A Public Health England (PHE) study from June 2021 declared the Delta variant, which caused a significant outbreak in India in April 2021[20], more than twice as transmissible as the original variant.[21]

Therefore, countries must sustain their efforts to contain, prevent and treat COVID-19. Furthermore, policies should stimulate new technological and therapeutic methods to combat the virus. EPTA institutes can remain attentive by informing or advising governments on how such new technological and therapeutic methods will have an impact on societies and their citizens. In addition, they can include societal perspectives in the development and assessment of STI.

[18] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(21)00424-4/fulltext
[19] https://www.cdc.gov/coronavirus/2019-ncov/variants/variant.html
[20] https://www.nature.com/articles/d41586-021-01059-y
[21] https://www.economist.com/graphic-detail/2021/06/29/delta-is-fast-becoming-the-worlds-dominant-strain-of-sars-cov-2

4 Conclusion

The COVID-19 crisis has been distinguished by the crucial role of science and technology in both mitigating the pandemic and adapting to it. It has required solutions that involve many parties such as governments, politicians, researchers, civil servants and citizens, often across borders. In times of crisis, the urgency of the matter requires politicians and policymakers to make decisions under uncertainty and time constraints. However, politicians and policymakers must strive to take the societal consequences of the measures into account. Therefore, it is crucial to continue to have a broad scientific and societal perspective in the process of decision-making.

TA institutes can support this, by analysing the relationships between STI, politics, and society, and by facilitating interactions between scientists, politicians, and citizens. The outcomes and recommendations can be a starting point to come to grips with future crises of this kind. TA institutes should aim to play a vital role in providing timely, balanced, comprehensive and independent information on how to deal with science and technology issues in an appropriate way in the future.

Country reports

Introduction to the country reports

This report provides an international overview of the events, responses, and governance of STI relating to the COVID-19 pandemic crisis, based on contributions from 16 countries[1], and two contributions from the EU as a whole[2]. The contributing members each provided their unique perspectives on the pivotal role of science and technology in dealing with the COVID-19 crisis, with the help of a common template.

The country reports were written in the summer of 2021 (July, August and September). Although most countries have since updated their report, due to the rapid developments regarding COVID-19 not all information is up to date or synchronous at the time of publishing (November 2021). To provide some grounds for comparing the COVID situation in different countries, the two graphs below give an overview of related deaths and the share of the population fully vaccinated, based on recent publically available numbers. Per country we also have included a graph on the stringency of measures taken. More facts and figures are presented in the country reports themselves.

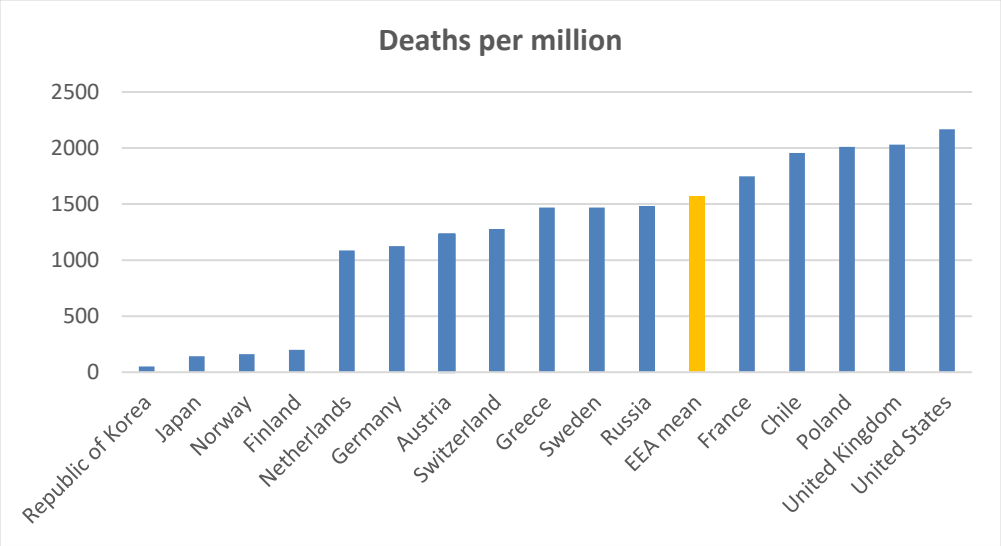


Figure 1. Deaths per million by October 14, 2021.
Source: ourworldindata.org

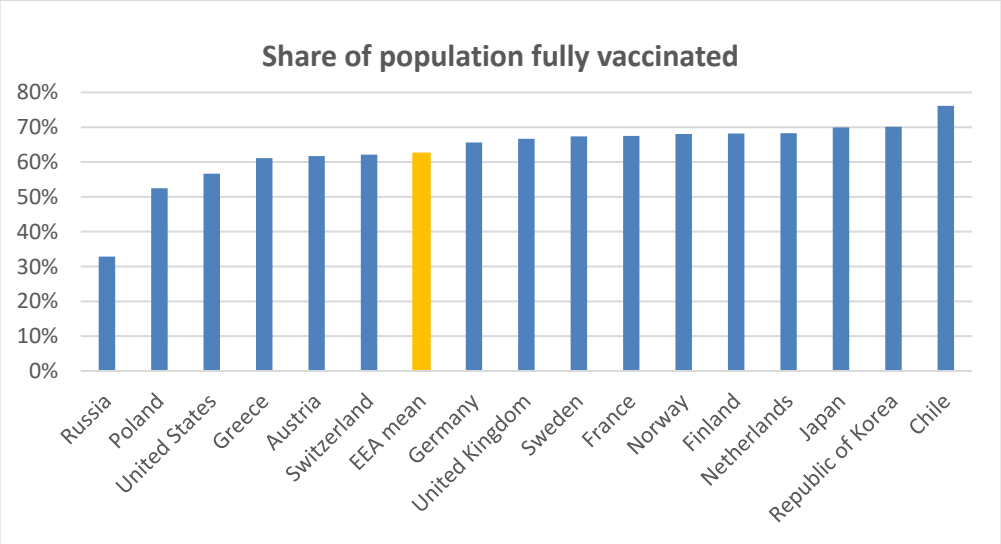


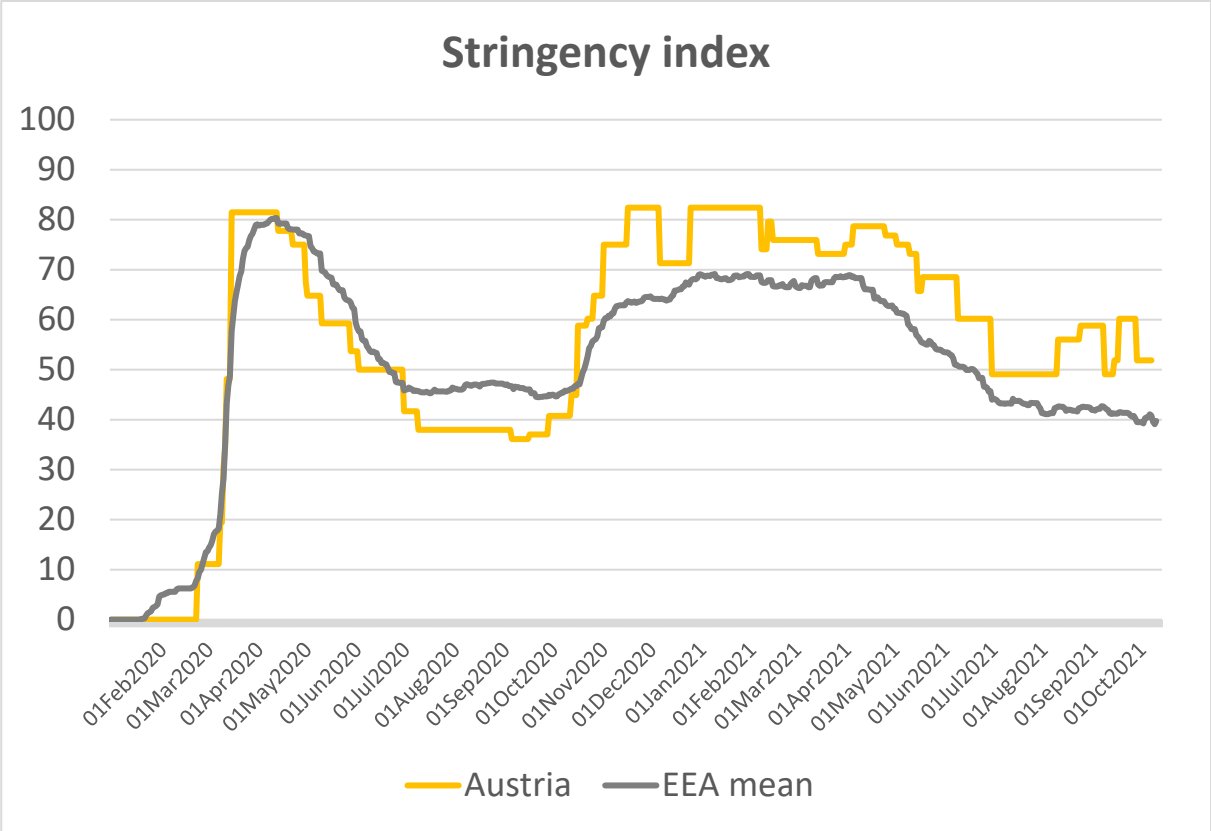
Figure 2. Share of population fully vaccinated, by October 23, 2021.
Source: ourworldindata.org

[1] Austria, Chile, Finland, France, Germany, Greece, Japan, The Netherlands, Norway, Poland, The Republic of Korea Russia, Sweden, Switzerland, United Kingdom and the United States.
[2] European Parliament and Council of Europe.

Austria

Institute of Technology Assessment of the Austrian Academy of Sciences (ITA), Michael Nentwich[1]

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators, including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

Austria was hit relatively early because of its neighbourhood with Italy, with the first infections in Tyrol by the end of February 2020. The ski resort Ischgl turned out to be a hot spot and unfortunately contributed to spreading the virus amongst tourists all over Europe – followed by international and national outrage.

Since then, until summer 2021, Austria has experienced three serious waves (March/April 2020, November/December 2020, and March/April 2021). The second wave was the most severe so far, with a peak of approximately 76,460 active cases (which is roughly a bit less than a hundredth of the Austria population), 3,942 patients in hospitals, and 697 of them in intensive care at the peak. The so-called effective reproduction rate, however, was highest in the first wave (R_{eff}=2.63). The so-called seven-day incidence per 100,000 inhabitants varied between 58.9 during the first wave, an all-time Austrian high of 562 at the second, and 250 at the third wave. In the first half of July 2021, it was as low as 7.1, but it rises

[1] With valuable input from Walter Peissl, Mahshid Sotoudeh, Titus Udrea, and Karen Kastenhofer (all Institute of Technology Assessment, Vienna) acknowledged.

again (with 320+ at the end of October). The COVID-19 Forecast Consortium (see below 2) expects a fourth wave towards the end of summer 2021, the beginning of autumn, due to the influence of the already dominating Delta variant.[2] According to official statistics, at the time of writing (mid-July 2021), there have been altogether more than 649,000 COVID-19 positive cases in Austria and 10,500 deaths.[3] Austria scores in the middle field in an international comparison of the death rate compared to population density.[4] Fortunately, Austria never experienced similar emergencies as in Italy, Spain, France, and other countries with more than full hospitals and the need for triage decisions. In particular, the relatively high number of available ICUs (and, in general, a decently funded public health system) was sufficient to cope with the severe COVID-19 cases. However, there are reports that hospitals had to delay standard surgeries during the peaks of the three waves.

Beginning officially in late December 2020, Austria rolled out a vaccination programme. Over the first quarter of 2021, the programme built up only very slowly due to scarce deliveries of vaccines – Austria being part of the EU-wide buyer community. Until well into the second quarter of 2021, strict rules applied to prioritise vulnerable groups (the elderly, medical personnel, etc.). In summer 2021, practically everyone (above the age of 12) has a chance to get vaccinated; the health bureaucracy and politics are now desperately advertising to convince those who have not signed up for vaccination yet. By early July 2021, 40% of the Austrian population is fully vaccinated, 56% partly.[5] It remains to be seen whether Austria will successfully reach the target level of at least 80% of fully vaccinated inhabitants by autumn 2021 to avoid a severe fourth wave.

Apart from the apparent considerable strain on the Austrian health system, the pandemic crisis had enormous economic effects. In addition to physical distancing, mask-wearing, and other hygienic rules, the principal instruments to fence the pandemic have been and still are lockdowns and restrictions of certain types of social and economic activities. For instance, the tourism industry is significant in Austria and was severely hit by restrictions. In 2020, Austria received 42% fewer foreign guests and had a minus of 36% overnight stays (note that the still unaffected winter season 2020 lasted until the end of February); there are hopes for a slow recovery in summer 2021.[6] Other sectors, such as retail of daily goods, continued working as usual or, like most industries, with state-financed short-time work. During the harvest season in 2020 and throughout the lockdowns, there was a severe shortage of migrant workers in agriculture and home care. The impact on the sectors ‘culture’ (theatres, etc.) and ‘education’ (schools, universities, etc.) was also significant.

Overall, the economic recession in 2020 was more severe in Austria than in other OECD and EU countries: minus 6.7% of GDP[7] and 3.7% more unemployment.[8] The economy is

[2] orf.at/stories/3220344/ (retrieved 13/07/21).
[3] orf.at/corona/daten/oesterreich (retrieved 19/07/21).
[4] ourworldindata.org/grapher/COVID-19-death-rate-vs-population-density?yScale=linear&country=~AUT (retrieved 09/07/21).
[5] orf.at/corona/daten/impfung; info.gesundheitsministerium.at (retrieved 09/07/21).
[6] austriatourism.com/tourismusforschung/tourismus-in-zahlen/ (retrieved 09/07/21).
[7] Schiman (2021) Die Rezession 2020: Österreich im Ländervergleich [The 2020 Recession: Austria in Country Comparison], WIFO Research Briefs 4/2021, March, wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=66933&mime_type=application/pdf (retrieved 09/07/21).
[8] Bock-Schappelwein/Huemer/Hyll (2021) Beschäftigung 2020: Bilanz nach einem Jahr COVID-19-Pandemie [Employment 2020: Taking Stock After One Year of COVID-19 Pandemic], WIFO Research Briefs, 1/2021, wifo.ac.at/jart/prj3/wifo/resources/person_dokument/person_dokument.jart?publikationsid=66814&mime_type=application/pdf (retrieved 09/07/21).

now slowly recovering, though: for June 2021, the Austrian National Bank reports that GDP is approx. 1% below the pre-crisis level.[9]

Many employees and self-employed persons switched to home-office (up to 80% of those who could switch to home-office did so[10]). This development also affected mobility practices. A survey of the Technical University Vienna[11] found out that public transport during the first lockdown phase dropped from a share of 53% to under 2%, and the so-called modal split is moving relatively towards passenger cars. There is no study yet regarding post-lockdown developments, but it seems that public transport is slowly gaining ground again.

2. Using science and evidence in the crisis

As in many other countries, scientific experts played a considerable role in advising politics right from the pandemic's start.[12] At least initially, politicians very much hoped to get straight answers from science to rely on. This has been well documented and analysed by the ITA researcher A. Bogner, who calls the phenomenon "the epistemisation of politics".[13] The longer the crisis endured, the more it became evident that the experts gave their expertise under conditions of uncertainty. While a mainstream expert opinion formed over time, deviating voices also remain. This makes politics more difficult, but at the same time, opens up new options. Some political groups chose to listen to specific experts and challenged mainstream-based government politics. We need to carefully analyse the consequences of this split on health, economic, and social issues within the current coalition government – in office since only two months before the COVID-19 outbreak – and the tensions between the opposition and government.

Throughout the pandemic, so far, several agencies and advisory bodies have evolved to play a role in making pandemic politics evidence-based, the central bodies being: (1) The "*Corona Commission*" (*vulgo* "Ampel-Kommission")[14] issues weekly analyses regarding the current pandemic situation and regional risks in Austria and gives recommendations to the Minister of Health regarding necessary measures. (2) The "Nationales Impfgremium" (*national vaccination board*) advises on the use of vaccines based on the current state of knowledge. It consists of 18 experts from fields as diverse as virology, public health, medicine, or microbiology (but no social sciences), and a few civil servants to reach out to the provincial governments of Austria. (3) The "Bioethikkommission" (*Bioethics Commission*) at the Federal Chancellery, consisting of 25 experts from medicine, genetics, law, theology, social science, etc., advises the Chancellery. Among others, it issued opinions and recommendations regarding contact tracing and vaccination; indeed, from the eight opinions 2020/2021, six deal with aspects of COVID-19.[15] (4) The Austrian *Agency for Health and Food Safety* (AGES) is a publicly owned company reporting to two ministries. It runs the Federal Office for Safety in Healthcare (BASG), responsible for the statutory tasks relating to control and licensing of pharmaceutical and medicinal products. Among others, the AGES provides the central hub for all COVID-19-related data. (5) The "COVID-Prognose-Konsortium" (*COVID forecast consortium*), consisting of experts from various universities and others, provides the Minister of Health with weekly forecasts

[9] oenb.at/Publikationen/corona/bip-indikator-der-oenb.html (retrieved 21/07/21).
[10] profil.at/gesellschaft/homeoffice-nach-corona-ja-oder-nein/401429868 (retrieved 12/07/21).
[11] blog.fvv.tuwien.ac.at/corona/COVID-19-questionnaire-results-austria-de/ (retrieved 09/07/21).
[12] Cf. Felt et al., 2020, Austria, in: Jasanoff et al., Comparative COVID Response: Crisis, Knowledge, Politics, interim report, compcore.cornell.edu/wp-content/uploads/2021/03/Comparative-COVID-Response_Crisis-Knowledge-Politics_Interim-Report.pdf (retrieved 12/07/21),
[13] Bogner (2021) Die Epistemisierung des Politischen [The Epistimisation of Politics], Reclam.
[14] Cf. §2 of the Austrian COVID-19 measures statute, ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20011073 (retrieved 13/07/21).
[15] bundeskanzleramt.gv.at/themen/bioethikkommission/publikationen-bioethik.html (retrieved 09/07/21).

based on mathematical models regarding the short-term development of the illness and the capacities in hospitals. (6) Finally, the Generaldirektorin für die Öffentliche Gesundheit (*chief medical officer*), based in the Ministry of Health, plays a central role as a point of access for scientific evidence. However, this position was vacant during 2020.

Apart from formal advisory bodies, the media seem to influence political decision-making by interviewing and giving space to various experts, from virologists and the medical profession to psychologists, educational researchers, sociologists, lawyers, and even technology assessors. With a few outstanding experts, their public statements certainly affected public opinion and how the Austrian government handled the issue. In addition, social media introduced a high level of instability in the political communication process.[16]

Overall, it seems that up-to-date science played a significant role in Austrian decision-making regarding the pandemic. However, some of the key bodies (see above) also included members from the administration and political institutions, giving room for political negotiations in the context of crisis management. For instance, when it comes to regional or local lockdowns, obviously, not only scientific arguments played a role.[17]

The main thrust of experts involved in advisory boards in Austria is natural scientists (virologists, health professionals), mathematicians, and the like. At the federal level, only in the Bioethics Commission members from the social sciences and humanities are included. Other experts often reach out to politics indirectly, in particular via the media and the public discourse. For instance, the University of Vienna regularly carries out surveys regarding how the population copes with and reflects the various measures to deal with the pandemic.[18]

Overall, decision-making seemed quite transparent with regular press conferences of the government, in particular in the first phases of the pandemic. The longer the crisis endures, the more and more interests of various stakeholders, e.g., the tourism industry, play a visible role. A profound and open debate on the values involved did not occur in the public arena; we have seen some value-driven dispute, however, in some media and Parliament with the Freedom Party often opposing the mainstream narrative.

As the previous rules on countering pandemics were outdated, the primary role of the Parliament was discussing and deciding on the government-proposed COVID-19 package of laws[19] in March 2020. From then on, Parliament regularly discussed and decided on various amendments necessary to cope with the development, for instance, financial support for parts of the economy. Parliament and the public criticised that there was not enough time to assess the legal proposals in-depth. Many parliamentary questions to the government and the respective answers triggered vivid debates over the last 16 months. While there was more consensus among all factions initially, the debates became more controversial over time as more specific decisions for different groups had to be taken, with most decisions taken by the ruling majority.

3. Using technology to cope with the pandemic

During the first wave in March 2020, the Austrian Red Cross developed the so-called "Stopp-Corona-App",[20] one of the first *tracing apps* for the smartphone worldwide to record potential contact persons if an infection occurs. It is compatible with similar apps in Europe

[16] bmi.gv.at/news.aspx?id=705971746E7071715752493D (retrieved 14/07/21).
[17] Note that in this short overview we are not looking at the regional level (the nine Austrian federal states), where local experts influence the local decision-making.
[18] viecer.univie.ac.at/coronapanel/ (retrieved 09/07/21).
[19] parlament.gv.at/PAKT/VHG/XXVII/A/A_00396/ (retrieved 09/07/21).
[20] stopp-corona.at (retrieved 09/07/21).

but has not been developed further since June 2020. While the approval of critical NGOs has quickly settled initial concerns regarding data protection and privacy after software revisions, the app did not receive widespread trust from the population. With about a million downloads and decreasing active users, the app missed its target to be a ubiquitous tool used by practically everyone in Austria.[21]

Austria was quite innovative concerning COVID-19 *test methods*. For instance, Viennese researchers developed the "gurgling method" (instead of the usual smear tests).[22] The AMS AG (Styria), in cooperation with a Canadian partner, works on an improved method for detecting COVID-19 antibodies ("AntigenSense"), and, together with Dutch partners, medPhoton (Salzburg) develops imaging diagnostic procedures for COVID-19 ("Smart-DETeCT").[23]

When in spring 2021, the idea started to spread to have a digital COVID-19 *status passport* to ease controlling whether a person has been vaccinated, tested, or has recovered from this disease ("Green Pass"), the Austrian government planned to be ahead of the European partners to set a good example. At first, the government chose a centralistic approach with possible problems regarding the EU data protection rules. In the end, Austria was by far not among the first to have such a passport, implementing the EU regulation,[24] in force since July 2021, and it chose a relatively low-tech solution with a PDF, showing the QR code in a simple viewer app.[25]

While the original proposal for the Green Pass also included the possibility to enable more *cross-register data linkage*, this was abandoned at the time to get the Green Pass implemented fast. In July 2021, however, the Ministry of Science renewed its proposal for an Austrian Micro Data Center (AMDC), operated by Statistics Austria. Implementing this would allow, for instance, combining data from the Austrian "Epidemiologisches Meldesystem (EMS)" (epidemiological reporting system) with all kinds of social data. Data protection NGOs and lawyers criticise that pseudonymity will not be enough to inhibit singling out individuals; other criticism refers to the increasing power of Statistic Austria as a data gatekeeper.[26]

In addition, other technologies played a role in coping with the pandemic. For instance, some Austrian firms changed production lines to produce needed materials such as *masks or disinfectants*.[27] As in other countries, parts of the Austrian population switched to e-bikes and e-scooters, initiating an enormous boom in this market.[28] The early stages of the pandemic showed that some sectors of Austrian society were not well prepared in terms of digitisation. For instance, digital tools have been rolled out only after months of home-schooling. Most enterprises and institutions, even academic ones, struggled with setting up platforms for e-meetings and the like.

4. Challenges and opportunities in dealing with STI

It seems fair to say that Austria did not adequately prepare to cope with such a pandemic. As mentioned earlier, the respective law was outdated and had to be quickly adapted (a

[21] help.orf.at/stories/3202229/ (retrieved 09/07/21).
[22] medienportal.univie.ac.at/uniview/forschung/detailansicht/artikel/gurgelmethode-neue-verfahren-fuer-probenahme-entwickelt/ (retrieved 31/07/21).
[23] science.orf.at/stories/3201366/ (retrieved 13/07/21).
[24] ec.europa.eu/info/live-work-travel-eu/coronavirus-response/safe-COVID-19-vaccines-europeans/eu-digital-COVID-certificate_de (retrieved 09/07/21).
[25] gruenerpass.gv.at (retrieved 09/07/21).
[26] derstandard.at/story/2000127966746/ein-schatz-fuer-forschungszwecke-kritik-an-datenmacht-der-statistik-austria (retrieved 09/07/21).
[27] agrartechnik.at/aktuelles/2020/04/agrana-startet-mit-herstellung--von-desinfektionsmittel.html (retrieved 31/07/21).
[28] kurier.at/wirtschaft/fahrrad-boom-viele-haendler-im-corona-sommer-2020-ausverkauft/401370998 (retrieved 13/07/21).

cumbersome process with quite some logistic glitches with even the Constitutional Court involved). There was no coordinating chief medical officer in place in the Ministry of Health. Moreover, the new coalition government had not yet settled and was not in smooth working mode at the outbreak. In addition, as with other issues in a federal state like Austria, it turned out that the distribution of competencies between the levels of government was not well-tuned to speedy and efficient reactions. In particular, there were numerous quarrels between the federal government and the nine regional governments. Consequently, the overall reaction to contain the pandemic in the early phases was inefficient (e.g., in the Ischgl case). However, the government seems to have quickly established vital links to virologists, public health, and other experts.

The political decision-making processes concerning the pandemic seem to have included expert knowledge to a large degree. The politics-science cooperation evolved. When it was time for vaccination, the Austrian governance system was better attuned to the unprecedented situation. For instance, the Bioethics Commission played a role in priority setting.[29] The experts in the various advisory boards (see above) contributed considerably to decision-making, also via media coverage. Concerning the logistics of the distribution of the vaccines, domain experts, not academic experts, played a more significant role (e.g., from the Red Cross, the medical association, the chamber of pharmacists, the Ministry of Defence).

Information of the public throughout the pandemic was intense but not always well adapted to the various target groups, such as migrants with lower German knowledge or other communities. For instance, a study from the Austrian Integration Fund (ÖIF) showed how people with migrant histories were much more likely than the rest to use social media than mass media to inform themselves about COVID-19.[30] Overall, there have been no differentiated measures concerning the various population groups or classes. All directives, such as quarantine rules, home-schooling, home office, or public transportation, seem to be applied to all indiscriminately, though with different impacts on various parts of the population (e.g., the younger generation). The full scale of the pandemic's consequences is visible only now, piece by piece, with apparent gaps in how the pandemic hits economic status, success in schools, or access to health care.

In conclusion, the COVID-19 crisis seems not to have revealed any particular strengths or resiliencies in the way Austrian policymakers use expert knowledge.

5. The ITA during the crisis

Despite the many technology-related issues around COVID-19, the ITA was scarcely involved in assessments. Under enormous time pressure, the Parliament did not choose to involve the ITA ad hoc or within the current framework contract between it and the ITA (together with the partner AIT) in these debates. However, with our half-yearly monitoring reports, we were able to put some issues on the (informal) agenda of the parliamentarians. In particular, we briefed Parliament on crisis scenarios, pandemic management, and European resilience in times of crisis.[31] Moreover, the ITA covered several issues in other projects not directly targeted at the Parliament but certainly reaching it indirectly.[32]

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[29] bundeskanzleramt.gv.at/dam/jcr:d92558b8-c664-46a5-af86-d4f6994a9ec8/201127_StN_COVID_Impfstoff.pdf (retrieved 12/07/21).
[30] integrationsfonds.at/mediathek/mediathek-publikationen/publikation/forschungsbericht-mediennutzung-von-migrantinnen-9603 (retrieved 14/07/21).
[31] parlament.gv.at/ZUSD/FTA/114_post-COVID-krisenszenarien.pdf; parlament.gv.at/ZUSD/FTA/105_pandemiemanagement.pdf; parlament.gv.at/ZUSD/FTA/091_europ_resilienz.pdf (all retrieved 12/07/21).
[32] oeaw.ac.at/en/ita/COVID-19 (retrieved 12/07/21).

Furthermore, the ITA decided to include the new section “From the Societal Challenges of the Covid-19 Pandemic to a TA in Situations of Crises” in its medium-term research programme 2021-2023.[33]

Overall, the role of the ITA was not very prominent in the crisis, particularly not concerning Parliament. However, we contributed to the general debate with various publications and appearances in the media. A partner of the ITA network, the Austrian Institute of Health Technology Assessment, regularly summarised and assessed the state-of-the-art regarding COVID-19 vaccines and therapeutics and other health-related COVID-19 topics.[34]

It is probably too early to come up with concrete advice. We observed that technology assessment could have played a much more prominent role in the public debate. For instance, TA insights would have been helpful for the design and implementation of the Stopp Corona App (constructive and participatory). However, politics and the media focused on disciplinary experts in virology, public health, or pedagogics. More interdisciplinary and multi-perspective assessments could have avoided some of the one-sided approaches taken. In Austria, involving and funding TA to cope decently with the challenges of such a crisis could be a piece of possible advice. Today, TA in Austria seems to be perceived as something for quiet times, not phases of a crisis. However, in the future, we may expect more frequent crises or even a permanent state of crisis, for instance, concerning the climate, so it is advisable to alter the framing.

Apart from the role of TA, an ITA scientist voiced the idea of a permanent “Pandemic Council”.[13] This council, similar to a bioethics council, would serve as a standing multidisciplinary, multi-stakeholder advisory board for the government.

6. Lessons for a post-COVID world

It is too early to say whether something changed permanently, as we are still in the middle of the ongoing crisis. However, it seems the pandemic deepened (the debates about) social, economic, environmental, and technological inequality, raising questions on improving societal and economic resilience and developing the digitalisation agenda more equitably and sustainably. Moreover, resilience, economic dependencies in a globalised world are now on top of the agenda.

Over the last year and a half, we realised that remote working (home-office) was scalable in many areas. However, its limits became visible, too. Our societies will have to come to terms with future work under these broadly experienced conditions concerning infrastructures (IT, childcare, office design, and mobility), working procedures, the employees’ physical and mental health, and quality results. The ubiquitous travel restrictions and opportunities of videoconferencing also showed that a business and academic world with a smaller carbon footprint is feasible – which is good news as our planet faces an even bigger crisis than COVID-19, also known as the climate crisis. In-depth research should assess the environmental, social, and economic impacts of home-office.

The current pandemic brought to our attention that democracy is under severe pressure in times of crisis. Looking at authoritarian regimes will not be of much help. To cope more efficiently with the next major crisis, an important lesson from the current one is that our governance structures should be adaptable and devised to ensure that legislative institutions can function in any situation (e.g., operating rules, technical framework). For instance, hybrid voting procedures in parliaments may be necessary. In addition, as a

[33] oeaw.ac.at/fileadmin/Institute/ITA/PDF/Ressourcen/MiFri_21-23_final.pdf (retrieved 27/10/21).
[34] eprints.aihta.at/1234/ (retrieved 12/07/21).

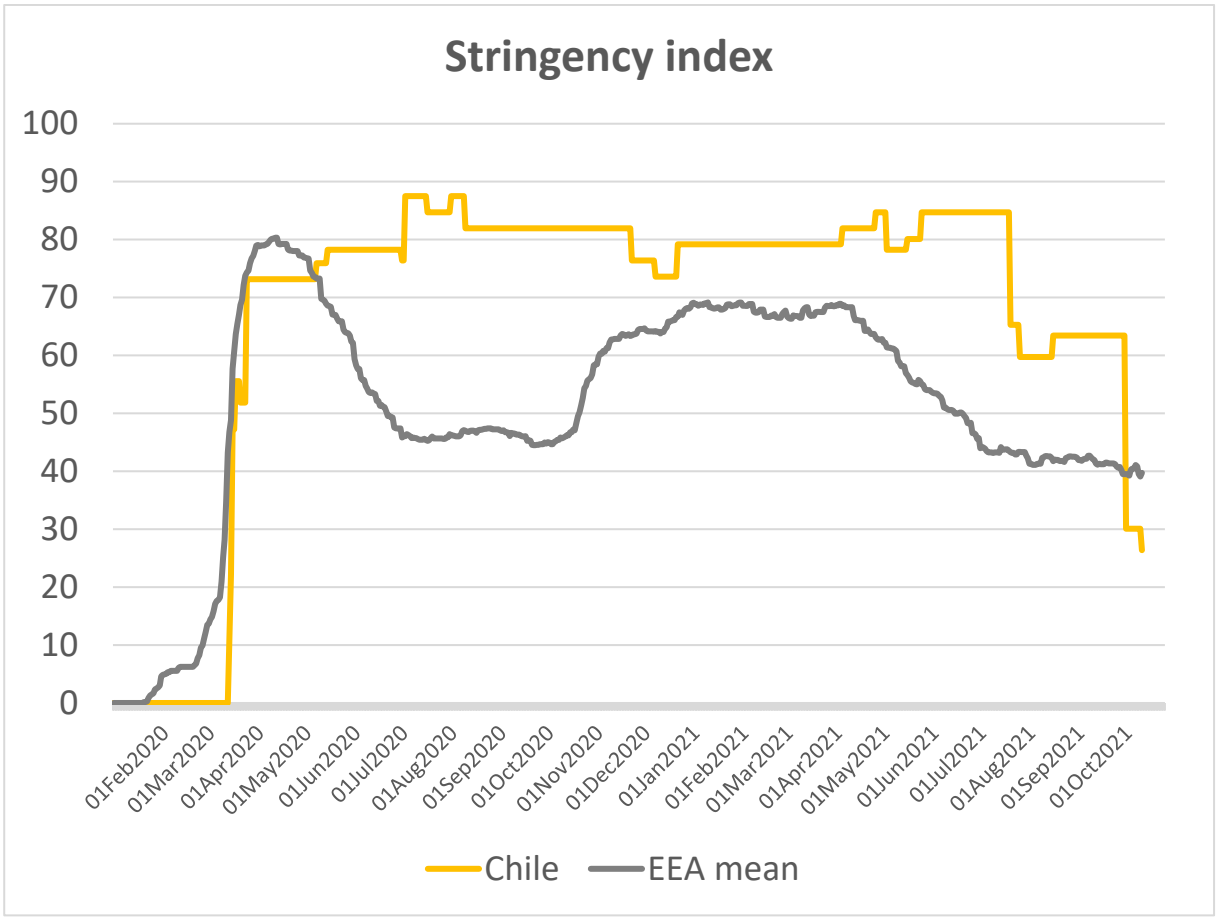
condition for democratic decisions on technology policy, parliaments are well-advised to promote further bridges between science and society and politics.

To sum up, there is room for improvement, and technology assessment can and should play a role in the post-pandemic and pre-next crisis phase. TA's tenets like transdisciplinarity and an encompassing forward-looking approach will be an asset in improving our societies' resilience

Chile

Parliamentary Technical Advisory (ATP) of the Library of the National Congress of Chile, Raimundo Roberts and Christine Weidenslaufer[1]

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

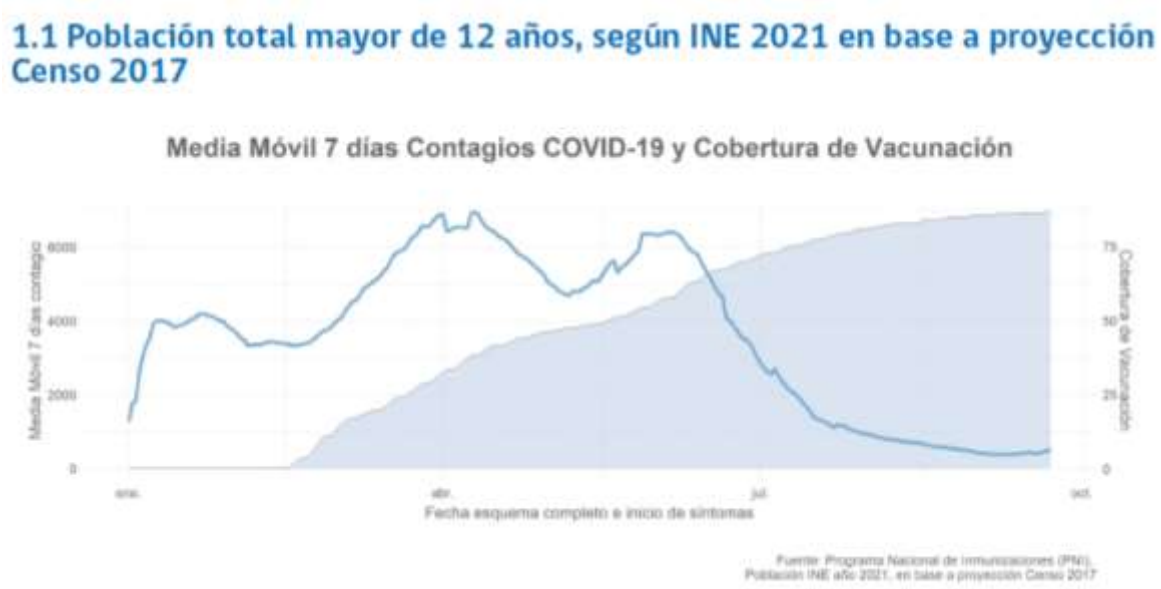
On October 5th, 2021, the total number of people who have been diagnosed with COVID-19 in Chile has reached a total of 1,555,902, where 23,242 patients are in the active stage. Since the beginning of the pandemic, the recovered cases amount to 1,498,792. Regarding the death toll, in the last 24 hours, there were 56 deaths due to causes associated with COVID-19, with a total number of deaths of 32,545 patients. The positivity at the national level is 1.48% in the last 24 hours and 14 regions have a positivity less than or equal to 2%.[2]

[1] With the collaboration of María Pilar Lampert, Pamela Cifuentes and Luis Castro
[2] Ministry of Health (2021). Available at: https://www.minsal.cl/wp-content/uploads/2021/10/CP-REPORTE-COVID-19-Martes-05-10-21.pdf

These numbers are very much different from those in June, when the positivity at the country level was 7.68%.[3] The Ministry of Health attributes these results to the wide vaccination campaign the Chilean Government has pursued since last year. According to the epidemiological report and COVID-19 vaccination status for the period between September 19 and 25, 2021, the incidence of cases was 36.5 cases per 100,000 inhabitants within the unvaccinated or incompletely vaccinated group, while the incidence in the fully protected group was 22.2. The incidence of cases admitted to the Intensive Care Unit (ICU) was 1.1 cases per 100,000 inhabitants, and a mortality rate was 0.8 deaths per 100,000 in the first group, while the incidence in the second group was 0.3, with a mortality of 0.2.[4]

Nationwide, as of today, 29.1% of confirmed COVID-19 cases did not have full protection. It was also observed that, from the cases admitted to the ICU and who died from COVID-19, 39.3% and 29.2% respectively did not have completed their vaccination program.[5]

The progression in vaccination roll-out and infection rate decrease is shown in the following chart:



Source: Ministry of Health (2021). Available at: https://www.minsal.cl/wp-content/uploads/2021/09/Informe-Vacuna-29-septiembre-2021.pdf

In Chile, as of October 7, 2021, more than 26.86 million doses have been applied, and 88.84% of the target population (a total of 15,200,840 people over 6 years old) have already received both doses. From the total vaccine roll-out, 3,547,177 constitute booster doses (also called third doses). If compared to other countries, regarding the percentage of population vaccinated against COVID-19, Chile comes in fourth place (after Spain, Singapore, and Uruguay), with 73.78% of the population fully immunized, and 7.56% with an incomplete vaccination. Regarding the number of doses of COVID-19 vaccines

[3] Ministry of Health (2021). Available: https://www.minsal.cl/wp-content/uploads/2021/06/CP-REPORTE-COVID-19-Mi%C3%A9rcoles-30.06.21.pdf
[4] Ministry of Health (2021). Available at: https://www.minsal.cl/wp-content/uploads/2021/09/Informe-Vacuna-29-septiembre-2021.pdf
[5] Ministry of Health (2021). Available at: https://www.minsal.cl/wp-content/uploads/2021/09/Informe-Vacuna-29-septiembre-2021.pdf

administered per 100 people, again Chile is fourth after the United Arab Emirates, Uruguay, and Israel, at a 170.22.[6]

Education

In Chile, once the COVID-19 pandemic was declared, the Government announced the total suspension of face-to-face classes in all schools, public and private, and for all educational levels, starting a distance education modality in the context of an emergency. The Government promoted a series of measures during 2020, such as setting up an online learning platform, with educational content according to the study plans, accessible even from mobile devices such as tablets and smartphones, and a television platform, *TV Educa Chile*, with capsules of pedagogical content, the participation of teachers, and transmitted in sign language.[7]

However, this new modality of distance learning, undoubtedly necessary in the emergency context in which it was generated, deepened the existing learning gaps, given the diverse social reality of our country: no or bad internet connection in some areas; varied socio-economic conditions of households and schools; and the kind of different types of instruction being provided[8]. In addition, it was detected that school dropout increased and that the Ministry of Education estimates that, during 2020, approximately 81,000 new students did not attend distance learning classes (before the pandemic there were already 187,000 children and adolescents out of the school system).[9]

These shortcomings led to re-establish face-to-face classes for the 2021 school year, highlighting the importance of the classroom for the achievement of learning, social-emotional development, and equity between students. As of March 2021, a voluntary and gradual return was started by some schools, either completely in person or in a hybrid model with a reduction of school days, considering the sanitary conditions according to the Government's Step by Step Plan. Since the beginning of the second school semester, in August 2021, the opening of schools throughout the country has been increasing considerably. Nation-wide, 74% had returned to classes, and only in the Aysén region, 100% of schools are functioning with face-to-face classes.[10]

Again, it is important to highlight that, prior to the pandemic, there was high inequality in access to a good education. Similarly, inequalities were observed in the exercise of the right to education by children and adolescents in situations of vulnerability, such as students with disabilities, migrants in an irregular situation, or children in alternative residential care.[11]

Economy

Chile's economy is going through one of the biggest crises in its history, with a 6% GDP drop in 2020, the loss of more than a million jobs, and an increase in absolute poverty that,

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[6] Pauta (2021). Available at: https://www.pauta.cl/ciencia-y-tecnologia/vacunacion-contra-el-COVID-19-chile-cuanta-gente

[7] Ministry of Educacion (2021). Available en: https://www.mineduc.cl/wp-content/uploads/sites/19/2021/01/BalanceMineduc2020.pdf

[8] Ministry of Education, Centro de Estudios (2020). *Impacto del COVID-19 en los resultados de aprendizaje y escolaridad en Chile*. Santiago, Chile. Available at: https://www.mineduc.cl/wp-content/uploads/sites/19/2020/08/EstudioMineduc_bancomundial.pdf

[9] Ministry of Educacion (2021). Available en: https://www.mineduc.cl/wp-content/uploads/sites/19/2021/01/BalanceMineduc2020.pdf

[10] Ministry of Educacion (2021). Available en: https://www.mineduc.cl/wp-content/uploads/sites/19/2021/01/BalanceMineduc2020.pdf

[11] UNICEF-PNUD-OIT (2021). Available at: https://www.unicef.org/chile/media/5901/file/Informe%20impactos%20de%20la%20pandemia%20.pdf

according to ECLAC forecasts, would be close to 4%. Meanwhile, according to the National Institute of Statistics, INE (2021), the unemployment rate in 2020 reached an average of 10.7%, a 34.5% increase compared to 2019.[12] Such increase was attenuated by the large number of people who left the workforce, and postponed or slowed down the search for a new job.[13]

In terms of economic sectors, the area of services is the most affected one, especially those that require intensive personal contact, like tourism and domestic work, as well as other sectors such as construction and commerce.[14]

2. Using science and evidence in the crisis

The Government organized different expert councils, to deliver reports or briefing notes with technical-scientific information on how to face the various challenges that the pandemic presented. These councils are the COVID-19 Advisory Council, the Scientific Advisory Council for the COVID-19 Vaccine, the Social Group COVID 19, and the Technical Group on an "Extraordinary Health Fund for the fight against COVID-19".

The COVID-19 Advisory Council was established in March 2020, to advise the Ministry of Health in the formulation and implementation of policies, strategies, and practices for the prevention, diagnosis, approach, and treatment of COVID-19, and normative reform, chaired by the Undersecretary of Public Health. The Council is made up of a wide array of experts from the academy (including specialists in public health, infectious diseases, epidemiology, and paediatrics) and officials from the health authority. The reports are delivered to the health authorities, published on the Ministry's website, and disseminated through social networks. Particularly relevant issues were masking and social distancing, the maintenance of strict quarantines, the reinforcement of testing, traceability and isolation of infected individuals, the closure of national and international borders, and vaccination campaigns[15].

The Scientific Advisory Council for the COVID-19 vaccine, organized by the Ministry of Science, Technology, Knowledge, and Innovation, was made up of nine experts (physicians, researchers, and representatives of the industry) who collaborated with the Government to identify and evaluate the most promising vaccine developments for the upcoming clinical trials that were to take place in Chile. This council had to identify and recommend, based on scientific and technical expertise, the ideal candidates for conducting phase III clinical trials.[16] Also, as described later, other councils were formed in order to establish genomic surveillance, reinforcing testing, and development of new medical resources, not only at national but regional levels, mainly under the supervision of the Ministry of Science, Technology, Knowledge, and Innovation.

The COVID-19 Social Group was established to strengthen the country's strategy and have a single voice in the fight against the new coronavirus. The Group delivered proposals with effective actions against the pandemic on mental health and on ethical guidelines on patient care in a pandemic situation. It was made up of the Ministers of the Interior and Public Security and of Health, the representative of the WHO/PAHO in Chile, medical specialists, representatives of local governments, and high-ranked academics.[17]

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[12] INE (2021). Available at: https://www.ine.cl/prensa/2021/02/19/tasa-de-desocupaci%C3%B3n-nacional-lleg%C3%B3-a-10-7-en-2020
[13] Flacso Chile (2021). Available at: https://flacsochile.org/impactos-economicos-y-sociales-a-un-ano-de-la-pandemia/
[14] Flacso Chile (2021). Available at: https://flacsochile.org/impactos-economicos-y-sociales-a-un-ano-de-la-pandemia/
[15] COVID-19 Advisory Council (n.d.). Available at: https://sites.google.com/udd.cl/consejoCOVID19chile/p%C3%A1gina-principal
[16] Scientific Advisory Council for the COVID-19 Vaccine (n.d.). Available at: https://minciencia.gob.cl/vacunaCOVID19/consejo-asesor-cientifico-vacuna-COVID-19
[17] COVID-19 Social Group (n.d.). Available at: https://www.gob.cl/mesasocialCOVID19/

Finally, the Technical Group on an “Extraordinary Health Fund for the fight against COVID-19”, convened by the Chamber of Deputies of the National Congress, is the result of an announcement by President Piñera of a two billion dollars fund destined to control the pandemic, rehabilitation of those affected by COVID-19, mental health, reduction of waiting lists, strengthening of services, and digital hospital. Around 250 specialists from various areas (from health-related professional colleges, scientific societies, and universities), discussed how to implement actions that allow establishing minimum standards and the optimization of the fund’s resources. In June 2021 it delivered a final report to the Government with more than 30 proposals.[18]

(How) was the use of up-to-date science for political decision-making warranted?

The development of the pandemic globally and locally showed the emergence of a number of technical, scientific, and public health concepts not widely used by society, such as coronavirus, SARS-CoV-2, polymerase chain reaction (PCR), antigens, flattening the contagion curve, etc.

In response to society's need for information, both the Government and the media began to use these concepts in daily reports since the beginning, fulfilling both the function of representing the State in the control of the pandemic and the protection of the population, as well as the provision of data for personal decision-making. Updated scientific information (up-to-date science) was key to the public’s compliance with the health measures established by the authorities.

At a more complex level of decision-making (such as the mass purchase of vaccines or testing kits, for example), it could be assumed that up-to-date science was important for timely decision-making, considering Chile’s leadership in the purchase of vaccines, or the establishment of a network of diagnostic laboratories in a matter of days.

Mainly medical, nursing, or public health specialists, as well as statisticians and mathematicians were involved in advisory boards or had advisory roles. However, representatives from the social sciences were involved in the various instances of technical consultation described in this report.

What role did the parliament have in political decision-making?

The Chilean Chamber of Deputies -and particularly, the Health Commission[19]-, based in its constitutional oversight role, played a fundamental role in supervising the governmental measures and strategies regarding the pandemic, such as the COVID-19 Plan, which aims to avoid person-to-person transmission and detect entry into Chile of infected people; the Step-by-Step Plan, a gradual strategy to face the pandemic according to the sanitary situation in each part of the country; the testing, traceability, and isolation strategy; the vaccination strategy, among others.

For its part, the Senate made its own efforts for this matter. Its Health Commission[20] began the Social Dialogue on the COVID-19 pandemic, with special sessions held on the development of the sanitary situation. Together with the Future Challenges Commission[21], it focused on monitoring the impacts of the crisis in the country and the effectiveness of the

18 BCN (2021). Available at: https://www.bcn.cl/portal/api-servicios/servicio/ObtenerNoticiaPorIdNoticiaHTML?id=congreso-nacional-rindio-su-septima-cuenta-publica
19 Health Commission (Chamber of Deputies). Available at: https://www.camara.cl/legislacion/comisiones/integrantes.aspx?prmID=1707
20 Health Commission (Senate). Available at: https://www.senado.cl/appsenado/index.php?mo=comisiones&ac=ficha&id=195&tipo_comision=10
21 Future Challenges Commission. Available at: https://www.senado.cl/appsenado/index.php?mo=comisiones&ac=ficha&id=941

Government response. A group of experts from different disciplines periodically participated in these sessions, which became a stable advisory group to the joint commission on these matters[22].

3. Using technology to cope with the pandemic

On average, between March and December 2020, Chileans spent 82.9 days in quarantine, which involved 10.7 million people or 55% of the population.[23] The Virtual Police Station (*Comisaría Virtual*)[24] is an innovation that strengthened electronic government tools that guaranteed compliance with measures such as quarantines and mobility restrictions. Since the beginning of the pandemic, the national police force, *Carabineros de Chile*, centralized mobility permits according to restrictions established by geographical area, using individual identification systems. This facilitated compliance with the measures established by the political and health authorities throughout the country.

In addition to quarantines, Sanitary Customs were put in place to control the spread of the COVID-19 outbreak in the population and in the Chilean territory. It is a mandatory territorial control and those who enter a controlled area by any means of transportation (by land, air, or sea), must undergo temperature control and be in possession of the corresponding permits, such as the Sanitary Passport. The Sanitary Passport can be obtained for internal displacement to regions under Sanitary Customs, through the website www.c19.cl and contains information that, through a QR code, is scanned by the health authority.[25]

Also, a Mobility Pass is a complete vaccination against the COVID-19 certificate. In addition, it informs if the person is subject to mandatory isolation by the health authority (by close contact, or as a probable or confirmed case).[26]

Finally, the Government's official application for mobile devices, Coronapp, allows to self-assess symptoms, receive notifications and information on the evolution of the pandemic, report high-risk behaviours or events, and ask neighbours for help in case of being quarantined.[27]

COVID-19 data analysis

Regarding the organization and availability of COVID-19 data, the Ministry of Science, Technology, Knowledge, and Innovation coordinates and maintains the "COVID-19 database" with open, updated, and disaggregated information on cases, symptoms, diagnoses, and use of ICU beds, among others, by sex, regions, and districts.[28]

COVID-19 data viewer

Associated with the aforementioned database, a COVID-19 data viewer was developed, which gathers information in different formats (statistical graphs and maps) on the number of cases, deaths, vaccinations, and other figures.[29]

Network of university diagnostic laboratories

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22 Broadcast records of Health and Future Commissions, Senate of Chile. Available at: https://tv.senado.cl/tvsenado/site/tax/port/all/taxport_7_41_1862_1.html
23 ECLAC (2021). Available at: https://www.cepal.org/sites/default/files/events/files/25_de_agosto_candia_210825_taller_cepal_-_ife_0.pdf
24 Virtual Police Station. Available at: https://www.comisariavirtual.cl/
25 Ministry of Health (2021). Available at: https://www.minsal.cl/nuevo-coronavirus-2019-ncov/
26 Mobility pass n.d.). Available at: https://www.gob.cl/yomevacuno/pasemovilidad/
27 Coronapp (n.d.). Available at: https://coronapp.gob.cl/
28 Ministry of Science (n.d.). Available at: https://www.minciencia.gob.cl/COVID19/
29 Government (n.d.). Available en: https://www.gob.cl/coronavirus/cifrasoficiales/

The Ministry of Science coordinated and funded, from March 2020 until the end of the year, a network of 33 university laboratories for COVID-19 diagnosis, which complemented the detection efforts made by the health services.[30]. The laboratories are located in the country's main cities, covering more than 5,000 kilometres, and dedicated their work almost exclusively to qPCR analysis. This network tested more than 800,000 samples during the first year of the pandemic and is currently involved in efforts to detect COVID-19 variants. In January 2021, the organization and funding of this voluntary network were handed over to the Ministry of Health.[31]

Genomic surveillance group MinCiencia[32]

Since January 2021, a Genomic surveillance group, formed by 32 university laboratories across the country, has been conducting surveillance for new SARS-CoV-2 variants and reporting to the Auspice-Chile[33] platform (associated with GISAID[34]) for visualization of phylogenomic data of the virus in Chile.

Innovation in equipment via public tenders

At the beginning of the pandemic, public funds were assigned for local production of equipment, from personal protection elements to mechanical ventilators, diagnostic systems, and reagents. The most outstanding innovations are:

- **Mechanical ventilators made in Chile.** In April 2020, public and private entities launched a special competitive financing program for the local development and construction of mechanical ventilators. Four of 35 projects were selected and funded for escalation.[35] In January 2021, the first 10 pieces of equipment manufactured in the Biobío region were delivered. As of April this year, about 50 ventilators had been delivered to different hospitals.
- **Local production of diagnostic systems.** Seven proposals (out of a total of 58) were financed to accelerate diagnostic processes using q-PCR kits and the use of convalescent plasma to ELISA tests. This increased the availability of equipment and detection.[36]

Other innovations

In the regions of Biobío and Los Ríos, more than 600 kilometres south of the capital, in 2020, there were interesting innovations promoted by public and private alliances. The regional representative of the Ministry of Science upheld researchers from the Austral University of Chile on a sewage tracking system in Bibío, while in Los Ríos a "pool testing" system was developed through saliva samples, called VIGIA COVID. This system was financed by local public and private funds and continues to operate.[37]

[30] Ministry of Science (n.d.). Available at: https://www.minciencia.gob.cl/areas-de-trabajo/minciencia-COVID19/red-de-laboratorios-universitarios/
[31] Government (2020). Available at: https://www.gob.cl/noticias/ministerio-de-ciencia-anuncia-traspaso-de-la-red-de-laboratorios-de-diagnostico-universitario-COVID-19-al-ministerio-de-salud/
[32] Ministry of Science (n.d.). Available at: https://www.minciencia.gob.cl/areas-de-trabajo/minciencia-COVID19/secuenciagenomica/
[33] Auspice (2021). Available at: https://auspice.cov2.cl/ncov/chile-global
[34] GISAID (n.d.). Available at: https://www.gisaid.org/
[35] Ministry of Science (2020). Available at: https://www.minciencia.gob.cl/noticias/un-respiro-para-chile/
[36] Ministry of Science (2020). Available at: https://minciencia.gob.cl/noticias/siete-proyectos-locales-de-diagnostico-y-tratamientos-para-COVID-19-recibiran-apoyo-publico-privado/
[37] Austral University of Chile (2021). Available at: https://diario.uach.cl/vigiaCOVID-y-quiolab-acercan-pcr-por-saliva-a-toda-la-comunidad-valdiviana/

4. Challenges and opportunities in dealing with STI

Although there was no particular preparedness for the COVID-19 pandemic at the international stage, Chile has been promoting the celebration of a new covenant for that purpose. On March 30, 2021, President Piñera along with 26 other world leaders signed a call to the international community to begin negotiations to sign a treaty on pandemics. Chile led a presentation of a proposed decision before the 74th World Health Assembly, convened by the World Health Organization (WHO) in Geneva, Switzerland.[38] The main goal of a new international treaty for pandemic preparedness and response is to build a more robust global health architecture that will protect future generations. The Declaration highlights the need to approach the challenges posed by pandemics from a multidimensional perspective, including not only health aspects but also humanitarian, economic, commercial, social, and environmental issues.[39]

In the framework of the global emergency, the Ministry of Science, Technology, Knowledge, and Innovation leads the National COVID-19 Vaccine Strategy. The objective is to guarantee the timely and equitable supply of a safe and effective vaccine for COVID-19 through international collaboration in clinical trials. Along with the Ministry of Science, in this national effort also participates the Ministries of Health, of Foreign Affairs, and the Presidency, the Network of Embassies and Trade Offices to facilitate and promote contacts between vaccine developers and national research institutions; the COVID-19 Vaccine Scientific Advisory Council that is tasked with identifying and evaluating promising vaccine options in development internationally, and establishing international alliances to conduct clinical trials in Chile, and the Consortium for Clinical Trials: a group of universities, research centres and companies that will manage and execute clinical trials in Chile during the coming months through a collaborative modality. The clinical trials will allow to include in the studies a significant group of people at risk population, such as health workers.[40]

Latin America is one of the regions with the most inequities in its urban centres in the world and, in addition, it presents great inequalities in terms of the longevity of its population. In other words, people with a lower socioeconomic status die earlier than wealthy people. This has been confirmed by the international study “COVID-19 and the worsening of health inequities in Santiago, Chile”, published in the International Journal of Epidemiology. According to the study, the association of years of schooling and overcrowding with mortality in the pre-pandemic period (2016–2019) is consistent with previous research in Santiago, showing wide gaps in life expectancy and infant mortality.[41]

5. The ATP during the crisis

The ATP section has maintained its original structure, with nearly 40 professionals from different areas of knowledge in five thematic groups. Five professionals have formed a task force focused on TA documents, particularly related to COVID-19 issues and analysis. Although the elaboration of a new advisory product called "Frontier Reports" had to be delayed in 2020, ATP is currently developing two of such reports at the request of the Chamber’s Commission for the Future, Sciences, Technology, Knowledge, and

38 Ministry of Foreign Affairs (2021). Available at: https://minrel.gob.cl/news/who-will-hold-a-special-session-to-analyze-the-international-pandemic
39 WHO (2021). Available at: https://www.who.int/news/item/30-03-2021-global-leaders-unite-in-urgent-call-for-international-pandemic-treaty
40 Ministry of Science (2021). Available at: https://www.minciencia.gob.cl/vacunaCOVID19/
41 Usama Bilal, Tania Alfaro, Alejandra Vives (2021). COVID-19 and the worsening of health inequities in Santiago, Chile, International Journal of Epidemiology, Volume 50, Issue 3, June 2021, Pages 1038–1040. Available at: https://doi.org/10.1093/ije/dyab007

Innovation. The final reports on two topics, distance learning and telework will be delivered in the forthcoming months.

Also, the Library of National Congress added a new section in its website, specially dedicated to COVID-19 issues at https://www.bcn.cl/coronavirus, that gathers resources such as a specialized bibliography; research documents (from ATP and other areas of the Library); related bills currently discussed in Congress; geographical information at the regional and community level, supported with maps and graphics, of the progress of the pandemic in Chile; ATP's COVID-19 newsletters, and downloadable infographics.

In order to extract lessons and learnings from the legislative responses to the problems faced during the pandemic, the Presidency of the Senate, in January 2021, required the Library of National Congress to conduct a study in order to identify the extent to which the laws that were approved in 2020 to address the COVID-19 pandemic contemplated a gender approach. The investigation revealed that of a total of 51 laws published in the period March 2020 - January 2021, related to the pandemic, 18 are related to a gender topic or have a specific impact on women. In turn, it was detected that the laws addressed economic, labour, justice and human rights matters. In particular, 12 laws were analysed to assess whether they contemplated an evident, intentional and systematized gender approach. In general, the results showed that five laws show a significant consideration of gender in their analysis and design, but no effects have been detected in their application; another five laws show a gender impact in their application, but this was not considered in their analysis and design; and finally, two laws directly pursue gender objectives, but to compensate, mitigate or solve problems that affect specific groups of women.

The study was considered in the book "Women in times of hope, crisis and pandemic"[42], published by the Library of the National Congress, commissioned by the Presidency of the Senate. It was launched on March 8, 2021, in the framework of the commemoration of Women's International Day. On the occasion, the President of the Senate upheld her decision to draft a crisis and catastrophe bill with a gender perspective, which seeks to prevent the pre-existing vulnerabilities of women from being reproduced in the emergency, as well as in future crises.

The Library of National Congress is working on improving our technical advisory services through new methodical approaches and new skills within the organization, conducted by the a special ask force. Improvements are a short Delphi-like survey to ask experts about issues related to parliamentary concerns, a new kind of policy brief based on scientific information and reviewed by experts, and a rapid consult about scientific and technical issues which complement our traditional advisory documents, theoretical and practical activities developed to learn how to use these tools, and a network with national scientist (specially universities and public funded research centers) and international institutions and TA practitioners like POST of Great Britain and the Inter American Institute for Climate Change, among others.

6. Lessons for a post-COVID world

Lessons learned are an ongoing discussion in Chile, especially in the context of the Constitutional Convention's current debate. Hence, we can't prioritize issues at the moment.

Opportunities for innovations & improvements to public institutions or governance

The University of Chile announced the construction of a Center for Biotechnology and Vaccine Production on September 9, 2021. The first part of the project is the development

[42] BCN (2021). Available at: https://www.bcn.cl/publicaciones/ediciones-bcn/detalle_libro?id=10221.1/82517

of the formula against COVID-19 for ReiThera, an Italian public-private company with which the U. of Chile signed an alliance. This vaccine has also shown an immune response in 99% of the people who participated in a Phase II clinical trial to test its effectiveness and safety.[43]

The initiative seeks to recover Chile's capacity to produce vaccines in its national territory, something that was done for nearly a century, but which ceased in the early 1990s. The new premises are projected as a multipurpose plant with the capacity to produce 100 million annual doses of up to 5 different biopharmaceutical products. The enclosure will have an area of 7,000 m2 and an installed capacity of 4,400 litres for the initial stages of vaccine production, without considering packaging (fill & finish).[44]

43 University of Chile (2021). Available at: https://www.uchile.cl/noticias/179735/u-de-chile-construira-centro-productor-de-vacunas-en-parque-caren
44 University of Chile (2021). Available at: https://www.uchile.cl/noticias/179735/u-de-chile-construira-centro-productor-de-vacunas-en-parque-caren

European Parliament

Panel for the Future of Science and Technology (STOA), European Parliament, Nera Kuljanic, Virginia Mahieu, Carl Pierer, Gianluca Quaglio, Svetla Tanova-Encke, Theo Karapiperis

1. Introduction: facts and figures

Statistics on the severity of COVID-19

As of 30 August 2021, 36 307 572 cases of COVID-19 infection had been reported in the EU/EEA region. Most people who are infected with COVID-19 survive – infection fatality rate estimates have ranged between 0.17-1.7%. Yet the number of deaths is still striking due to the sheer number of people infected: as of 30 August 2021, 750 921 deaths had been reported in the EU/EEA[1] region.

Cancer

Healthcare services face multiple challenges in providing essential care to their patients in the midst of varying COVID-19 restrictions across the EU. For example, cancer care services have endured significant delays or cancellations leading to backlogs of patients furthering the already existing strains on healthcare systems. Prevention programmes, population-based cancer screening, and early detection services were suspended in many countries, and there are concerns about whether/how it is possible to deal with the backlog. Patients with potential cancer symptoms did not seek or sought late medical advice, resulting in missed or delayed diagnoses in the first round, and an increase of advanced cases and poorer prognosis in the second round. Cancer treatments and follow-up to treatments were often delayed or discontinued.

Several European medical societies carried out surveys to better understand the alterations in the care for patients with cancer. The European Society of Medical Oncology held a survey and reported that 44% of cancer surgeries were cancelled or postponed, and 10% of patients missed at least one cycle of chemotherapy. The European Society of Radiation Oncology also carried out a survey within their Society, revealing that 60% of departments saw a decline in patient volume; while the European Breast Cancer Research Association of Surgical Trialists reported an increase in time between diagnosis and treatment in 20% of 377 responding breast-cancer centres.

Surgery programmes, health research

Regular hospital infrastructure, such as postsurgical recovery units and operating rooms, were converted into intensive-care stations or isolation rooms, which often put regular surgery programmes on hold, and led many hospitals to close some or all of their regular wards. The pandemic also put patients, their families, partners and carers under emotional stress due to isolation and family disruption, as a result of the restrictions on visits to homes and hospitals.

The COVID-19 health crisis affected health research considerably, leaving facilities with financial and logistical challenges. For example, recruitment to clinical trials and the

[1] The European Economic Area (EEA) consists of EU Member States plus Iceland, Liechtenstein and Norway.

conduct of trials were severely affected, despite efforts by the Commission to simplify the management of trials.

Nonetheless, the pandemic sparked the use of innovative health technologies (e.g., telemedicine) in the mitigation of the detrimental effects on health-related services and research, and fuelled the drive to restructure existing health systems and make them more resilient for future health crises.

Mental health

The pandemic also had a widespread impact on people's mental health, inducing, among other things, considerable levels of fear, worry and concern. The growing burden on mental health has been referred to by some as the 'second' or 'silent' pandemic. While negative mental health consequences affect all ages, young people, in particular, have been found to be at high risk of developing poor mental health. Other specific groups were also hard hit, including health and care workers, people with pre-existing mental-health problems, and women. The pandemic has also appeared to increase inequalities in mental health, both within the population and between social groups. A July 2020 European Parliament resolution recognises mental health as a fundamental human right, calling for a 2021-2027 EU action plan on mental health. The European Parliament has also called on the Commission to put mental health at the heart of EU policy-making.

Secondary effects of COVID-19

The socio-economic impacts have also been dramatic. In the second quarter of 2020, seasonally adjusted GDP fell by 13.9% across the EU compared with the same quarter in 2019. Thanks to the widespread use of various short-term work schemes, employment was comparatively less affected, though there was still a registered decrease of 2.9% over the same time period.

The COVID-19 pandemic, due to lockdowns in Europe and in the rest of the world, severely affected the EU industries. Disruptions in multiple supply chains across a variety of sectors occurred, especially at the beginning of the crisis and particularly in the case of internationalised and complex value chains. Unprecedented policy responses have been initiated across Europe and the globe in an attempt to mitigate the impacts of this economic shock and to help the recovery. However, the pandemic has also created opportunities for certain segments of the economy, as consumers and businesses have radically changed their behaviours.

2. Using science and evidence in the crisis

The main mission of STOA is to provide Members of the European Parliament (MEPs), their Committees and other parliamentary bodies with high-quality, impartial and evidence-based information regarding science and technology. As such, STOA is not a legislative body itself and was not directly involved in policy-making during the pandemic. But rather, the resources STOA provided to support policy-making included evidence-based advice on the options for best courses of action through briefings and reports, as well as the opportunity for MEPs to directly exchange with scientists and other experts in two main ways: online events, workshops and roundtables, and interviews with experts published through the European Science-Media Hub (ESMH).

Over the course of the crisis STOA produced many relevant publications for MEPs in multiple formats, including several full-length studies, short ‘What ifs’, and workshops featuring key prominent speakers allowing MEPs and experts to directly discuss. The topics that were covered, to name but a few, included EU health-data governance, the

impact of social isolation, and key technologies to fight the coronavirus (vaccines, AI, thermal imaging, contact tracing apps).

The European Science-Media Hub (ESMH)

One strong asset of STOA particularly during the pandemic has been its ESMH, a platform for dialogue between policy-makers, scientists and media. Applying a rapid approach with faster, more journalistic-style publications, the ESMH team began reporting from the beginning of the COVID-19 crisis by publishing topical, well-researched and accessible information for a broad audience. During the crisis, the ESMH was able to quickly react to unfolding events, providing peer-reviewed information and interviews with experts to MEPs and citizens on topics such as vaccinations, treatments, dis- and misinformation, and the EU Digital COVID Certificate. In the course of 2020 the ESMH established itself as the main provider of COVID-related information on behalf of STOA.

In addition to its standard tools for providing MEPs with updates on the state of research (events, studies, interviews), the ESMH developed new means for monitoring and analysis in order to offer an overview of the main narratives and topics in public debates on social media platforms and in the traditional media coverage of the crisis. These included regular press reviews, monitoring of European responses to the crisis, and media and social media monitoring. These were complemented with audio-visual and multimedia products such as standalone infographics.

The COVID-19 crisis showed how crucial good interaction between policy-makers, researchers and media truly is for crisis management. Sound science communication, enhancing the value of scientific evidence, and reinforcing public trust in expertise are essential. In this context, the ESMH organised a series of events with MEPs and science journalists aimed at tackling the misinformation around COVID-19, also in the frame of the WHO events on the infodemic.

As the key to both effective scientific advice and foresight is a multi-disciplinary perspective, the types of experts involved in both STOA studies and events and in ESMH articles and interviews ranged from public health experts and epidemiologists, to behavioural scientists, social scientists, disinformation and conspiracy theory specialists, as well as science communicators and journalists.

Scientific advice to the European Union (EU)

The role of STOA is part of the overall effort to provide the Parliament – and the EU – with strong scientific advice. Other sources of scientific advice to the EU came for example to the Commission via the Scientific Advice Mechanism (SAM), comprising the Group of Chief Scientific Advisors and the SAPEA (Science Advice for Policy by European Academies) consortium, as well as the European Group on Ethics in Science and New Technologies, and directly to Commission President Ursula von der Leyen by special advisor Peter Piot. This final advisor was interviewed by the ESMH for its website in October 2020, strengthening the scientific advice network at EU level.

SAM and the two other bodies mentioned first produced a joint statement on scientific advice to European policy-makers, in which they outlined the challenges to giving sound advice in times of a crisis, the need for constant revision and monitoring of new research, as well as the importance of transparency and communication with both policy-makers and the public in all aspects of governance. This was followed by a Joint Opinion report on ‘Improving pandemic preparedness and management’, which proposed measures to prevent future pandemics by enhancing international coordination of the EU, strengthening healthcare and risk communication services, and supporting education and sustainable ways of living, all while upholding fundamental rights.

3. Using technology to cope with the pandemic

As part of its mission, STOA has assisted MEPs by mapping and analysing various technological solutions to cope with and fight the pandemic. On the EU level, the development of vaccines and the use of mobile apps to trace infections have received particular attention.

Contact-tracing apps

Early in the pandemic, contact-tracing apps were one of the most discussed innovative technological tools to help contain the spread of the virus. After a number of interviews published by the ESMH in May 2020 exploring the opportunities, challenges and limitations of digital tracing, STOA found, already in July 2020, that, amid privacy and cybersecurity concerns, the technology would not be able to deliver the promised outcomes without ensuring citizens' trust. In particular, STOA had also anticipated a reluctance of users to provide the required data, unless it was made clear that it would not be shared in the future with insurance companies, employers, or for other commercial purposes. These insights turned out to be prescient: more than a year and a half after the COVID-19 outbreak, the download rates of these apps across the EU are discouragingly low. As of 15 April 2021, Ireland's COVID tracker had been downloaded 2.4 million times – 49% of its population, the highest percentage in the EU – while Hungary's Virus Radar and Bulgaria's ViruSafe have the lowest relative numbers, corresponding to 0.8% of their respective populations. Among the reasons for this failed uptake, the reluctance of citizens to provide the data figures prominently.

Vaccine development

In the context of vaccine development, STOA has examined efforts to apply gene editing, synthetic biology and nanotechnologies to prepare and test future vaccines, treatments and diagnostics. In relation to gene editing, STOA had identified CRISPR/Cas9 as one of the most promising technologies. Despite CRISPR's advantages, such as affordability, ease of use, and widespread availability, STOA found that it remains ethically controversial and vulnerable to potential malicious misuse or even accidental mishap. For this reason, STOA suggested that the development of CRISPR-based diagnostics and of possible vaccines or therapies requires strong ethical oversight. Concerning synthetic biology and vaccines, STOA has suggested that, despite its great potential, it raises several difficult scientific, legal and ethical questions. These are associated with the development of synthetic life, cells or genomes and concern with their potential impact on the environment, biological diversity and human health. Finally, on nanotechnologies, STOA found that their application to medicine casts into doubt the adequacy of current risk assessment procedures, as the only common feature of nanoparticles is their size.

EU Digital COVID Certificate

STOA has been following the discussions on the EU Digital COVID Certificate from the very beginning of its implementation in July 2021. An article on the certificate published by the ESMH in June presented different views in the research community: while some researchers saw the certificate as an opportunity to develop an EU-wide standard in digital health, others raised concerns about fundamental rights, including non-discrimination and privacy, as well as about the underlying technical infrastructure of the certificate. It became very soon clear that the EU certificate was a crucial element in Europe's response to the COVID-19 pandemic, with close to 600 million certificates generated. As reported by the European Commission in October 2021: "The EU Digital COVID Certificate is a success worldwide: it has set a global standard and is currently the only system already in

operation at international level. 43 countries across four continents are plugged into the system, and more will follow over the coming weeks and months".

STOA will continue to follow the implementation and the (notably societal and ethical) implications of the use of digital technologies in the context of the pandemic with additional projects already planned in the near future.

4. Challenges and opportunities in dealing with STI

More than ever before, public health faces complex political, social, economic and environmental challenges, for which innovative and cross-cutting responses are needed. The multifaceted character of the current coronavirus crisis has highlighted these features, whilst also drawing attention to the fact that the EU, operating at supranational level, has until now only had a subsidiary role in the field of public health, essentially to 'complement national policies' defined in the Member States. There is no EU health system because Member States individually enjoy primary responsibility for organising and delivering their own health services. The EU does not support the organisation and provision of health services at Member-State level. Instead, EU action complements national policies and facilitates cooperation between Member States.

The initial response afforded by EU institutions was limited and widely criticised. However, as the pandemic progressed, the EU began to play a more active role. Prohibitions on exports of medical equipment were lifted, joint procurement was implemented, and Member States began to work together more closely, spontaneously developing converging regulatory procedures. Despite recent criticism aimed at the EU's vaccination strategy, the benefits of collective action have become more evident to Member States, and in response to crises the EU seems more adaptable and resilient than before. Experience from previous health crises has helped in improving EU health policy response during the COVID-19 crisis. The present pandemic, by far the biggest public-health crisis of the EU's history, could prompt the largest developments yet. Such collective action will probably progress in the future, with the input of individual Member States remaining crucial.

The EU response to the COVID-19 crisis has shown that its health policy is adaptable. In March-April 2020, the initial responses to the pandemic were primarily made by individual Member States, with the EU merely guaranteeing the free movement of goods and lifting export bans on medical equipment. In the following months the situation evolved and became more integrated: the RescEU and ReactEU budgets were expanded, the ECDC[2] and EMA[2] agency mandates were reinforced, and a significant budget was allocated to vaccine research. Although still limited if compared to other items in the EU budget, the new health programme, EU4Health, has been given a more robust budget, and greater responsibility for work within EU health systems. The joint procurement system was enhanced through the EU strategy for vaccines, and the EU pharmaceuticals strategy was approved. All these actions demonstrate a real change in vision and political engagement with EU public health policy, compared to the situation at the beginning of the pandemic.

The different national approaches to handling the pandemic reflect the different ways Member States structure and organise their own health systems, as well as their independence in defining their own national health policies. This cannot be ignored. However, Member States have shown themselves more predisposition to work collectively than in the past, as unquestionably attested by the rapid adoption and deployment of the EU Digital COVID Certificate. Having said this, it should be noted that, while EU health policy is attempting to expand – through public procurement, emergency planning, support

[2] ECDC: European Centre for Disease Prevention and Control; EMA: European Medicines Agency

to the health systems of Member States etc. –, considerable challenges remain, grow and evolve. These challenges are politically sensitive, and creates difficulties for EU health decision-makers. How they, the EU citizens, and the leaders of Member States react will be crucial if a 'renewed' post-coronavirus EU health policy is successfully developed.

5. STOA during the crisis

While STOA itself is not a legislative body, the Members that make up its Panel are also members of legislative committees. Supported by STOA and along with the work of the committees such as ITRE and ENVI, MEPs took an active role in shaping EU policy in response to the crisis.

Early on in the pandemic, 23 April 2020, STOA organised a meeting where MEPs discussed with high-level experts the impact of the pandemic, as well as STI solutions and policy options in response to the crisis. One of the main findings of this meeting was that the data, on which national strategies are based, remained imperfect and did not allow experts to reach solid conclusions about the behaviour of the virus, or develop long-term strategies.

Furthermore, a STOA study on the EU health data strategy (presented in a STOA Panel meeting and soon to be published) revealed that there is no comprehensive health data architecture or governance at EU level, and therefore no common data collection method or shared infrastructure. This became problematic during the pandemic, as it hampered the Member States' ability to rapidly and reliably share cross-border health information. In order to strengthen EU-wide health capacities in terms of both communicable and non-communicable (e.g. cancer, obesity) diseases, and better prepare in the face of future cross-border crises, the study recommends options for health data governance at EU level through a common European health data space (see also next question).

Through articles and interviews with researchers, the ESMH also explored the potential of data sharing and the EU initiatives related to digital health, mathematical modelling and forecast for preventing pandemics, and the challenges related to the EU digital COVID certificate. The ESMH also published a Digital Humanities Series of articles covering different aspects of the digital communication and life online in the EU during social distancing in 2020.

In the first months of the crisis, STOA collected a non-exhaustive list of initiatives (by the EU and other organisations) related to the pandemic that aim to facilitate the exchange of information and enable contacts between different stakeholders at the European level and beyond. This list was published on the ESMH website. Part of these initiatives have given rise to platforms where people can store and share datasets. Most of them are related to research and innovation. Other links in this list represent useful data collection platforms in multidisciplinary areas. This mapping exercise covered the period from 1 April 2020 to 15 June 2020.

Another important issue of concern for the MEPs has been the digital revolution and its disruptive effects upon democracy and the protection of civil liberties and human rights, especially in the context of the current pandemic. STOA hosted a lecture and a discussion with Shoshana Zuboff, a world-class thinker on 'surveillance capitalism' and other experts. It examined the impacts of digital technology on democratic decision-making and the notion of democratic citizenship, and investigated the challenges associated with the growing datafication of our societies and the need to reclaim data sovereignty in the era of artificial intelligence.

As the COVID-19 crisis has had impacts on many supply chains, it has given an impetus to the discussion on EU technological sovereignty. STOA Members were particularly

interested in how the EU is performing in developing and protecting ownership and know-how in the areas of critical technologies (Key Enabling Technologies), especially in comparison with strong global players such as China and the US. A recently completed STOA study on this topic will be published soon.

STOA is currently finalising a study on psychosocial and mental health effects of the pandemic (including the responses of Member-State governments to contain the pandemic) on the EU citizens, which seems to be the first attempt to synthesise available scientific evidence on this issue for the EU population. The findings will assist MEPs in proposing initiatives to protect vulnerable population groups and to ensure a resilient response of European citizens in view of the current pandemic as well as potential future crisis situations.

Through STOA's activities related to COVID-19, several key lessons have emerged as valuable for tackling future crises. First and foremost, it became evident that the link between citizens, researchers and policy-makers is vital for effective public communication and to mitigate the spread of disinformation. This is indeed the primary goal of STOA and the ESMH, and it proved its importance and effectiveness during the pandemic. Furthermore, following trends on media and social media gives insight for policy-makers into how the public perceive measures and regulations, as well as on the spread of disinformation. Combining this approach with identification of sound information through experts allows for better informed political decision-making based on the reality of the situation for citizens. Of course, better communication between scientists, the public and policy-makers also allows for better dissemination of data, enhances multi-disciplinary peer review and potentially could provide an early warning for future crises.

6. Lessons for a post-COVID world

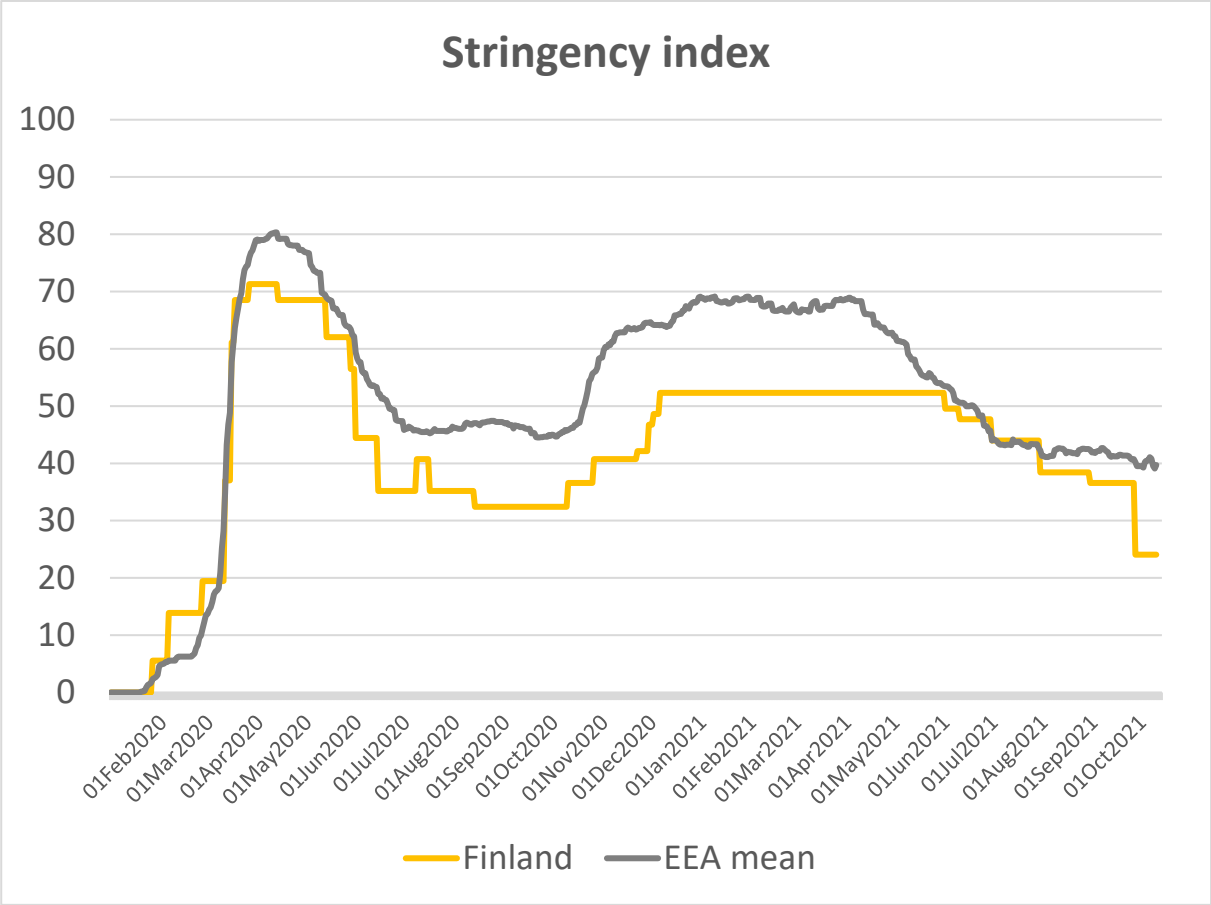
STOA has explored this question through its foresight intelligence activities. Working with radars in its horizon scanning activities, STOA expects the most significant changes in a post-COVID world to affect the areas of services & consumption, economy & trade, social & political preparedness, health & wellbeing, working & living, and industry & manufacturing. While most of the expected changes are linked to ongoing trends and developments, such as digitalisation or AI advances, and issues such as the climate crisis, the pandemic has exposed or accelerated the respective transformations. For instance, in relation to services & consumption, STOA has confirmed that the platform economy will continue to be a dominant driver of change. This is related to phenomena such as data consumption, zero-contact services, as well as automated supermarkets.

Finally, as identified by the aforementioned STOA study on health data, there is a weakness in the way the EU currently records and shares health data across its internal borders. This weakness was brought to light by the COVID-19 crisis and the way it is addressed is likely to be one of the most lasting changes at the level of EU governance as a result of the pandemic. The study made recommendations for the future governance and infrastructure for supporting a common European health data space, the form of which could range from a temporary structure attached to an existing agency to a separate permanent standalone agency. If a permanent structure is created to oversee health data in the EU, this will both add to the already pressing discussions on data sovereignty, and could change the EU approach to health.

Finland

Committee for the Future, Parliament of Finland, Maria Höyssä (Senior Advisor) and Olli Hietanen (Committee Counsel)

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

The following facts and figures from October 1st, 2021, illustrate the situation in Finland:

- Total number of infections: 143 182
- Total number of deaths: 1 118
- People vaccinated once: appr. 4 100 000 (74,6 % of entire population = 84 % of +12 years old population)
- People vaccinated twice: appr. 3 500 000 (63,4 % of entire population = 71 % of +12 years old population)
- People vaccinated thrice: appr. 37 000 (appr. 0,7% of entire population)
- The percentage of distant work by state employees rose from 21% to 52% during 2020.

- The percentage of distant work by state municipal employees rose from 10% to 16% during 2020.
- The percentage of distant work by private sector employees rose from 15% to 26% during 2020.
- The turnover of event industry firms decreased by 22% and profitability decreased by 65% during 2020.
- The number of calls to mental health help centres increased by 30% during 2020.
- The number of calls to domestic violence help units increased by 50% during 2020.

2. Using science and evidence in the crisis

The Finnish Institute for Health and Welfare (THL) is the leading expert organization in Finland. It supports the decision-making of the Ministry of Social Affairs and Health. THL followed the spreading of COVID-19, and issued memoranda over the issue for the Government, starting from January 1st, 2020. THL organized the first press conference on COVID-19 mid-February 2020. THL and the Ministry of Social Affairs and Health started to organize weekly COVID-19 press conferences in spring 2020.

According to a study on the Government's crisis management during the COVID-19 pandemic and the experiences of the implementation of the crisis law (Mörttinen, 2021), experts were widely heard at various stages of decision-making, but due to the rapid unfolding of the events, the hearings were often done in a hurry. In spring 2020, expert knowledge concerned mostly epidemiologic issues. One issue where expert views diverged was the pros and cons of using masks. Subsequently, THL gave mask use recommendations on August 13th, 2020, relatively late compared to the international context.

According to the above study, decision-makers and especially civil servants felt that in spring 2020, there was a lack of more holistic expert knowledge, such as with regard to its impacts on the economy, business, labour, as well as social and juridical perspectives. The health perspective was often felt to be too dominantly guiding decision-making. Most of the interviewees of the study also felt that decision-making was focused on short-term issues, with more future-oriented views starting to open up only after the "Exit strategy and aftercare working group", appointed in April 2020 and led by Secretary of State Martti Hetemäki (first report in early May 2020 and second report on June 6th, 2020). The working group heard a broad group of representatives of business, communities and NGOs, and followed developments in other countries. A scientific expert panel consisting of experts on social policy, education policy, economic policy and environmental and climate issues was set to support the work of the working group.

However, already from February 2020, most of the universities started to publish lists of experts from whom media and decision-makers could ask COVID-related questions. These lists included experts also from the aforementioned broader fields.

Finland utilized its crisis legislation during two periods: from March 17th to June 16th 2020, and from March 1st to April 27th 2021. The emergency restrictions considered potential measures from the perspectives of fundamental rights, with an emphasis on fundamental right to health and good life and the right to social and health services. The emergency period saw very general and extensive restricting of physical contacts among the population to contain the spreading of the virus, to secure the functioning of health care and to protect people in the risk groups. In between and after the emergency periods, COVID-19 measures were guided by the Communicable Disease Act, which is implemented in the regional level by regional authorities. Especially in the transition period, there was some confusion over the judicial status of national guidelines issued by the Ministry of Social Affairs and Health and the views expressed by the THL. For instance,

the city of Turku did not wait for THL's national mask use recommendation, but instead gave its own recommendation for use of masks in public transport a week earlier. From summer to autumn 2021, some regions have relaxed the restrictions slower than the national guidelines have recommended, based on the regional authorities' assessment of the local situations.

With regard to the parliament's role, expert hearings are routinely integrated to parliamentary handling of Government's proposals. In spring 2020, the Parliament reduced the handling of non-urgent matters to develop virtual handling practises and to also speed up the handling of government proposals to implement and apply crisis legislation in the relevant Parliamentary Committees. During the pandemic, many of the Committees' expert hearings have been arranged virtually, but their status has remained the same as in normal times.

Materials (in Finnish) relating to the handling of the COVID-19 pandemic are gathered to a specific webpage on Prime Minister's Office website (https://valtioneuvosto.fi/tietoa-koronaviruksesta/paatosaineistot). The page lists all the related government decrees, proposals and decisions (multiple ones per week). The site also has links to all government press conferences, factsheets (also in languages of major minorities in Finland), results of "Koronapulssi" (regular citizen surveys relating to feelings and attitudes during the pandemic), assessments of the impacts of COVID-19 measures as well as links to COVID-19 research overviews, that have been published regularly since August 2020. These research overviews are 3-weekly published summaries of the most interesting international COVID-19 related research results from wide range of fields. Each field is reported on by an experienced academic researcher. The topics include infection, health impacts, economy, education, technology, environment, international relations and security, human behaviour, resilience and foresight.

3. Using technology to cope with the pandemic

The Koronavilkku contact tracing application developed by THL was launched in August 2020. By November it had been downloaded 2.5 million times (total population: 5.5 M). Those with a COVID-19 diagnosis get a code from a doctor that they can use in Koronavilkku app to automatically alert (anonymously and without the use of location data) other users of Koronavilkku that were close to the diagnosed person's phone of possible infection spreading. There was some discussion in the media after the initial enthusiasm, as some health care professionals noted the uselessness of the application in contact tracing (due to strong privacy protection and lack of location information), yet it runs quietly on most phones to date as an additional pandemic management tool. Its significance is to alert the user about possible exposure to COVID-19 and offer an easy access to further guidance.

A "COVID-19 passport" is currently (13/9/21) being planned, but the details are not yet clear.

4. Challenges and opportunities in dealing with STI

A contingency plan for a pandemic outbreak had been made in 2006 and 2012. There had also been a rehearsal or simulation across the government administration before making the first plan. The following description has been freely translated from Mörttinen 2021, p. 12:

"The 2006 contingency plan raised the need to add global pandemic outbreaks to Emergency Powers Act. This addition was in force when the national contingency plan for an influenza pandemic was updated in May 2012. The update was preceded by the swine flu epidemic and WHO's exhortation to renew such plans. Between the two plans, on April

29 2009, a pandemic prevention group was created under Ministry of Social Affairs and Health (…). The group was ended at the last days of Sipilä Government, on February 26, 2019. (…). A year from that, the COVID-19-pandemic was a reality. In the introduction of the 2012 plan, it was stated that 'next update will be made after the WHO update and the renewal of Communicable Disease Act'. However, updates had not been made by spring 2020. Pandemics were left to the last places in lists of potential threats. For instance, in Finnish Government programs, cyber threats and radicalisation issues dominated the security agenda."

The risk of "pandemic influenza or similar widespread epidemic" had featured in the National Risk Assessment 2018, along with 19 other risks. A potentially actualised pandemic was evaluated to have a direct negative (but not severely compromising) impact, especially on functional capacity of the population and services and on psychological resilience. An indirect negative impact was anticipated on defence capability; internal security; and economy, infrastructure and security of supply. Only minor impacts were estimated on leadership and on international and EU activities.

Mörttinen 2021 mentions an interesting study stemming from a Romanian-Finnish collaboration. During its EU Council presidency, Romania focused strongly on hybrid threats and worked with the European Centre of Excellence for Countering Hybrid Threats (HybridCoE), which is based in Finland. A desktop rehearsal was made to explore how decision-making would work in a scenario where an artificially induced pandemic would be used to influence voting in an EU country. The virus chosen for the simulation operated in a very similar manner as COVID-19, and was anticipated to lead to quick shortages of intensive care, which in turn was envisioned to decrease the functioning of international health care collaboration. Also, the negative impact of sectoral "silos" on communication and decision-making became evident in this desktop rehearsal. According to Mörttinen (2021), the results of this rehearsal were not formally utilised in Finnish decision-making, but they were brought to the attention of the core decision-makers during the first phase of the COVID-19 outbreak, and most likely boosted the actions that government took in late March 2020.

In contrast to many other countries, Finland does have fairly extensive emergency supplies, managed by the National Emergency Supply Agency. The Agency was at the centre of great media attention in relation to storing, purchasing and delivering of masks during the pandemic. The Agency's activities have been recently evaluated (Ministry of Economic Affairs and Employment; Yle Uutiset)

The Government has had the Ministries make impact assessments of COVID-19 policies (25/9/2020) from the perspectives of population level health, social, economic and fundamental rights. The more specific topics included impacts of testing and tracing; keeping physical distance; distant work; mask recommendation; protection of aged people and risk groups; distant learning in basic education; restrictions on restaurants and bars; closing of public spaces; closing of public service spaces; restrictions on cross-border travel; restrictions on public events; restrictions on public gatherings. The report ends with the notion that foresight remains hazy for the next 6 months. According to various studies, the long-term impacts of the epidemic may cause changes in people's beliefs and expectations, which calls for increasing attention to the perspectives of behavioural sciences. Later impact assessments (the latest published on 18.6.2021) have focused on regional differences in many economic and social indicators.

5. The Committee for the Future during the crisis

As a response to the foresight challenge posed by the coronavirus crisis, the Committee for the Future decided to test a new approach and launched a three-step data acquisition

initiative to create a situational picture of the COVID-19 pandemic and to anticipate the consequences of the pandemic. The value of the work is two-fold: it enables the members of the Committee, who are MPs, to deal with the situation in an informed and future-oriented manner, and it enables the Committee to make informed and insightful statements when handling issues related to Government and EU policies. Other benefits are more indirect.

The first step was to compile a list of all questions the members wanted immediate answers to. These questions concerned, for example, the control measures for the pandemic, the pandemic's impacts on social structures and crisis resilience, businesses and the economy, impacts upon education etc. The questions were sent to dozens of appropriate experts as requests for comment. Instead of addressing the responsible authorities, the requests were sent to a wider research community. This way the policy-makers could hear a variety of research perspectives, including critical ones.

This new direct approach to requesting expert statements generated another experiment related to statements: the coordinators and program directors of projects financed by the Strategic Research Council developed a new process that helps produce collective answers quickly by utilising the entire knowledge base of strategic research. The Committee for the Future received approximately 300 pages worth of statement material for immediate use.

The second step was to ask some 20 experts to provide slightly more comprehensive reports on the potential positive and negative consequences of the COVID-19 pandemic in the short and the long term. These were published as a report. The Committee members have repeatedly referred to the usefulness of the variety of these perspectives for their own work.

The third phase of receiving statements took place in autumn 2020, when the more comprehensive reports commissioned by the Committee were completed. These reports assessed how the possibility of a pandemic was presented in recent leading international foresight reports, and which other yet-unrealised risks these reports highlight. The Committee also looked into uses of technology to control the pandemic and how the pandemic is influencing technological development.

This example also highlights the Committee for the Future's special role in Parliament: when the legislative committees focused on Emergency Power Acts needed here and now, the Committee for the Future detached itself from day-to-day politics and considered the long-term effects of the pandemic and how to develop the foresight system in a way that allows us to detect critical risks better than before.

6. Lessons for a post-COVID world

The pandemic has extensively increased distant learning and distant working. The level of distant operating will likely remain higher after the pandemic than before it. As it has become obvious that suitable technologies exist, the discussion is focusing upon how to use the distant working technologies in a liberating and productive manner, without adverse social, psychological and health effects. There has been a lot of discussion on the quality of leadership, and of how distant workers could be better supported by management. It seems likely that immersive virtual presence and possibly also gaming-like tools will be the next big thing in both distant working and learning.

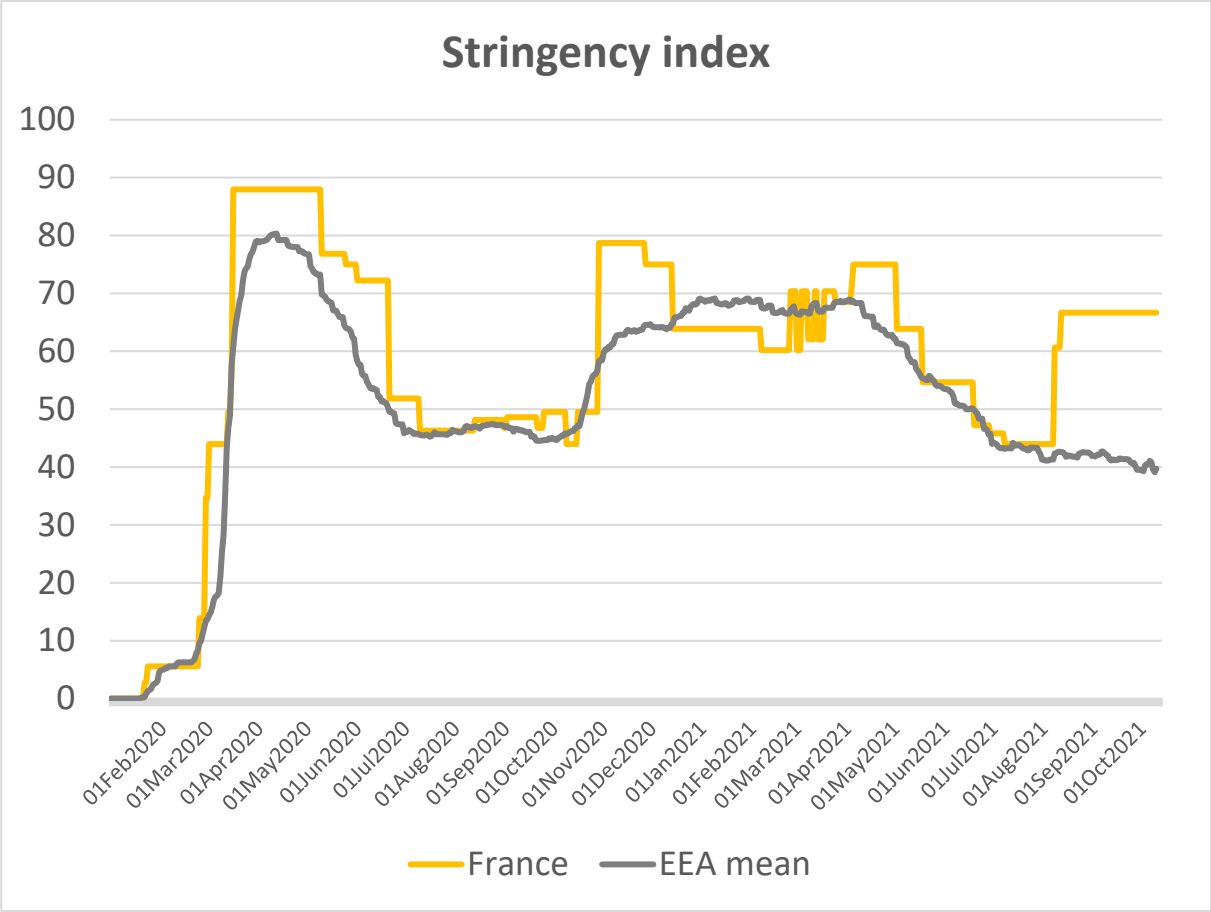
From a regional perspective, increasing the broadband coverage in areas that have seen a reduction of their population will probably remain an important discussion and policy point, as many of these regions benefited from people doing distant work from summer cottages and second homes.

The security of supply and the functionality of international value chains have turned out to be more vulnerable than expected. This may lead to development of various back up supply systems for critical assets of industry, as well as emergency supplies in general. The pandemic may also boost the development of technological solutions to sustainable development, as COVID-19 has revealed the vulnerability of our accustomed way of life, which increases the value of resilience-enhancing solutions in the eyes of investors. This development may be accelerated by the EU stimulus package, the EU Taxonomy and the EU Commission's Proposal for a Corporate Sustainability Reporting Directive (CSRD)

France

Office Parlementaire d'Evaluation des Choixs Scientifiques et Technologiques (OPECST), Bénédicte Rougé

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

France is one of the countries most affected by the virus, with, on August 1st 2021, 6.21 million confirmed cases and 112,000 deaths (i.e. 1,659 deaths per million inhabitants, which is above the European average of 1,519 deaths per million). A study estimated that 22.7 % of the population in mainland France would have been contaminated by COVID-19 by 9 April 2021[1]. In terms of mortality, as in the other countries, the people over-65s, and particularly over-85s, have been the most affected.

France had to deal with a particularly strong first epidemic wave, which started in March 2020, resulting in 27,300 additional deaths over the months of March and April 2020 compared to the same period in 2019. While the epidemic had come to a low point during summer 2020, France underwent a second wave from September 2020, which was, in

[1] "Proportion de la population ayant été infectée par SARS-CoV-2" (Proportion of the population infected with SARS-CoV-2), Institut Pasteur, April 2012 (https://modelisation-COVID19.pasteur.fr/realtime-analysis/infected-population/).

contrast, of a similar intensity to that experienced by other European countries. The widespread containment measures taken in the initial shock in March 2020 were not repeated in this second wave, due to their socio-economic impact and decreasing social acceptability, and were replaced by less restrictive and more targeted measures. Thus, although less intense, this second wave lasted longer and the surplus of deaths between September and December (compared to 2019) is ultimately larger than that of the first wave (+34,300). Moreover, this wave did not give way to a lull, as France had experienced during the summer, but to a high plateau that lasted until the emergence of the third wave, coming from the Alpha variant circulation, in May 2021. Although the situation in France subsequently returned to a low level of virus circulation, probably thanks to the first effects of vaccination, France now fears the emergence of a fourth wave, corresponding to the arrival of the Delta variant, and foreseen by epidemiological models in the late summer.

The French vaccination campaign began in January 2021, through the European Union's common purchasing programme. As in other European countries, the vaccination strategy prioritized the most vulnerable people and those at high risk of exposure. The initial pace of delivery of doses was criticized as being too slow and as being one of the main obstacles to the French vaccination campaign. However, the latter lagged behind other EU Member States, even though they benefited from the same delivery rate. This delay might partially be explained by the priority given to the elderly, who are more difficult to mobilise than health care workers. As France has a particularly low estimated adherence to vaccination compared to most economically advanced countries, France has initially not implemented an incentive campaign or indirect pressure to vaccination. However, as this backlog has not been cleared despite the opening of vaccination to the entire adult population, and in view of the drop in daily vaccinations and the prospect of a fourth wave, it was decided to make vaccination of health professionals compulsory and to make access to many places conditional on holding a health pass[2]. The announcement of these measures was followed by an upsurge in vaccination, with 52.6 % of French people having completed their vaccination cycle and 63.2 % having received at least one dose by August 1st[3]. The government's objective is to reach 50 million first-time vaccinations by the end of August (which represents 74.2 % of the French population).

Although the crisis will probably have an additional indirect health impact, mainly due to hospital deprogramming (which has led to postponements of diagnoses and treatments) as well as the impact of the crisis and restrictions on mental health, it seems too early at present to be able to estimate the extent.

The measures taken to contain the epidemic caused an unprecedented economic shock, mainly due to reduced mobility. France has been particularly hard hit, with gross domestic product (GDP) falling by 8.3 % in 2020. The recession is significantly stronger than in Germany (-5 %) and slightly higher than the average for the euro zone (-7.5 %). Thanks to a massive public effort to preserve the economic and social fabric, employment has been relatively preserved compared to previous economic crises. However, there are uncertainties regarding certain key sectors of the French economy (aeronautics, tourism) and the upcoming state of the labour market, particularly for the most precarious populations (people with low level of qualification or social integration). Besides, the effort taken on by the State might weigh heavily on public finances and accentuate the unfavourable position of France, which is already highly indebted, in the euro zone.

[2] See sub-section “3. Using technology to cope with the pandemic”.
[3] As a comparison, by July 1st, 34.5 % of French people had completed their vaccination cycle and 50.6 % had received at least one dose.

2. Using science and evidence in the crisis

To deal with the health crisis linked to the COVID-19 epidemic, the French government, endowed with a "*Conseil de défense sanitaire*" (Health Defence Council), has surrounded itself with numerous advisory bodies.

Among these, we can first of all mention the pre-existing structures: the "*Haute Autorité de santé*" (French Health Authority, which is an independent public authority that gives its opinion on the evaluation of health products, professional practices and the organisation of care and public health), the "*Haut Conseil de la santé publique*" (French Public Health Council, which is, for its part, responsible for assisting the public authorities in public health decision-making) and the "*Comité consultatif national d'éthique*" (National Consultative Ethics Committee, which is an independent consultative body which can be consulted – but can also act on its own initiative – on ethical problems and social issues related to medicine and health).

Health professionals have also been able to play an advisory role at a national level, notably through National Academies of Medicine and Pharmacy (which have respectively expressed their opinions in their fields of competence through various statements) and through National Orders of Physicians and Pharmacists (which are private bodies mandated to carry out a public service function, to which practising physicians and pharmacists are obliged to register, and which have also expressed themselves through statements).

In addition to these different structures, other advisory bodies have been created to address the specific needs of the COVID-19 crisis.

At the beginning of March 2020, the "*Conseil scientifique COVID-19*" (COVID-19 Scientific Council) was set up to provide scientific and reactive insights into specific and concrete issues related to the management of the Coronavirus health crisis. In addition to renowned epidemic and infection specialists, the 13 members include a sociologist and an anthropologist. Its opinions regularly review the state of knowledge about the virus and propose measures to curb its spread. Shortly afterwards, another body with a more operational focus, composed of 12 researchers and physicians, was also created: the "*Comité analyse, recherche et expertise*" (Research, Analysis and Expertise Committee). Its role was to advise the government specifically on programmes and doctrine relating to treatment, testing and backtracking practices to identify people in contact with those infected by the virus. However, this committee was only mobilised for the first wave of the pandemic and ceased its work in June 2020.

Regarding the specific issue of vaccination, here again, several bodies have been created. Firstly, the "*Comité scientifique sur les vaccins COVID-19*" (Scientific Committee on COVID-19 Vaccines), responsible for informing the government on the various vaccines. As regards the vaccine strategy, a specific council has been created ("*Conseil d'orientation de la stratégie vaccinale*", Vaccine Strategy Guidance Council) to provide scientific advices on the government's strategy, as well as a citizens' council ("*Conseil citoyen sur la vaccination*", Citizens' Council on Vaccination), representing French society as a whole[4], to raise the doubts and fears aroused by vaccination against COVID-19. It is also worth noting that the views of civil society were also expressed through the "*Conseil économique, social et environnemental"* (Economic, Social and Environmental Council), which is a French constitutional assembly composed of social representatives (employers,

[4] This council is composed of 30 citizens and 5 substitutes drawn by lot according to age, gender, region, level of education, socio-professional category and type of housing.

trade unions, associations) and which created a temporary commission on the term of vaccination against COVID-19[5].

Following its mandate, the Parliament played several roles during the health crisis. On the one hand, it legislated on emergency health and economic measures to cope with the COVID-19 epidemic, a role in which the Office's informative reports and briefings were particularly useful. On the other hand, it fulfilled its role of controlling the government's action. To this end, the National Assembly has set up a fact-finding mission on the impact, management and consequences in all its dimensions of the COVID-19 epidemic[6]. The Senate, for its part, has set up an inquiry committee to evaluate public policies in the face of major pandemics in the light of the COVID-19 health crisis and its management[7], as well as a joint fact-finding mission to evaluate the effects of the measures taken or envisaged in terms of lockdown or restrictions on activities[8].

The President of the Republic Emmanuel Macron has also entrusted the infectiologist and epidemiologist Didier Pittet with a mission to independently evaluate the way the French executive has dealt with the epidemic[9].

3. Using technology to cope with the pandemic

From the summer of 2020, and like many countries around the world, France has decided to use a contact tracing application to break the chains of contamination. The *StopCOVID* application was thus launched on 2 June 2020 using a centralised protocol (i.e. the risk identification work is carried out by a single server)[10] in order to ensure absolute anonymity and to use a "sovereign" solution[11]. However, this decision has led to problems with the effectiveness of the application for several reasons: the impossibility for the application to run in the background on *iPhones* (unlike the solution developed by Apple and Google, which can run continuously) and the non-interoperability with applications from other countries, whereas the other European applications are compatible with each other.

Yet, the main obstacle to *StopCOVID*'s effectiveness was its very low usage: in September 2020, the application had been downloaded 4.5 times per 100 inhabitants, compared to 9.1 in Spain, 9.8 in Italy, 15.0 in the UK and 22.1 in Germany for similar applications. Moreover, as the application is not interconnected with the SI-DEP[12] database (containing the results of virological tests), the application requires users to report their infection themselves, which was only done for a very small proportion of recorded cases. In order to inject a new dynamism, the *StopCOVID* application was transformed on October 22nd into

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[5] It was notably under the aegis of this commission that the citizens' council on vaccination was created.
[6] "Impact, gestion et conséquences dans toutes ses dimensions de l'épidémie de Coronavirus-COVID 19" (https://www2.assemblee-nationale.fr/15/missions-d-information/missions-d-information-de-la-conference-des-presidents/impact-gestion-et-consequences-dans-toutes-ses-dimensions-de-l-epidemie-de-coronavirus-COVID-19/(block)/68851).
[7] "Commission d'enquête pour l'évaluation des politiques publiques face aux grandes pandémies à la lumière de la crise sanitaire de la COVID-19 et de sa gestion" (https://www.senat.fr/commission/enquete/gestion_de_la_crise_sanitaire.html).
[8] "Mission commune d'information destinée à évaluer les effets des mesures prises ou envisagées en matière de confinement ou de restrictions d'activités" (http://www.senat.fr/commission/missions/evaluations_des_mesures_en_matiere_de_confinement.html).
[9] "Mission indépendante nationale sur l'évaluation de la gestion de la crise COVID-19 et sur l'anticipation des risques pandémiques" (https://www.vie-publique.fr/rapport/279851-gestion-crise-COVID-et-anticipation-de-risques-pandemiques-rapport-final).
[10] The protocol used is called ROBERT (ROBust and privacy-preserving proximity Tracing) and has been developed by Inria (French National Institute for Research in Digital Science and Technology) and the German Fraunhofer Institute.
[11] This choice differs from most countries, which mostly prefered the decentralised Exposure Notification protocol, jointly developed by Apple and Google. In Europe, only Hungary has also opted for a centralised protocol, as have Singapore, Australia and Hong Kong worldwide.
[12] "Système d'Informations de DEPistage" (Screening Information System).

TousAntiCOVID, a more interactive version with additional features[13]. While these improvements have made up for some of the backlog, they do not address the above-mentioned weaknesses of the application. Thus, although the French application has not been the subject of an impact assessment, it would appear that the actual impact has been relatively small. However, a survey conducted by several European media[14] showed that a similar observation could also be made about most European contact tracing applications – even when they used a decentralised protocol and managed to achieve greater popular adherence – because of the optional nature of these solutions and the absence of data crossing with other databases.

In addition to its contact tracing purpose, the *TousAntiCOVID* application can be used via its "*Carnet*" (notebook) functionality to securely[15] store test or vaccination certificates in a smartphone, as part of health pass measures. Although initially opposed to such measures, France was the first Member State to introduce a scheme corresponding to the "green certificate", adopted by the European Parliament to facilitate travel within the European Union. One month later, at the end of May, a bill containing the necessary legislative basis to make access to certain places, establishments or events conditional on the possession of a health pass was approved by Parliament[16]. This pass was initially only required for access to large gatherings of more than 1,000 people but, confronted with the prospect of a fourth wave, the law was amended by decree to apply, since July 21st, to all leisure and cultural venues with more than 50 people. Besides, a new law was approved by Parliament at the end of July to extend the health pass, from August 9th, to cafés, restaurants, trade fairs and exhibitions, as well as to planes, trains, long-distance buses and shopping centres by decision of the prefects.

Technology also played other roles in the management of the health crisis. Several interesting initiatives have been launched, such as wastewater analysis projects (COMETE and Obépine networks) to monitor the circulation of the virus at an early stage, as well as the CoData initiative, which brings together companies and computer scientists to collect and analyse data on the Coronavirus and the health crisis. A young computer scientist, Guillaume Rozier, has also created a data visualization website, COVIDTracker, to track the pandemic using figures available in open data. Besides, as the vaccination campaign was mainly organised through online appointments, the French unicorn Doctolib, offering an online medical appointment service, played an important role in its organisation[17]. Finally, the French Academy of Technology produced a report on the role of modelling and data in managing the crisis[18].

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[13] These features include: general information on the disease and barrier measures, statistics on the epidemic at national and local level, the possibility of downloading the pre-filled certificate for lockdown and curfew, a map of testing (and then vaccination) centres.

[14] Investigation carried out in the framework of the "Spooky Mayfly" operation by four European media: "Le Monde" (France), "VRT" (Belgium), "Die Zeit" (Germany) and "The Investigative Desk" (Netherlands). See: “Contre le COVID-19, l’utilité des applications de traçage des cas contacts impossible à mesurer” (Against COVID-19, the usefulness of contact tracing applications cannot be measured), Le Monde, May 2021 (https://www.lemonde.fr/pixels/article/2021/05/21/COVID-19-l-impossible-mesure-de-l-utilite-des-applications-de-tracage-des-cas-contacts_6080953_4408996.html).

[15] The application does not know the identity of the user.

[16] The health pass corresponds to the possession of a recent negative test result, a proof of vaccination or an attestation of recovery from an infection (i.e. an old positive test).

[17] Guillaume Rozier, for its part, launched the ViteMaDose application on this occasion, which makes it possible to quickly and easily find a vaccination slot near your home.

[18] “COVID-19 : Modélisations et données pour la gestion de crises sanitaires“ (COVID-19: Modelling and data for health crisis management), Académie des Technologies, May 2021 (https://www.academie-technologies.fr/blog/categories/publications-de-l-academie/posts/COVID-19-modelisations-et-donnees-pour-la-gestion-de-crises-sanitaires-rapport)

4. Challenges and opportunities in dealing with STI

The aforementioned reports conducted by the two chambers of Parliament, as well as the independent report conducted by Dider Pittet, have highlighted several shortcomings of the French government in its management of the health crisis. In addition to organisational issues, the crisis has shown some weaknesses in the way policy makers deal with STI.

First of all, one can deplore a delay in the national awareness of the seriousness of the situation and the activation of a coordinated response, despite early alerts from the scientific community. The "*Conseil scientifique COVID-19*" (COVID-19 Scientific Council) and the interministerial crisis unit were respectively set up on March 11th and 17th, making it impossible to identify in advance the difficulties encountered subsequently, particularly in terms of logistics. This lack of anticipation was recurrent during the crisis, with delays in the taking of many decisions, particularly with regard to the curbing measures put in place to deal with the emergence of new epidemic waves[19].

The French government also proved to be inadequately prepared for a health crisis of this magnitude. The strategic stockpile of FFP2 masks has been reduced from 700 million units in 2011 to 100,000 at the end of 2019, leading to a shortage during the first epidemic wave, complicating the already critical situation of hospitals that had to deal with the epidemic outbreak. Likewise, the testing capacity and information systems needed to count cases, hospitalisations and deaths attributed to COVID-19 have also been lacking at the beginning of the crisis.

At the research level, the exceptional mobilisation of all the players has enabled numerous initiatives to be implemented in record time. However, this effort, as remarkable as it is, has come up against significant structural and strategic unpreparedness. In the absence of national coordination and support for fundamental research in the past years, France has yet shown itself to be both unable to develop a vaccine and therapeutic solutions against COVID-19.

Finally, the public authorities' crisis communication did not succeed in imposing clear and coherent messages and the multiplication of scientific bodies, as presented above, did not facilitate the expression of a visible and identifiable scientific viewpoint. This proved to be all the more problematic in the face of the large quantity of contradictory information – sometimes of questionable scientific legitimacy – that flooded the media and social networks. Although based on WHO recommendations[20], statements about the lack of interest in wearing a mask in the general population (which was later made compulsory), fuelled the mistrust of part of the population with regard to health recommendations, which did not seem to be dictated on a scientific basis. The French controversy surrounding hydroxychloroquine, advocated by Dr Didier Raoult despite the absence of results from studies complying with the standards of clinical research, is another example of the failures of government communication, the President of the Republic having paid a visit to the infectiologist in April 2020 while the seriousness of his studies had already been questioned. These various failures and setbacks have led to a loss of confidence by a certain part of the population in the government's word and is probably at the origin of one part of the important movement against COVID-19 vaccination in France.

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[19] However, it can be pointed out that public acceptance of health control measures is paramount and that, although constraints are more effective the earlier they are imposed, acceptability is strongest when decisions appear to be unavoidable.

[20] Dr Michael Ryan: "We don't generally recommend the wearing to masks in public by otherwise well individuals because it has not been up to now associated with any particular benefit." World Health Organisation, COVID-19 Virtual Press Conference, March 2020 (https://www.who.int/docs/default-source/coronaviruse/transcripts/who-audio-emergencies-coronavirus-press-conference-full-30mar2020.pdf?sfvrsn=6b68bc4a_2)

5. The OPECST during the crisis

The scale of the health crisis has put science at the centre of the media and political debate, while simultaneously mobilising a large part of the scientific community, which has produced a huge number of academic studies on the various subjects related to COVID-19. Thus, more than ever, the role of the Office has been particularly important in providing parliamentarians with relevant and rigorous information on technical subjects[21]. Throughout the crisis, the Office sought to provide up-to-date information on the different scientific and technical aspects relative to the pandemic, through numerous expert hearings, notes, briefings and reports. In addition to providing those much-needed insights into many complex issues, the Office has also been able to highlight less publicised topics to parliamentarians such as long COVID or the relation to death[22].

More than a year after the start of the health crisis, the Office can now begin to take a first retrospective look at the management of the health crisis and its many consequences from a scientific perspective, which will have to be continued until the crisis is well and truly behind us. These issues will require a particular attention in order to assess the real extent of the crisis and to provide guidelines on how best to prepare France for the emergence of a new infectious disease.

6. Lessons for a post-COVID world

In addition to the issues directly related to the crisis, this pandemic has given rise to new topics for discussion regarding technology and society, which the Office will endeavour to address to inform Parliament on these matters.

One of the first questions that will emerge as an important issue in the coming years is the digitalisation of society. Due to the crisis-induced lockdown, many workers have found themselves having to telework and it seems highly likely that working habits will be permanently changed for a proportion of employees. This trend might furthermore be enhanced by the emergence of new technologies. Hence, questions are being raised about the new IT tools that are needed, particularly concerning their security and the impact they may have on workers. In this respect, the Office is currently working on a scientific note on videoconferencing tools. This topic also raises the issue of the digital divide between generations and territories[23], which will become more salient in an increasingly connected society, and the psychosocial consequences of these technologies, which is a subject that will also require a great deal of attention. On this last point, the Office has already started a study to analyse the impact of the pandemic and social distancing measures on daily life, through the issue of eating habits.

One of the other axes that may have emerged from the crisis is public confidence in science. The pandemic has brought scientific controversy into the public arena and the image of science has been damaged in some respects, as the anti-vaccine movement has shown. Thus, it is particularly important to promote open and honest science to legitimise

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[21] The French Parliament (National Assembly and Senate) was asked to vote on numerous laws (for lockdown, tracing, use of information technology, etc.) and twice on the vaccination strategy. OPECST members had a very active role during the debates on these issues, providing rigorous scientific information to their colleagues.

[22] Main topics of the COVID-19 related documents issued by OPECST since March 2020 : Use of masks ; Testing and tracing ; Vaccines and vaccine strategy ; Use of information technology ; Epidemiological modelling ; Children and COVID-19 ; Long COVID ; Pollution and COVID-19 ; Pharmacovigilance of vaccines ; Vaccination of children ; COVID-19 variants ; Patent waiver on COVID vaccines ;Treatments and therapeutic strategies ; Psychological consequences of COVID-19 crisis ; etc.

[23] As previously mentioned, the vaccination campaign was mainly organised via online appointments (in particular thanks to the French website Doctolib), raising the problem of access to the Internet and computer tools for part of the population.

its results and facilitate its dissemination. The Office has recently published a report on this issue[24]. In addition, it is necessary to promote scientific mediation operations and to educate the population and policy makers about science; the technology assessment institutes clearly have a role to play in this respect.

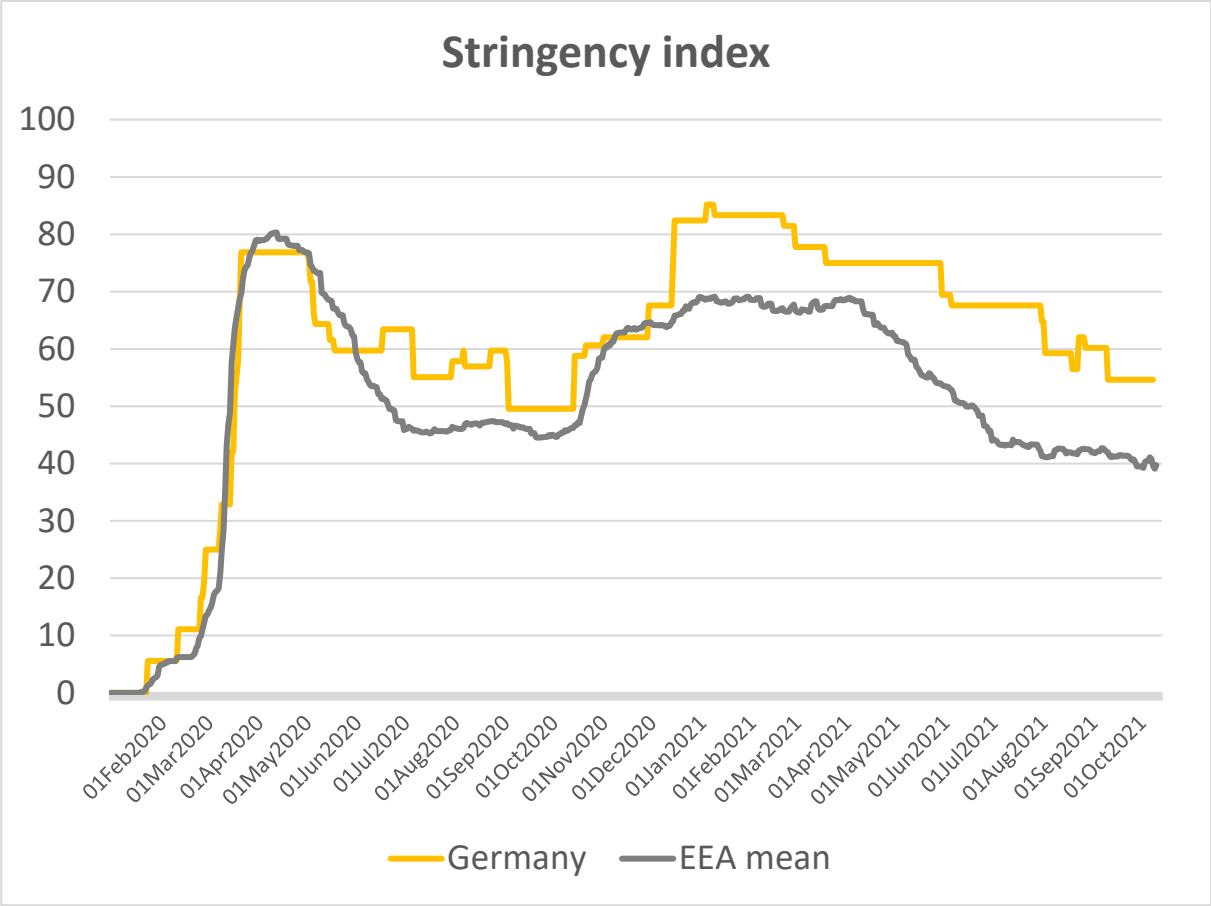
Finally, the implementation of a post-COVID economic recovery plan is also an additional opportunity to put the environment back at the heart of the media and political agenda, a subject which is already at the heart of the Office's work and which should be one of the concerns of all the technology assessment institutes.

[24] “Promouvoir et protéger une culture partagée de l'intégrité scientifique” (Promoting and protecting a shared culture of scientific integrity), report by Mr Pierre Ouzoulias, Senator, and Mr Pierre Henriet, Deputy, on behalf of the OPECST (http://www.senat.fr/notice-rapport/2020/r20-428-notice.html).

Germany

Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag (TAB), Michaela Evers-Wölk, Armin Grunwald, Reinhard Grünwald, Matthias Sonk, & André Uhl

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

Very similar to many neighbouring countries, the COVID-19 pandemic in Germany unfolded in three waves so far which peaked in April 2020, December 2020 and April 2021 respectively (see Table 1).

Compared to other European countries the first wave was contained to somewhat lower levels. One reason is that Germany was lucky to have 4-6 weeks “early warning” from the events in Italy and Austria and implemented strict measures to identify and isolate infection clusters and to reduce social contacts rather early. However, it is important to note that figures from one country cannot simply be compared one-to-one with another country

because of differences in testing, diagnosing and reporting regimes and standards. The same holds true between the different waves.[1]

Table 1: Peek day value (7-day-average) of new cases, patients in intensive care, and deaths "with and from" COVID-19

	1. Wave April 2020	2. Wave Dec. 2020	3. Wave April 2021
New Cases (day)	5.600	26.000	22.000
New Cases in 7 days per 100.000	47	215	190
Patients in Intensive Care	2800	5800	5100
Deaths (day)	230	880	230

Data taken from WHO 2 and Die ZEIT3

In late December 2020 the vaccination campaign started in Germany. The beginning was plagued by a lack of vaccine, delays in building up infrastructure (vaccination centres, registration procedures etc.) and a fierce debate about if and which groups should be prioritized. After resolving most of these issues, currently around 1.4 million doses are administered on peak days. As of October 1st 2021 about 68% of the whole population have received at least one shot, 65% have full protection by vaccination[4]. Since the beginning of the pandemic there have been about 4.5 million confirmed cases of COVID-19 infections and more than 95.000 deaths. The health system was on or close to maximum load both during the second and the third wave, in some regions also beyond. This could be handled by transferring patients within Germany.

The economy in Germany was hit by the pandemic much harder than by the financial crisis in 2009. The gross domestic product plunged by 2.2% in the first quarter of 2020 alone (compared to the fourth quarter 2019)[5]. During the whole year 2020 GDP shrunk by 5% (from 2019 levels).[6] Unemployment increased by ca. 600.000 during the first wave (from a 2019 average of around 2.3 million to 2.9 million in June 2020).[7] The development would have been even more dramatic, if not for the "Kurzarbeit" (short-time work), a state-sponsored programme to support companies that otherwise would have to lay off personnel.[8] In April 2020, 6 million employees benefitted from "Kurzarbeit" which corresponds to 18% of the workforce. For comparison: in the financial crisis 2009 the maximum was only around 1.5 Mio persons.[9] A wave of companies going bankrupt was prevented by the suspension of the obligation to file for bankruptcy and liquidity assistance

[1] For example: During the first wave around 50.000 laboratory tests have been performed each day, compared to almost 250.000 during the second wave, thus the figures for the first wave have to be multiplied by a factor of 5 for a fair comparison. In the third wave mandatory quick tests have been introduced for all children in schools twice a week, resulting in an apparent increase in cases in this age group. https://www.rki.de/DE/Content/InfAZ/N/Neuartiges_Coronavirus/Daten/Testzahlen-gesamt.xlsx?__blob=publicationFile
[2] https://COVID19.who.int/WHO-COVID-19-global-data.csv / All links in this chapter have been checked on 6.9.21
[3] https://www.zeit.de/wissen/corona-karte-deutschland-aktuelle-zahlen-landkreise. There you can also find a multitude of charts and figures of relevant health related aspects.
[4] https://www.zeit.de/wissen/corona-karte-deutschland-aktuelle-zahlen-landkreise
[5] https://www.bundesregierung.de/breg-de/themen/coronavirus/bruttoinlandsprodukt-2020-1753128
[6] https://www.destatis.de/DE/Presse/Pressemitteilungen/2021/01/PD21_020_811.html
[7] https://www.dashboard-deutschland.de/#/indicator/data_ba_arbeitslose_und_stellen
[8] Explained here for example: https://www.imf.org/en/News/Articles/2020/06/11/na061120-kurzarbeit-germanys-short-time-work-benefit
[9] https://www.ifo.de/node/64016

provided by the federal and state governments[10]. It is unclear as to now, if this only delayed the matter and what will happen when the obligation is re-established. Some branches of the economy were hit particularly hard: for example, hotel and restaurant services experienced a drop of about 90% in turnover both in the first and in the second wave.[11]

2. Using science and evidence in the crisis

During the first wave of the pandemic the interaction between science and politics was unique, very close and very successful. A key figure was Prof. C. Drosten, an internationally renowned virologist, who turned out to be a key communicator and facilitator both towards politicians and towards the general public.[12] This provided the basis for the support of all first wave all measures to control the pandemic by pretty much the whole political spectrum.

In the second and third wave this was very different. The amount of science-based policy advice has grown immensely, but its impact did not grow accordingly (to put it mildly). Party politics and considerations of political power re-entered the public arena forcefully and overruled scientific arguments. For example, despite scientists' warning of the third wave (connected with the so called "alpha" variant), on March 3rd 2021 the conference of chancellor Merkel with the heads of the federal states decided to lift some of the restrictions of the lockdown. The obvious reason was the fear that tough measures against the pandemic would hurt the prospects at the upcoming elections in two important federal states (Rhineland-Palatinate and Baden-Wuerttemberg). MPs both from majority and opposition parties criticized that this mode of decision making fundamentally lacked the democratic control by the Bundestag.[13]

Currently, science-based policy advice during the COVID-crisis comes in a plethora of forms: there is a wide diversity of formal and informal advice formats, some asked for by political decision makers, some proactively provided by standing or ad-hoc committees, councils, academic institutions, learned societies, advisory boards, think tanks and also individual scientists. Some of it is provided directly e.g. in one-to-one consultations of parliamentarians, some is delivered and amplified via offline and online media.

The core of official health-related science advice is provided by the federal Robert Koch-Institute (RKI), which directly reports to the federal health ministry, and on the topic of vaccination the "Standing Commission on Vaccination" (Ständige Impfkommission, STIKO, an independent group of 12-18 medical, epidemiological and other health experts).

The conferences of chancellor Merkel with the minister presidents of the federal states were advised by a small number of experts selected by the chancellery: Lothar Wieler (Director of the RKI), Christian Drosten (Virologist), Michael Meyer-Hermann (Physicist), Gérard Krause (Epidemiologist), Cornelia Betsch (Psychologist), Melanie Brinkmann (Virologist), Kai Nagel (Mobility Expert), and Rolf Apweiler (Molecular Biologist). The selection and balance in this group was heavily criticized by some political parties and a number of interest groups.[14]

[10] https://www.ifo.de/node/61378
[11] https://www.ifo.de/branchenatlas/beherbergungsgewerbe
[12] More details can be found here: https://doi.org/10.1126/science.abc5095
[13] See for example https://www.zeit.de/politik/deutschland/2020-09/corona-massnahmen-bund-laender-konferenz-parlamentarismus, or https://www.zeit.de/politik/deutschland/2020-10/corona-massnahmen-abgeordnete-kritik-vollmachten-regierung
[14] https://www.br.de/nachrichten/deutschland-welt/corona-experten-laesst-sich-die-kanzlerin-einseitig-beraten,SN5NgG3

Some federal states set up their own advisory boards, e.g. the Expert Council Corona of the state government of North Rhine-Westphalia[15] or the Scientific Advisory Board of the Thuringian state government[16]. Economic expertise was included e.g. via the National Regulatory Control Council (Nationaler Normenkontrollrat, NKR)[17] or the Board of Academic Advisors at the Federal Minister for Economic Affairs and Energy[18].

Recommendations on ethical issues are given by the German Ethics Council, which published a number of very influential reports on the prioritization of vaccination[19], on contact restrictions for people in need of care[20] and on special rules for vaccinated people[21].

In order to end this by no means exhaustive list, the academies and learned societies have to be mentioned: The German National Academy of Sciences Leopoldina released several "ad-hoc Opinions"[22], the Helmholtz Association published a "systemic analysis"[23], the Fraunhofer, Leibnitz, Helmholtz and Max-Planck Associations issued a joint statement[24].

It is notoriously difficult to determine the impact that different efforts of scientific policy advice have, but it seems that "hard sciences" (in particular modelling of virus spread) had a much heavier weight than "soft" social sciences, with the consequence that social, psychological and other side-effects of measures against COVID-19 were widely ignored.

3. Using technology to cope with the pandemic

Corona Warn App (CWA)

In contrast to many other conflicts over technical and infrastructural design decisions, the discourse about the "right" approach to contract tracing in Germany has attracted a lot of public interest. Consequently during the development of the official Corona Warn App (CWA), care was taken to ensure that decentralized structures and principles of data avoidance and data economy were followed and that open source software was used. In addition to the pure warning signal, new functions were added gradually, in particular documentation of test results, vaccination status, and check-in at events and in shops. This approach led to substantial costs: the development and operation (especially personnel costs for the hotline) of the CWA have so far summed up to around 67 million euros.

Critics complain that the focus on data economy compromised the potential for effective pandemic control. A central storage of e.g. pseudonymised identifiers could have contributed towards more effective contact tracing and thus support the work of the public health authorities (Gesundheitsämter). As a side effect of the chosen decentralized approach, it is very difficult to say how successful the CWA is in terms of its contribution to the containment of the infection rate, because the data required for this analysis are not

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[15] https://www.land.nrw/de/expertenrat-corona
[16] https://www.landesregierung-thueringen.de/regierung/wissenschaftlicher-beirat
[17] Jahresbericht des NKR 2020: *„Krise als Weckruf: Verwaltung modernisieren, Digitalisierungsschub nutzen, Gesetze praxistauglich machen"* (Okt 2020, https://www.normenkontrollrat.bund.de/nkr-de/uebergabe-nkr-jahresbericht-2020-1803314)
[18] "Brief zur Corona-Krise": https://www.bmwi.de/Redaktion/DE/Downloads/Wissenschaftlicher-Beirat/brief-wissenschaftlicher-beirat-coronakrise.pdf?__blob=publicationFile&v=8
[19] https://www.ethikrat.org/fileadmin/Publikationen/Ad-hoc-Empfehlungen/englisch/joint-position-paper-stiko-der-leopoldina-vaccine-prioritisation.pdf November 2020 /
[20] https://www.ethikrat.org/fileadmin/Publikationen/Ad-hoc-Empfehlungen/englisch/recommendation-long-term-care.pdf
[21] https://www.ethikrat.org/fileadmin/Publikationen/Ad-hoc-Empfehlungen/englisch/recommendation-special-rules-for-vaccinated-people.pdf
[22] https://www.leopoldina.org/presse-1/nachrichten/ad-hoc-stellungnahme-coronavirus-pandemie/
[23] https://www.helmholtz.de/fileadmin/user_upload/01_forschung/Helmholtz-COVID-19-Papier_02.pdf
[24] https://www.mpg.de/14760567/28-04-2020_Stellungnahme_Teil_02.pdf

collected.[25] It is estimated however that from all CWA users who received a warning about 110,000 to 230,000 were tested positive and thus that many chains of infection were broken. This roughly corresponds to the contribution that all health authorities made jointly in their effort offline.[26]

Hackathon #WirvsVirus

Under the patronage of the federal government, the largest hackathon worldwide was organized in March 2020 with 28,000 participants. Within five days, 1,500 ideas for solutions with potential impact in the COVID-19 pandemic were developed (e.g. “Botti” a chatbot for children in emergency situations, “Digitale Bühne” an Audio-/Videoconference Tool for music and theatre ensembles, “digital Lehren Lernen” a tool to improve digital and media competencies of teachers), of which 147 were supported in the further development and implementation until October 2020. At the end of the program, 51 of them were in use. This open social innovation process combines bottom-up social commitment and top-down political focus.[27] It is too early to say, how sustainable the impact of these projects is. The initial results were promising enough[28] to initiate a follow-up, which is called “Update Deutschland”.[29]

Status quo and perspectives of telemedicine

In pre-pandemic time, the deployment of telemedical applications was relatively slow in Germany compared to some European countries like USA, Estonia or Denmark.[30] Since the outbreak of COVID-19 the momentum for telemedicine has picked up speed. Health professionals responding to the requirement to avoid face-to-face contacts and an increased funding for demonstration projects are just two of the obvious reasons. The trend for more video and telephone consultations due to the pandemic has continued even after the first wave eased off. Absolute numbers are still low however. Less than 20% of doctors offer video consultations (compared to 6% before the pandemic) and only about 5% of the patients have used these services.[31][32]

Clinical teleconsultation (Telekonsil) is another application of telemedicine that has received a boost from the pressure for action that the pandemic has placed on the healthcare system. Since 2020, telemedicine networks have been funded to make expert knowledge widely available for the treatment of COVID-19 patients.[33] More than 2,000 physicians from smaller hospitals have been receiving telemedical advice from experts at the big university hospitals on the treatment of seriously ill COVID-19 patients since February 2021. Currently, 39 hospitals make regular use of online consultation on intensive care and infectious disease issues. This is an immediate advantage in the

[25] https://www.br.de/nachrichten/netzwelt/corona-warn-app-die-bilanz-nach-einem-jahr,SaPUAO9
[26] https://www.heise.de/news/RKI-Schaetzung-Warn-App-hat-mehr-als-100-000-Infektionsketten-unterbrochen-6070747.html
[27] https://wirvsvirus.org/abschlussbericht/
[28] See the evaluation report: Gegenhuber et al. 2021: https://hertieschool-f4e6.kxcdn.com/fileadmin/2_Research/5_Policy_Briefs/OSI_Policy_Brief_2021_EN.pdf
[29] https://updatedeutschland.org/
[30] See e.g. https://www.mckinsey.de/~/media/mckinsey/locations/europe%20and%20middle%20east/deutschland/news/presse/2020/2020-11-12%20ehealth%20monitor/ehealth%20monitor%202020.pdf and https://www.bertelsmann-stiftung.de/fileadmin/files/Projekte/Der_digitale_Patient/VV_SHS-Gesamtstudie_dt.pdf
[31] https://www.wiwo.de/erfolg/gruender/telemedizin-rezepte-fuer-post-corona-gesucht/26928074.html
[32] https://www.management-krankenhaus.de/news/patientenumfrage-datapuls-2021-vorteile-von-videosprechstunden-durch-corona-erkannt-aber
[33] https://www.g-ba.de/downloads/34-215-935/06_2021-02-18_Zuschlag-IDV-Zentren.pdf

current pandemic situation, as it allows most hospitalized patients to remain at their local hospital.[34]

It remains to be seen whether the boost of telemedicine (e.g., video consultations and telemedicine networks) will continue after the funding comes to an end. These and other questions are being further investigated in the ongoing TAB project "Status quo and perspectives of telemedicine"[35].

Opportunities of digital administration

Which impact the pandemic will have on the digitization of public administration remains to be seen. The analyses of case studies available today do not allow to draw general conclusions about longer-term developments. As part of the implementation of the Online Access Act (Onlinezugangsgesetz,OZG, enacted 2017, which obliges the federal and state governments to also offer their administrative services electronically via administrative portals by 2022 at the latest), crisis- and health-related administrative services and their digitization were prioritized in particular.

It is an open question, which impetus the pandemic will provide for the digitization of public administration in Germany and, in particular, for the spread of AI- or DLT (blockchain)-based administrative innovations in the medium and long term. The recently finished TAB project “Opportunities of digital administration” deals with these topics.[36]

4. Challenges and opportunities in dealing with STI

The way scientific evidence influences political decision-making has come under the magnifying glass by the pandemic crisis. In the first wave of the pandemic it was mainly virologists and epidemiologists who were consulted by political decision makers. Later a broader spectrum of scientific disciplines was included. All too often, scientific advice was used to legitimise a political decision as being the only possibility. However individual scientists can come to completely different conclusions based on the same research results. It is not unusual that political decision makers choose to listen to the advice of those scientists who support their judgements rather than challenge it.

Political decisions based on sound scientific evidence can fail for a number of reasons. First of all there can be a lack of reliable data. For example there is a lack of up-to-date and robust data on the vaccination status of the population in Germany, which are essential for the formulation and evaluation of vaccination recommendations and programs. Some data which is needed for effective policies for certain target groups is not collected or used because of privacy issues and other concerns. For example, hospitals do not submit occupation, household size, migration background and other information of COVID-19 patients to the health authorities.

Sometimes there is clear and sufficient evidence but this nevertheless does not suffice to put the issue high on policy makers’ agendas. For example, it is undeniable that dealing with the virus is an international problem. Fully vaccinating all own citizens, but leaving people in poorer countries behind, increases the global risk that mutations of the virus occur, which could undermine the effectiveness of the vaccines. To some extent, the vaccination gap is also a domestic problem, in particular for disadvantaged social groups (low income, or migrants). This is an issue in Germany and other countries.

[34] https://www.kma-online.de/aktuelles/klinik-news/detail/virtuelles-krankenhaus-nrw-erfreut-sich-grosser-beliebtheit-a-44931
[35] https://www.tab-beim-bundestag.de/en/research/u40600.html
[36] https://www.tab-beim-bundestag.de/en/research/u40200.html

And finally, there are issues backed by clear evidence and high on the publicly debated priority list, for which action was (and is still) insufficient: it is clear that children and young people are the "losers" of the COVID-19 pandemic, especially those from low-income families.[37] Closed day-care centres, home schooling, contact restrictions - all this means that problems such as social anxiety and depression have increased. A population-representative survey conducted in May 2021 shows that while only a small share of the population gives the education system's crisis preparedness high marks, nearly half of respondents think it was "very badly" prepared. In addition, it is shown that mothers of preschool and school children are particularly burdened.[38] Even though awareness of this issue was high by policy makers and the general public alike, already very early in the pandemic, political action was not adapted sufficiently to deal with this issue.

5. The TAB during the crisis

The institutional setup of TAB does not support fast reaction times and quick projects. Therefore, in a crisis situation with immediate need of political advice based on the best available scientific knowledge, TAB is not the institution to be consulted at short notice.

Rather, in accordance with its mission and mode of operation, the Bundestag asked TAB for a systematic and thorough analysis of the shortcomings revealed by the COVID-19 crisis and the lessons learned. Therefore, in March 2021 it commissioned TAB to carry out a project called: “Crisis Radar – Improving the resilience of society, politics and economy through crisis forecasting.” The aim of this TA project is to investigate how a continuous and forward-looking crisis radar should be set up and institutionalized – on a national level as well as internationally – to enable early crisis warning and risk management.

Two questions are guiding the project. First, what deficits exist so far in the early detection of systemic threats? Second, which instruments, institutions and consultation mechanisms in the political arena need to be improved (or newly created) in order to ensure a rapid, comprehensive and sustainable response to crisis events?

It is planned to integrate crisis radars in a comprehensive resilience strategy. The guiding idea is to support a "transformative resilience", which is understood as the ability of present and future societies to deal appropriately and wisely with the crises of the future. First results of this work are expected in early 2022, the final report is due in 2023.

6. Lessons for a post-COVID world

Since the first phase of the pandemic, many predictions have been proposed concerning a transformation of societal and political priorities and fundamental changes of human behaviour and lifestyle (e.g. the end of globalisation as we know it[39], or how digitalisation will change the world completely very soon[40][41]). History, however, tells a lot about inertia of existing societal subsystems and self-dynamics of lifestyles and behaviour. A look back to the financial crisis of 2008/2009 serves as an illustrative example: ten years ago, a widespread consensus prevailed that the world had witnessed a turning point of historic

[37] https://www.bundestag.de/presse/hib/844902-844902, https://jugendsozialarbeit.news/coronakrise-kinder-und-jugendliche-aus-armen-familien-sind-die-verlierer/ [Anmerkung: es gibt keine gute Studien, aber Hurrelmann etc. hat Expertise]

[38] Cluster of Excellence “The Politics of Inequality“ (2021): P COVID-19 und soziale Ungleichheit – Thesen und Befunde. Vertrauen. Impfzugang. Radikalisierung. Unzufriedenheit. Wo die Coronakrise die Gesellschaft ungleicher macht. Policy Paper Nº 07 vom 29. Juli 2021.

[39] https://www.spiegel.de/wirtschaft/corona-krise-das-ende-der-globalisierung-wie-wir-sie-kennen-a-af9f2dd4-f5ce-4402-903f-c6b4949bd562

[40] https://www.deutschlandfunk.de/komplizen-der-digitalisierung-pandemie-und-digitale.1184.de.html?dram:article_id=495218#a7

[41] https://www.manager-magazin.de/unternehmen/artikel/durchbruch-fuer-digitalisierung-corona-veraendert-die-arbeitswelt-a-1305535.html

dimensions. The “casino-capitalism” (as a book by the well-known German economist Hans-Werner Sinn is called) had to be stopped to prevent a catastrophe like this from happening ever again. Today, more than a decade later, the visible change is much less fundamental: lenders, hedge funds or rating agencies continue to go about their business as if nothing had happened.

It is not a new insight for TA, which is very accustomed to a forward looking perspective, that it is hard to say, which permanent changes will follow a crisis. Therefore, instead of raising the predictive question for what change induced by the pandemic *will* remain permanently, it is more appropriate to ask for lessons learned in the sense of what *should* remain. Starting points should be considerations of fragility and resilience of society.

The pandemic dramatically shed light on *fragility* as a crucial aspect of modern life, which over the last decades became increasingly invisible, hidden or ignored. Vulnerabilities, including those originating in complex technological and socio-technical systems, cannot be ignored anymore. Instead, the pandemic provides an opportunity to look at vulnerabilities with regard to pandemics but also beyond. Indeed, new viruses are by far not the only source of serious vulnerability. The dependency of modern societies on the functioning of critical infrastructures (e.g. electricity, water, waste management) in particular in face of their quick digitalisation, may be another source of vulnerability[42], and of course accelerated climate change and natural disasters a further one. In addition there are vulnerabilities concerning cohesion of society and democratic practices. Misinformation and conspiracy theories are spreading enormously. Social media such as Facebook and Twitter in particular act as accelerators for fake news, exacerbating the polarization of society.

The upside of technologies like digitalisation which makes life easier by providing new services, frequently come at the price of increasing vulnerability and dependencies, emerging e.g. from monopolist economic structures, from nationalist policies, from the misuse of data, from decision-making handed over to AI algorithms, and from the naive trust into the system’s smooth and continuous functioning. Chilling examples are provided by the recent wave of ransomware attacks on critical infrastructure[43] and public administration[44]. TA should contribute to enlightening these dependencies and corresponding vulnerabilities by making use of its experience with large sets of unintended side effects of technology and technicalisation.

Another issue for lessons to be learned concerns globalisation. The COVID-19 pandemic, obviously, was and is a global phenomenon. It is an expression of the *Anthropocene* because globalisation, e.g. worldwide trade and travel, made the fast spreading of the disease over the planet possible. Simultaneously, it demonstrated specific vulnerabilities of globalisation by uncovering deep dependencies of the economies and companies on smoothly functioning global supply chains. For example, because of a lockdown in China, the car manufacturer Fiat did not receive essential components and had to close a production plant in Serbia.[45] The lesson to be learned in this field is to not only focus on economic efficiency by organizing supply chains but also to take care of their resilience in case of interruptions and disturbances – which includes tasks for TA.

An area of prime importance concerning technology and innovation is the field of digitalisation. Thanks to digital technologies and services home-office, home schooling, video meetings and other virtual processes made possible to maintain many societal

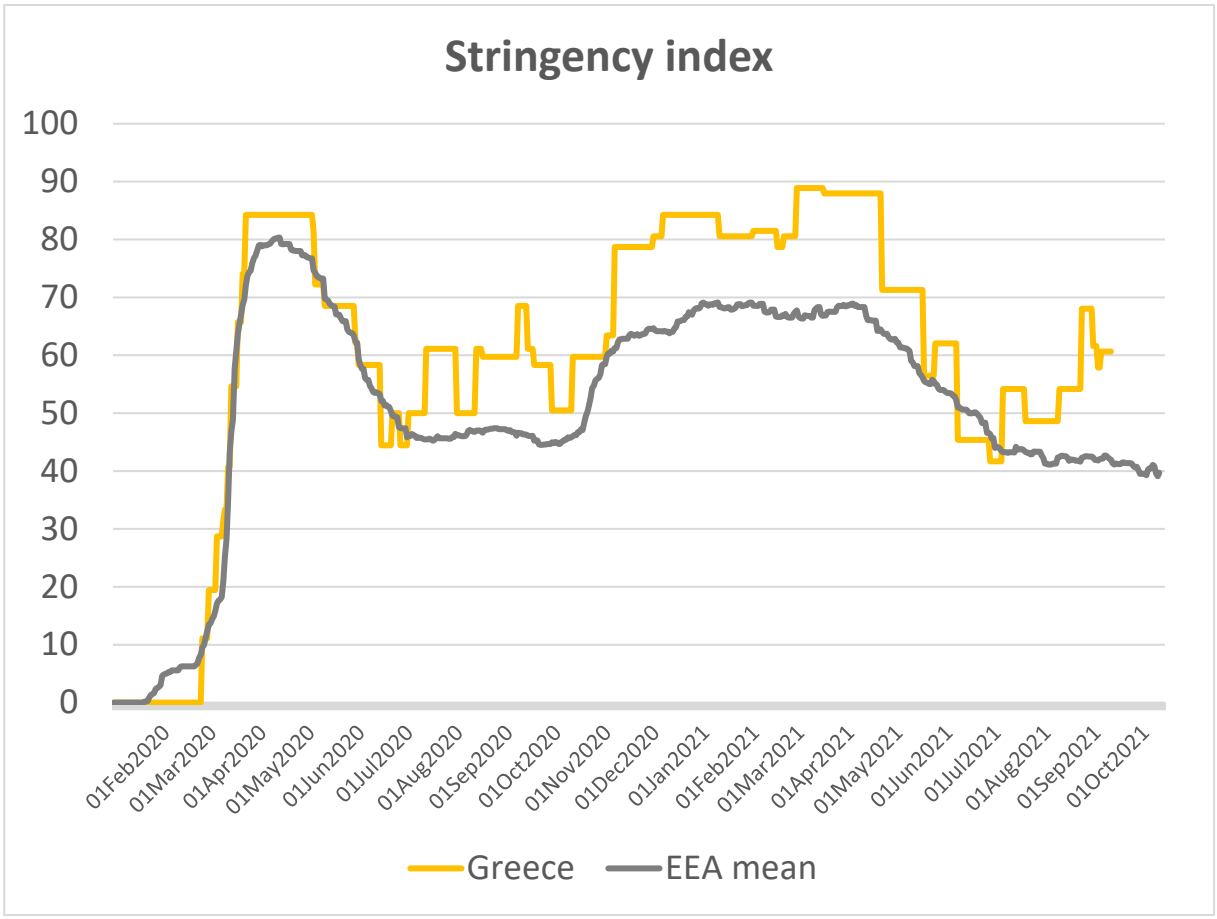
[42] See for example the running TA-project: „Opportunities and risks of the digitisation of critical municipal infrastructures using water and waste management as examples“ https://www.tab-beim-bundestag.de/en/research/u40300.html
[43] https://en.wikipedia.org/wiki/Colonial_Pipeline_ransomware_attack
[44] https://scilogs.spektrum.de/datentyp/ransomware-in-der-oeffentlichen-verwaltung/
[45] https://www.produktion.de/wirtschaft/coronavirus-fiat-macht-werk-in-europa-dicht-113.html

activities also during the phases of lockdown and social distancing. While many of the experiences made in this respect and competences established during the pandemic will also be used in the post pandemic phase, a more differentiated picture emerged. Deficits and shortcomings of home schooling became obvious, video meetings are fine for certain purposes but not for others, many people got tired from too many screen activities, and so on. In this respect, the pandemic is a double chance. First, it demonstrated the advantages and potentials of digital technologies to large parts of the population and gave high momentum to digitalisation. Second, it simultaneously pointed out the limitations of digital technology in many respects. This tension opens up possibilities for learning and for optimizing combinations of real and virtual arrangements, according to the respective purposes. TA should be a motor in these learning processes. To sum it up: for TA, the pandemic could and indeed should be an opportunity to reassess institutional and procedural (carrying out TA projects and communicating the results) framework conditions to improve the impact of TA and ultimately the rationality of political decision making in times of crisis.

Greece

Greek Permanent Committee on Research and Technology (GPCRT), Mina Gerasidi and Kostas Papadimitriou

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

Since the beginning of the pandemic, Greece has effectuated two lockdowns in order to prevent the widespread of the coronavirus. The first took place in March 2020 and was gradually lifted from May 2020 onwards and the second took place in November 2020. Schools, retail, and any other public venue activity were shut down and a night curfew was imposed. Teleworking was also imposed where possible and there were restrictions upon entering the country. The lifting of restrictions began gradually in early April 2021 with the opening of retail, schools, restaurants and cafes (only outdoors) and tourism, and most recently the arts sector. Indoor restaurant spaces were recently opened only for vaccinated people (having completed vaccination at least 14 days ago) or with a negative PCR test. Masks are mandatory in all indoors spaces and there is a recommendation for their use in crowded open spaces (at the time of writing, indoor restaurant spaces only for vaccinated and children under 12 years with a 24 hours self-test).

The vaccination process started in January 2021 for the healthcare personnel, the elderly and people with underlying health conditions, and continued with the general population, from the oldest to the youngest. The procedure is currently open for everyone, from 12 years and over.

The vaccination platform uses the social security number and identification through personal codes either from the national tax platform or web banking. The process includes the following steps:

- Checking criteria of priority groups before scheduling the appointment on the website http://emvolio.gov.gr and the web / mobile application or by sending a text message (SMS) to a code of exclusive use.
- Scheduling the appointment after connecting to the tax information on the website http://emvolio.gov.gr. For citizens who are not familiar with technological means, it is possible to visit the common public service centres or pharmacies. The second vaccination dose is scheduled at the same time.
- Reminder of the appointment by email and SMS, relevant preparatory instructions (e.g. not to have a fever, to have the QR code along, etc.) and special instructions depending on the vaccine to be used.
- Vaccination: Identification with the QR Code and identification (identity card, passport, etc.) by the staff of the Vaccination Centres. The doctor evaluates the clinical picture of the person and decides to proceed or not with the vaccination.

The Vaccination Centre records the details of the vaccine package, which is used to enhance the tracing process. If required, the online application informs the doctor of the date and time of the recurrence[1].

The program 'Help at Home' was implemented in order to provide care for elderly people or people unable to provide for themselves food, medicine or any other need. Civil servants whose work was suspended due to the lockdown (for example day care teachers) covered these needs.

In the effort to control the spreading, free of charge self-tests were provided to employees and students. Currently, employees need to possess the national vaccination certificate (Greek Green Pass) to attend work or present two rapid tests per week, every Tuesday and Friday, on their own expense. From September onwards the requirement will be stricter, stipulating either vaccination certificate or two negative PCR tests weekly. Recently, the mandatory vaccination of all health care workers and workers in elderly care facilities was foreseen for all public and private sector. The evolution of the pandemic to date is shown in the following diagrams, regarding cases, losses and intubation of patients.

[1] https://emvolio.gov.gr/en
https://emvolio.gov.gr/sites/default/files/ethniko_epiheirisiako_shedio_emvoliasmon_kata_toy_COVID-19_v6.1_1.pdf?t=1 (in Greek only).

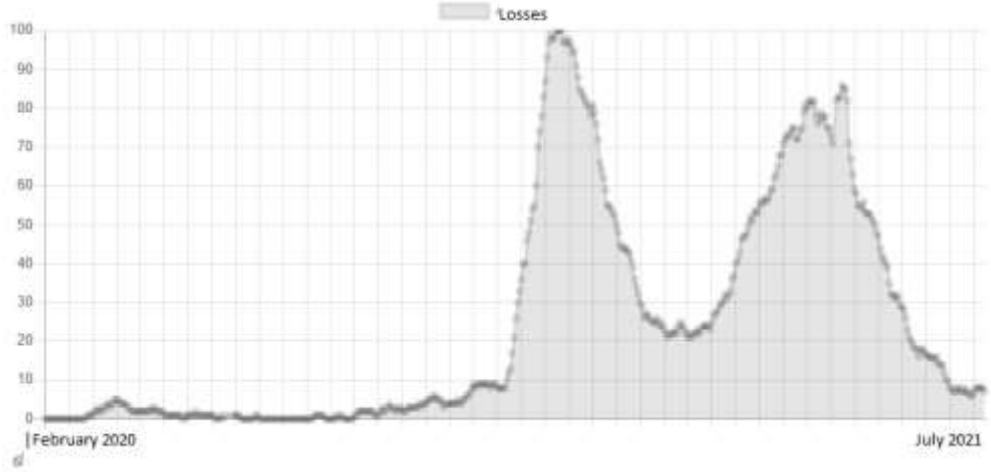


Figure 1. Loss of life due to COVID-19 in Greece

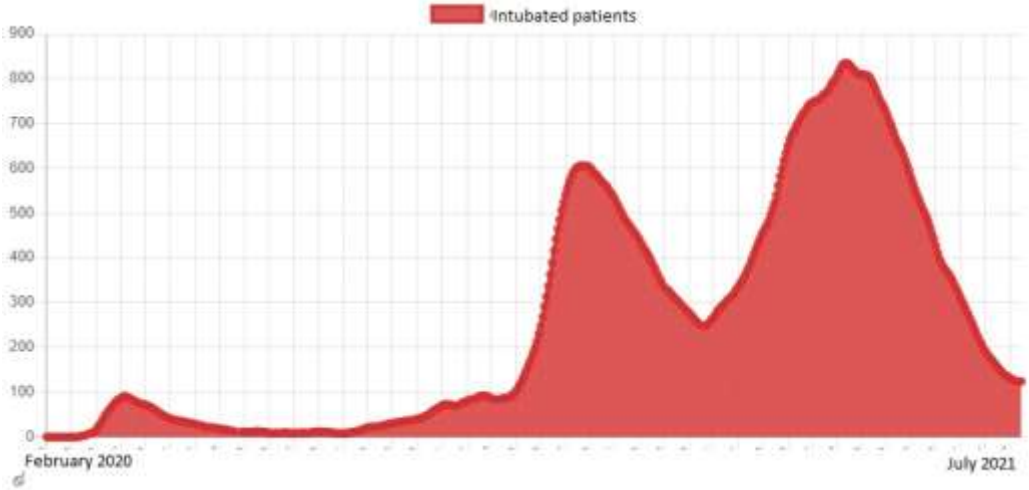


Figure 2. Intubation of patients due to COVID-19 in Greece

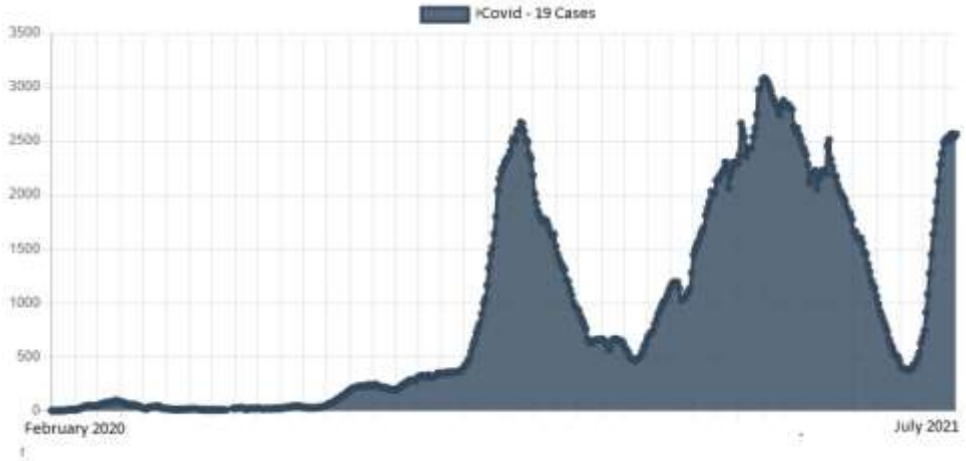


Figure 3. Cases of COVID-19 in Greece

Statistics show that, compared to the respective months of 2020, retail and tourism has recovered in 2021. At present, there is, however, no possibility to compare data of previous years. Comparison of data of previous years is not possible for sectors that remain still in suspension of activity.

For the companies in the retail sector where statistics are available, the turnover in April 2021 was increased by 52.0% compared to April 2020 and by 18.7% compared to March

2021. It is noted that there were no activities that showed a decrease in turnover in April 2021 compared to April 2020.

In all companies in the accommodation sector, the turnover in the first quarter of 2021 was decreased by 59.2% compared to the first quarter of 2020. In all catering companies, the turnover in the first quarter of 2021 was decreased by 52.5% compared to the first quarter of 2020. For companies in the accommodation sector, the turnover in April 2021 was increased by 113.6% compared to April 2020. For companies of the catering services sector, the turnover in April 2021 recorded an increase of 87.5% compared to April 2020[2].

2. Using science and evidence in the crisis

The pandemic decision-making mechanism operates in the regular government meeting under the Prime Minister, with the cooperation and participation of the heads of the following bodies:

- The Ministry of Health
- Civil Protection
- The Committee of Public Health Experts of the Ministry of Health (epidemiologists / doctors of infectious and chronic diseases / primary care, paediatricians / sociologists / economists / administrators of health services, representative of the Hellenic Patients Association, representatives of sectors of the Ministry of Health, representatives of the regional and municipal administration).

Measures taken by this collective effort were based on the protection of public health and the safety of citizens. The suggestions of experts were used as a compass. Government officials often emphasized that the measures were taken mainly based on expert advice. In other words, priority was given to the recommendations of the experts, some of whom made, during the critical periods, official updates to the public on a daily basis.

At Parliamentary level, it was decided that legislative work had to adapt to the need of social distancing of Members in the House. With regard to the Committees, it was decided that the Standing Committees (which elaborate bills) should meet as a matter of priority and that meetings of the Special Standing Committees (which conduct public hearings and discussions) should be suspended. Now, there are meetings held either in person or online, depending on the theme under discussion. Regarding the operation of the Plenary, during the discussion of the bills, only the Rapporteurs, the Special Speakers, the Parliamentary Representatives, one or a few more speakers from each Parliamentary Group, the Ministers, and, if they wish, the Prime Minister and the party leaders of the Opposition, could take the stand and only for half of the time provided by the Rules of Procedure. The roll-call vote is held on the presumption of the majority, while the Members of Parliament will rotate to the chamber to avoid overcrowding. Postal votes are also accepted.

The Parliamentary Scrutiny is carried out normally while the electronic deposit of the means of the Parliamentary Scrutiny is requested and not their deposit with a physical presence in the competent Services. During this period, the submitted means of exercising Parliamentary Scrutiny multiplied (exclusively electronic deposit from March 2020, with employees in teleworking and electronic protocols, seals and signatures, leading to a new era). Questions, questions with a request for submission of documents, reports and answers of the competent Ministers have increased significantly. As the qualitative analysis of the data shows, the vast majority of the means of exercising Parliamentary

[2] (https://www.statistics.gr/COVID-19)

Scrutiny concerned issues of the difficult daily life imposed by the coronavirus, the management of the health crisis and its social and economic consequences.

In the first wave of the pandemic, during the period of the restrictive measures from 13 March 2020 to 15 April 2020, parliamentary work increased by a total of 65% in terms of the written instruments of Parliamentary Scrutiny and by 35% with regarding their received answers, on average per week compared to the period before the epidemic crisis.

During the second wave of the pandemic in November 2020, the work of the Parliamentary Scrutiny increased by a total of 50% regarding the written means of Parliamentary Scrutiny submitted, and by 189% regarding the responses received, compared to November 2019. In December 2020, it increased by a total of 72% in terms of the written means of Parliamentary Scrutiny submitted and by 40% in terms of the responses received and transmitted, compared to the corresponding month of 2019.

Regarding the Administrative Services, a plan was made for the provision of services through telework and / or with reduced staff. The special purpose leave of absence was applied for parents of children up to 15 years old and for personnel with underlying health conditions, while in the second wave of the pandemic the maximum physical presence of the personnel was at 50%.

From the recording of the above statistical data, it is presumed that the Parliament is, at the time of the pandemic, at the centre of the political dialogue and contributes decisively to the timely and valid information of the citizens by the Government. At the same time, it contributes to highlighting and addressing the problems posed by the health crisis and proves that Parliament is the institutional refuge of the citizen, especially in times of crisis.

3. Using technology to cope with the pandemic

Organizing the vaccination was a great challenge. It was the culmination of the citizens' support mission during the pandemic, that is to say providing digital tools in order to stay safe. The coronavirus has suddenly made it necessary to avoid a queue, no longer as a matter of convenience, but of protecting the lives of the citizens.

Within the pandemic, a number of innovations were developed that were part of government planning, but the emergency conditions brought their implementation earlier. These innovations will certainly stay after the pandemic.

The important role of genomics and artificial intelligence in the service of public health corresponds to a new approach beginning and developing at an exponential pace. The COVID-19 pandemic, unlike previous pandemics, has promoted citizens to active "researchers", not merely objects of epidemiological studies. That is because they provide data such as their digital tracking, their way of life and, of course, their biological and clinical data in order to identify, monitor and timely forecast areas and individuals at high epidemiological risk in real time and then an intervention is possible.

Greece is above the average of European countries in terms of the percentage of genomes that have been sequenced and in terms of the percentage of those sequences that have been reported in open databases.

T-cell technology is also being developed even if it is at a very experimental and exploratory stage. It is expected to provide a useful tool concerning both the treatment of the disease and the prophylaxis of citizens.

Taking into account the existing experience and infrastructure, the new ‘MyHealth’ application will be available in a few days. Citizens will have access to their personal information included in the e-prescribing system. The ‘MyHealth’ application will also be

the model for the Electronic Health Record: citizens will have uniform access to all their medical data in a single application.

Finally, electronic video conferencing applications have been widely used in economic and social life. All educational units operated with remote monitoring. Mandatory teleworking was also realised in both the private and public sectors for a percentage of employees. With the experience gained, teleworking and distance learning will certainly remain, in use where needed even after the pandemic.

4. Challenges and opportunities in dealing with STI

Although a country with a technological delay compared to its partners in the European Union, Greece had great use of digital tools and services during the pandemic. The provision of services to citizens has increased significantly. In 2020, digital services exceeded 94 million, while in 2018 it was only 8 million. Already, in the first half of 2021, the state registers have served the citizens electronically or have "communicated" more than 150 million times.

In areas with difficult access to the Internet, the networks of municipalities and schools were widely used. Through municipalities and schools, tablets were provided to students who could not attend e-learning due to lack of electronic tools, taking into account socio-economic criteria.

5. The GPCRT during the crisis

Our Service provided regular scientific updates through newsletters and reports throughout the pandemic accompanied by proposals for the TA Committee's planning. They included innovations and developments concerning the pandemic and following the progress of the research centres that worked under the supervision of the General Research and Innovation Secretariat. The field of research and technology actively participated in important actions and initiatives of the General Research and Innovation Secretariat. In addition, the supervised Research Centres have developed a diverse activity against SARS-CoV-2, using the research infrastructure and the capacities of equipment and human resources being at their disposal. The Hellenic Pasteur Institute has been designated as the National Reference Centre for the detection of SARS-CoV-2[3].

6. Lessons for a post-COVID world

Artificial intelligence clearly had a role during the pandemic. Based on the combination of several data, such as clinical data and their correlations, AI can make a competent prediction as to whether a patient will have a severe or a mild disease.

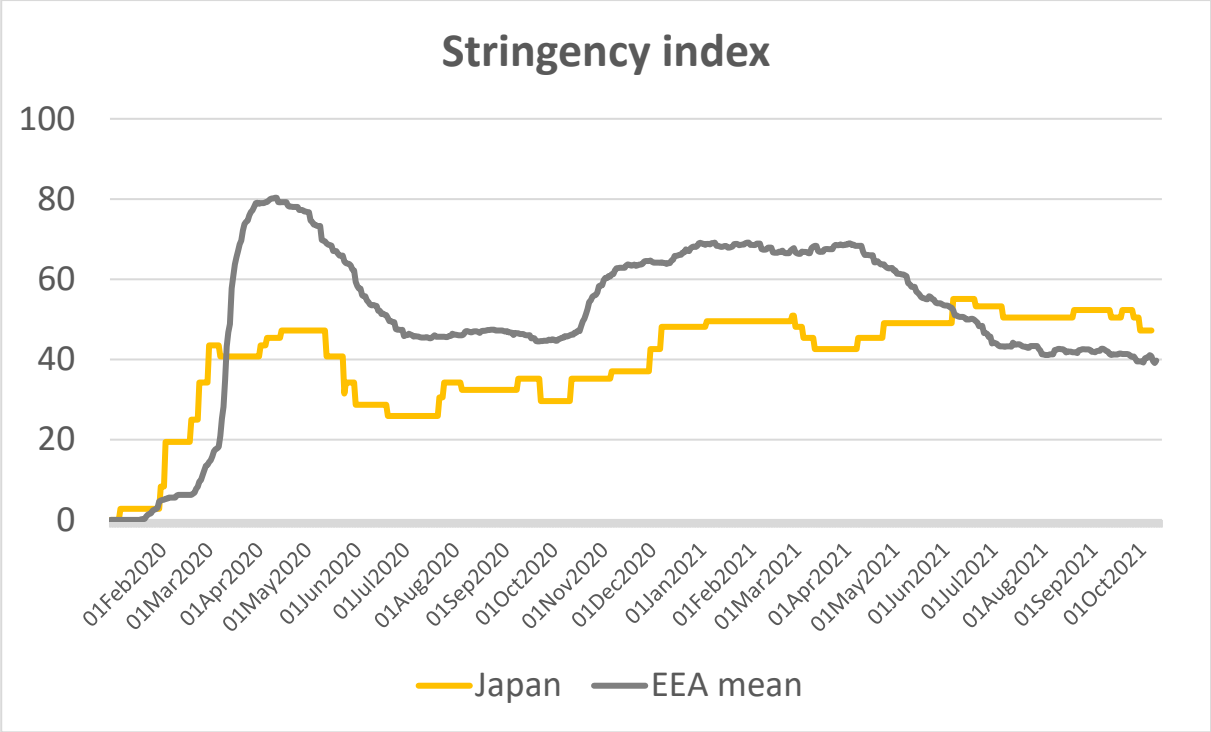
Given that Greece has many islands and has a special geomorphological configuration, there is an increased difficulty in implementing information programs compared to a mainland. Information technology has helped to spread the message to the citizens.

Technology helps public health to come to the forefront at the level of prevention, and promotes primary health care. The collection of data during recording and monitoring helps identify threats - whether infectious diseases, toxic environments, such as radiation, or infected water or food. Thus, competent bodies were able to take timely, mainly precautionary measures, so that the threat could be limited or completely prevented. Due to the pandemic, policy makers may prioritize prevention in public health care.

[3] See GSRT link (in Greek only).

Japan

Research and Legislative Reference Bureau (RLRB), National Diet Library (NDL), Chifuyu Hiyama



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the stricest subregion

1. The RLRB during the crisis

The RLRB has been providing materials and information chiefly for deliberations in the Diet as researches on request from the Diet members. Since Jan. 2020, 9100+ researches related to Covid-19 (approx. 25% of the total) have been conducted.

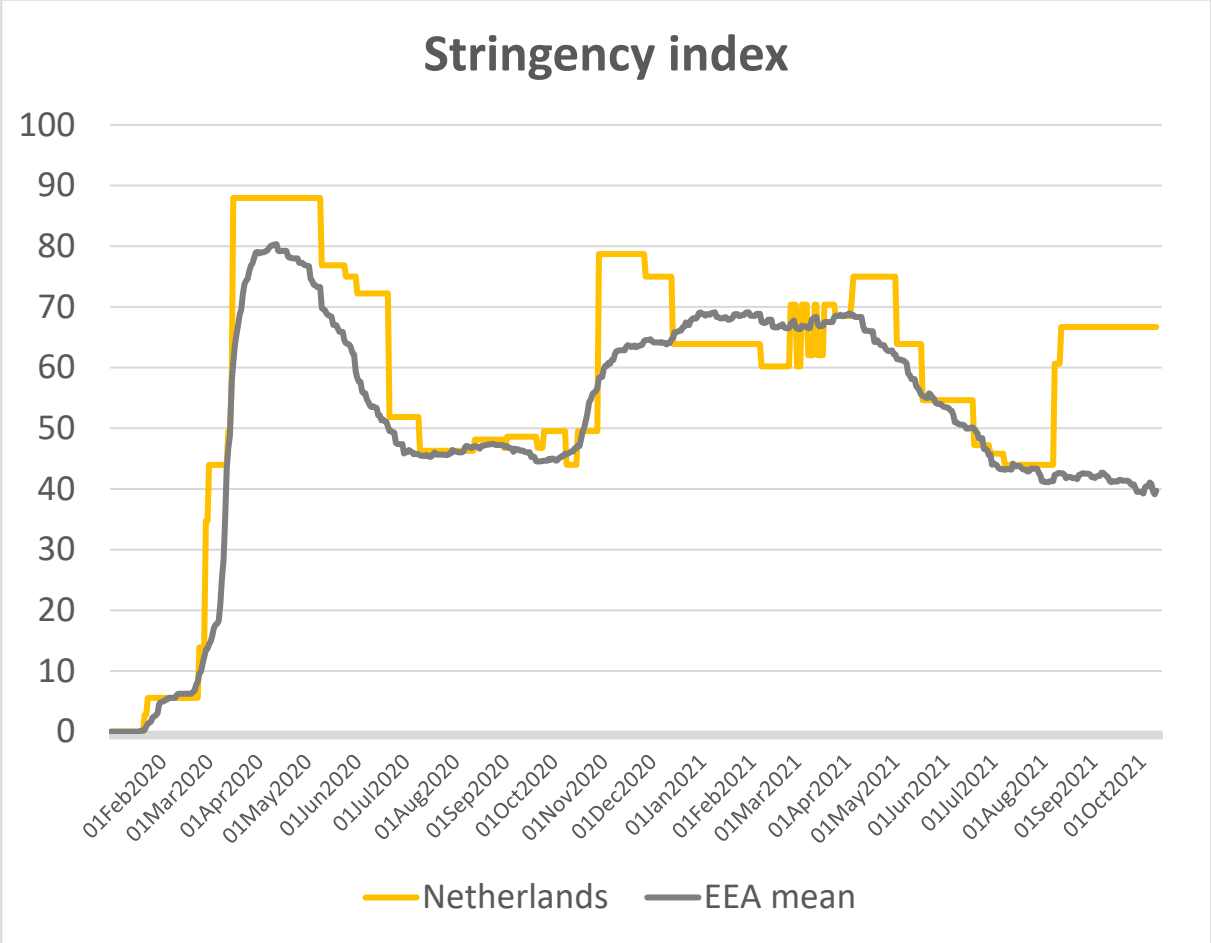
More than 100 titles of our reports in variety of subjects directly linked to Covid-19, such as the impact on economy, public finance, household, industries, employment, education, healthcare system as well as related foreign legislations, etc., have been published primarily for the legislature and also provided to the general public on the website of the National Diet Library[4]. From TA perspective in particular, we published a report, *Trends and Issues of Social Media in the Era of Coronavirus*, which focuses on the dissemination of misinformation and data analysis on user behavior of social media alongside the spread of Covid-19 to clarify the issues of social media from various perspectives such as social psychology, technical ethics, constitutional/information law, and journalism[5].

[4] List of publications related to Covid-19 (in Japanese) https://www.ndl.go.jp/jp/diet/ndl_diet_covid_19.pdf
[5] *Trends and Issues of Social Media in the Era of Coronavirus*. (in English) https://dl.ndl.go.jp/view/download/digidepo_11653560_po_20200401.pdf?contentNo=1

The Netherlands

Rathenau Instituut (RI), Rosanne Edelenbosch, Yayouk Willems, Sophie van Baalen and Petra Verhoef[1]

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

By the end of July 2021, The Netherlands registered over 1.8 million COVID-19 infections resulting in 17,800 deaths (1018 deaths per million inhabitants) [2]. In the summer of 2021, 69% of the population had received a first vaccination dose, and 48% a second dose[3]. The vaccination willingness is very high in the Netherlands: 91% of citizens above 16 years old have received or want to receive a vaccine (98% for ages 70+ and 85% for ages 16-39)[4].

[1] With the valuable input of Rinie van Est, Jeroen Heres, Linda Kool and Mathilde Sanders
[2] https://www.volkskrant.nl/nieuws-achtergrond/corona-wereldwijd-cijfers-over-het-coronavirus-in-alle-landen-op-een-rij~b14e8079/
[3] https://www.volkskrant.nl/nieuws-achtergrond/hoe-gaat-het-met-vaccineren-in-nederland-en-wereldwijd-de-belangrijkste-grafieken-op-een-rij~b7109a05/?utm_source=link&utm_medium=app&utm_campaign=shared%20content&utm_content=free
[4] https://www.rivm.nl/gedragsonderzoek/maatregelen-welbevinden/vaccinatie

The Dutch labour market has reacted mildly to the pandemic: in May 2021, the unemployment rate was 3.3%, only 0.4 percentage points above the pre-crisis level[5]. The main reason for this is that the Dutch government budgeted 45.9 billion euro in support for companies, entrepreneurs and employees during the COVID-19 crisis[6]. However, economic and social consequences could arise when government support ends, and experts fear a 'calm before the storm'[7], especially for young adults (<27 years), who have been strongly affected mentally and economically by this crisis[8].

2. Using science and evidence in the crisis

Decision-making based on scientific knowledge

According to the Prime Minister (PM) of the Netherlands, Mark Rutte, the Dutch cabinet navigated the COVID-19 crisis with "the compass of scientific knowledge"[9]. During the outbreak of COVID-19, an Outbreak Management Team (OMT) advised the Dutch cabinet. The OMT consists of physicians, epidemiologists, virologists and microbiologists and works together with Municipal Health Services (GGD), experts and representatives of various organizations and chaired by the director of the National Institute for Public Health and Environment of the Netherlands (the RIVM). They discuss how to combat the outbreak based on current information, their professional knowledge and the available scientific literature. The intention is to arrive at one recommendation to the cabinet, based on scientific consensus[10].

Outside of health crises, the Health Council (‘Gezondheidsraad’) is tasked with providing the government and parliament with health care related advice based on the most recent scientific evidence. The OMT took over this task regarding most issues related to COVID-19, in order to increase speed and the decisiveness. The Health Council was the primary advisor regarding COVID-19 vaccination, and was criticized by society with regard to how much time it took to develop an advice, even though the turnaround time of an advice was shortened to days or weeks, from the usual months to years.[11]

The OMT had an important knowledge position, but the government did not always adopt the measures it proposed. For example, in March 2020, the cabinet made the decision to close all schools after members of the Federation of Medical Specialists (FMS) contradicted the OMT's advice to keep schools open[12]. This was an interesting moment: keeping schools open became no longer tenable when different scientists disagreed. Later on, a press statement from the government re-emphasized the important knowledge position of the OMT: "Parties emphasize that it is essential that we base the approach to the corona crisis on the advice of experts, led by the OMT/RIVM"[13].

The composition and role of the OMT remained a subject of societal debate[14]. Where, for example, are the economists, psychologists, sociologists, and historians? According to the chair of the OMT, the OMT should only provide a medical-epidemiological point of view.

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5 https://www.rabobank.nl/kennis/s011166291-tijdens-coronacrisis-230-000-werklozen-en-5-300-faillissementen-voorkomen
6 https://www.rijksoverheid.nl/onderwerpen/prinsjesdag/inkomsten-en-uitgaven-van-het-rijk-2021
7 https://vng.nl/sites/default/files/2021-05/sociaal-sterker-de-crisis-uit.pdf
8 https://www.nji.nl/coronavirus/onderzoek-gevolgen-coronatijd
9 https://www.trouw.nl/nieuws/een-noodzakelijk-politiek-besluit~b1279a52/
10 https://www.ad.nl/politiek/hoe-jaap-van-dissel-zijn-heldenstatus-verloor-van-nationale-reddingsboei-naar-kop-van-jut~a3655700/
11 https://www.nrc.nl/nieuws/2021/06/24/gezondheidsraad-laat-zich-niet-opjagen-ook-niet-in-pandemie-a4048742
12 https://nos.nl/artikel/2336385-hoe-twee-vragen-op-een-artsencongres-tot-sluiting-van-alle-scholen-leidden
13 https://www.rijksoverheid.nl/actueel/nieuws/2020/03/15/goed-gesprek-vws-rivm-met-koepels-van-artsen-en-ziekenhuizen
14 https://www.eur.nl/nieuws/heeft-het-omt-te-veel-macht-gekregen

Broadening up their expertise would be undesirable, he said, because this would necessitate taking into accounts different lines of arguments within the OMT, while political choices are up to the cabinet[15]. As a result, numerous scientists and experts from different fields grouped together to provide advice to the cabinet. For example, a group of scientists calling themselves 'the Red Team', consisting of behavioural psychologists, economists, and statisticians, gained increasing political influence. They argued that more stringent measurements were necessary to better contain the virus. The Red Team later retracted from the debate, as they had made their message clear and did not want to undermine trust in the cabinet. Another example was the alliance 'Herstel-NL', consisting mainly of economists, doctors and entrepreneurs. Herstel-NL voiced alternative, less stringent, measures and isolation of vulnerable groups in order to mitigate the social and economic effects.

Over the past year, many citizens gained some insight in scientific research and its role in society and political decision-making. Scientific studies and their validity were prominently discussed in the media and citizens digested and made sense of daily rates of infections and hospitalizations. The value of evidence from different types of scientific studies were topics of conversation at the dinner table, just like the increasing prevalence of corona-sceptic activists online[16]. Interestingly, research from the Rathenau Institute shows an increase in trust in science in Dutch society as compared to previous years, especially in medical research[17].

Case Study Face Masks in the Netherlands

In the first months of the crisis, the OMT advised against the requirement to wear face masks in public areas. They argued there was limited evidence supporting the use of these masks and that this measure would create a false sense of security, leading people to believe they do not have to keep their distance. When other countries increasingly began adopting a policy where face masks were obligatory, the mayors of various Dutch safety regions - geographical regions within which safety services and crisis management are coordinated by the mayor of the largest city of that region- indicated they wished to start experimenting with face masks in specific places. By the end of July 2020, the cabinet decided that safety regions could experiment with this obligation. The number of infections accelerated further in August 2020 and research increasingly showed the effectiveness of face masks. Still, the chair of the OMT continued to reject the measure because, according to him, it was "not a substitute for one-and-a-half-meter distance". In response, the Red Team sent an incendiary letter. In the end, pressure from the House of Representatives led to the 'urgent advice' to wear a face masks in public places, but not in schools. As of June 1 2020, masks have been mandatory in public transportation. Finally, on November 1, 2020, face masks became mandatory in public indoor spaces. From June 26, 2021, this obligation was lifted, provided one can keep a distance of 1.5 meters.

Values and Interests

The Dutch PM used the following metaphor at the start of the crisis: "With 50 percent of the knowledge, we must take 100 percent of the decisions.[18]" This created a dilemma for the cabinet; on the one hand, communicating clearly to the Dutch public and, on the other, admitting to uncertainty. Unfortunately, *how* the cabinet came to decisions based on this imperfect knowledge was often unclear. Additionally, when decisions were made, the

15 https://www.volkskrant.nl/nieuws-achtergrond/de-zeven-plagen-van-jaap-van-dissel-tweede-golf-had-voorkomen-kunnen-worden~b9aa81cf/
16 https://pointer.kro-ncrv.nl/nederlands-trollenleger-verspreidt-en-coordineert-desinformatie-over-vaccin
17 Vertrouwen in de wetenschap | Rathenau Instituut
18 Rutte: we hebben iedereen nodig, 17 miljoen mensen | NOS

cabinet presented these as if this was ‘the only choice’ possible. As such, they did not leave any room for uncertainty when these policies were implemented and refrained from being transparent about their underlying principles, values and interests.

The development of the “COVID-19 contact tracing app” in the Netherlands provides an interesting example of how the cabinet overlooked certain values over the course of decision-making during the pandemic. The Minister of Health presented the contact tracing app as “the solution” to get out of the crisis. Because of the urgency of the matter, the Minister initially outsourced the development of the app to external companies. He therefore started a two-day public hackathon, where seven companies presented ideas for contact tracing apps. These apps, however, received extensive criticism regarding their privacy, security safeguards and embedding within the healthcare system. In addition, the carelessness of the process was widely criticized by the public. As a result, the minister restarted the developing process and had an open-source in-house app developed by the Ministry of Health, Welfare and Sport.

This process included the establishment of two different task forces, one with expertise in coronavirus control and the other with expertise on behavioural science. In addition, both a citizen panel and an expert panel carried out an ethical analysis. Rathenau theme coordinator Rinie van Est was part of the expert panel, in which he dealt with the aspect of procedural justice, amongst other issues. Security and privacy were important themes in the development of the app. However, discussions regarding the proportionality of its use and the way the app could be embedded in the broader healthcare system were lacking. For example, the test capacity was not up to full scale when they launched the app. When someone is notified that they have been in close contact to a person infected with the coronavirus, they need to get tested. At that time, it could take up to a couple of days before there was a test spot available.

In October 2020, the app *CoronaMelder* became available to the public, with one third of the Dutch population downloading the app[19], detecting 9000 infected people between November 2020 and March 2021, of whom 1,700 had no complaints yet[20]. Although the app was presented as one of the most promising tools to tackle the pandemic, in the end only few people made actual use of it, and its value remained limited. Overall, this example of a failed quick fix solution shows that in addition to scientific uncertainty, values, and interests, the daily practice in which a technology will be used must also be taken into account. We witnessed the same with regard to the vaccination strategy: the beginning of the vaccination campaign was marked by long queues of elderly people in the snow, elderly couples that were vaccinated 90 kilometres apart, and a widely criticized and opaque system for prioritization.

The corona crisis highlighted that the relationship between science and politics is fragile[21]. The Rathenau Institute emphasized that politicians need be clear that decisions with regard to combating the coronavirus are choices. Underlying value and interest considerations can and should be more explicit in explaining why these choices are made[22]. Science does not free us from difficult (political) choices- the right way out of this crisis consists of repeatedly weighing up ethical, economic, and practical dilemmas. The serious inclusion of different citizen perspectives should be part of this process, in part to

19 https://www.nrc.nl/nieuws/2021/01/13/te-weinig-mensen-geven-via-de-coronamelder-hun-besmetting-door-a4027474?t=1628587272
20 https://decorrespondent.nl/12252/task-failed-succesfully-hoe-corona-apps-toch-nog-nuttig-bleken-te-zijn/719668194168-4b9a431e
21 https://www.volkskrant.nl/columns-opinie/politici-wijs-niet-te-snel-naar-de-wetenschap~b16e5c68/
22 https://www.binnenlandsbestuur.nl/bestuur-en-organisatie/opinie/ingezonden/een-pleidooi-voor-voorzorg-juist-tijdens-crises.17723754.lynkx

prevent the emergence of conspiracy theories and misinformation. Up to now, this has been insufficiently implemented.

Discussions on important values did take place within society. For example, opinions differed as to which way solidarity should go: towards the elderly and vulnerable, or towards young people who are isolated during this important phase in their lives?

What role did the parliament play?

In the regular course of events, the parliament plays an important role in deciding how to approach dilemmas. However, at the beginning of the pandemic, the whole country was in crisis mode and societal pressure on the government to act quickly made it difficult for parliament to ask questions. The cabinet simply did what it deemed necessary, leaving no room for real discussion with the House of Representatives. Over time, room for debate had to be re-created. Alternative knowledge visions from, for example, the Red Team and Herstel NL played a role in this. In February 2021, the Dutch cabinet resigned over an issue unrelated to the coronavirus, and in March 2021, there were elections and attempts to create a new government in the spring and summer of 2021 were repeatedly unsuccessful. On the topic of COVID-19 the cabinet remained operational. Although this was supported by most parties at first, the position of the cabinet, also with regard to COVID-19 became increasingly debated as time went on.

3. Using technology to cope with the pandemic

Apps: In addition to the contact-tracing app, the government also launched a type of digital Corona certificate. The CoronaCheck app allows Dutch citizens to use a QR code to show that they are in possession of either a recent negative test result, a vaccination certificate, or a certificate of immunity. The certificate was introduced quickly in the Netherlands under pressure from the House of Representatives and following European agreements.

Vaccines: The question of whether and when a vaccine would be introduced was important in decision making. From the very beginning, the Netherlands was committed to the development of vaccines. The Netherlands is home to some crucial companies for vaccine development (like the Janssen vaccine). Lockdown measures could only temporarily contain the virus and reduce the burden on hospitals while the vaccine was still unavailable. In the Netherlands, the vaccination program was halted twice for precautionary reasons.

Testen voor Toegang (‘Testing for Entry’): This program was set up so that people with a valid test certificate could visit social events. It began with a pilot study using 'field labs', with the goal not to analyse how many people were infected, but to examine the visitor test readiness and the testing infrastructure[23]. Although in April and May 2021, access testing systems proved not to be up to scratch, in June 2021 venues were able to open as usual due to a decreased rate of infection. Ultimately, Testing for Entry was used primarily for in-door clubs and café’s. Eleven commercial testing agencies carried out the tests, and the government set aside 500-700 million for this purpose.[24] However, opening up clubs and cafés seemed to be too soon at that time, as it gave rise the fourth wave of COVID-19.

Corona dashboard: During the past year, a number of ‘dashboards’ providing an overview of facts and figures emerged on different websites. The official Corona dashboard of the RIVM provides information such as the number of vaccinations, the vaccination readiness, the supply and stock of vaccines, the number of hospital and ICU admissions, the

[23] https://www.kvk.nl/corona/dit-moet-je-weten-over-fieldlabs-en-pilots/
[24] https://www.trouw.nl/binnenland/is-het-testen-voor-toegang-voor-niets-geweest~bf31f66c/

reproduction number of Corona, and the number of deaths. These figures are updated weekly and reported and interpreted in the media.

E-health: In the past one and a half years the use of digital technologies by health care providers increased dramatically. By video calling or chatting with doctors and the introduction of remote monitoring of medical information such as blood pressure and heart rate, health care can be provided without patients physically visiting the doctor, thus enabling health care at a distance[25].

4. Challenges and opportunities in dealing with STI

Experts had been warning of a disruptive pandemic for years before the COVID-19 pandemic hit[26]. Yet the Netherlands was taken by surprise by the virus and even in late January 2020, the RIVM thought that any outbreak would be under control quickly.[27].

Examples of vulnerabilities in the Dutch approach to dealing with science, technology and innovation:

- Decision makers automatically leaned primarily on technical experts how to tackle the COVID-19 crisis, not on social experts. In a later stage, this has been corrected, for example by including different (citizen, ethical and behavioral) panels in the development of the CoronaMelder app and the organization of a societal dialogue about “the Netherlands after the crisis.”28
- High expectations from commercial parties to deliver solutions were frequently not met. Problems were for example encountered in the acquisition of protective materials, the development of apps and software, and the organization and execution of tests for traveling.
- The Dutch healthcare system is very efficient, with cost considerations leading to the smallest possible stockpiles. Buffers are therefore minimal and the Netherlands has a minimal production capacity of its own29.
- During the crisis, the GGD turned out to be crucial, but understaffed and underserviced. Expenditures on these services have been cut back for years30.
- The Dutch digital infrastructure is lacking when it comes to quickly and securely taking action. Several times the implementation of digital tools to combat the virus was underestimated. There were a number of data breaches, including at the municipal health services (GGD).
- In a crisis, decision makers want data to be easily accessible. Under the guise of 'necessity knows no law', the government can use higher goals as an excuse to push aside privacy legislation. In addition, legislation such as the GDPR has proven not to be sufficient.

[25] https://www.nrc.nl/nieuws/2020/11/06/artsen-omarmen-sinds-corona-e-health-a4019047
[26] https://www.nrc.nl/nieuws/2020/12/19/eerst-overmoedig-toen-onmachtig-a4024502
[27] https://www.volkskrant.nl/nieuws-achtergrond/februari-de-verloren-maand-in-de-strijd-tegen-het-coronavirus~b09e4c7a8/
[28] https://platformoverheid.nl/artikel/nederland-na-de-crisis
[29] https://www.volkskrant.nl/nieuws-achtergrond/februari-de-verloren-maand-in-de-strijd-tegen-het-coronavirus~b09e4c7a8/
[30] https://www.ad.nl/binnenland/alarm-over-slagkracht-ggd-weggehoond-bewindsman-zei-infectieziekten-zijn-toch-voorbij~a594f3b2b/

How can we learn from this - what should we do differently?

Interestingly, at the beginning of the COVID-19 pandemic, the appeal to learn from the situation unfolding was the most prominent. At present, everyone seems eager to go back to the old 'normal'. Preventive measures for a next pandemic or societal crisis are only slowly getting off the ground[31]. The GGDs, for example, are asking for a new, nationally managed crisis organization. To deal with such situations in the future they also wish for investments in better digital information and digital tools, as they "don't want to be dependent on an *appathon* again"[32].

At the same time, society has shown itself to be very resilient. With the help of digital resources, many processes were able to continue and economic activities did not come to a grounding halt.

There is now more attention towards organising an open dialogue with society. A cross-departmental program "COVID-19 and society" held a series of dialogues in the first half of 2021. Six hundred citizens, 123 companies and civil organisations, fifty scientists and 41 local administrators discussed how The Netherlands can recover from and transition after the COVID-19 crisis, resulting in six central themes: 1) new inequalities, 2) sustainable economic recovery, 3) healthy people in a green living environment, 4) social and mental resilience, 5) the new work and living in a *blended* society, and 6) administrative relations and inclusive decision-making.[33]

5. The Rathenau Instituut during the crisis

At the beginning of the crisis, there was internal discussion about the role of the Rathenau Instituut. On the one hand, we did not want to join the existing cacophony of voices; on the other hand, as the role of knowledge and technology in fighting the pandemic is entirely in our domain, it was difficult to keep quiet. We considered our message in times of crisis carefully. The first time we published about the coronavirus was in a Message to Parliament about the contact tracer app in April 2020. By then, we were already in lockdown. Eventually we decided to incorporate the pandemic into our working program. The coronavirus is considered to be a "game changer" and therefore touches on everything our institute does.

A Corona dossier is maintained on the Rathenau website with relevant reports and articles. On four occasions we sent a message to Parliament about the way in which technology was used to curb the virus. In times of crisis, it has proven especially difficult to be heard by parliament, let alone influence decisions by the Cabinet.

6. Lessons for a post-COVID world

The past two years bore witness to a reflexive resort to technology. Even though vaccines have proven to be (part of) the solution, the pandemic will leave a scar on society: for example, the delay in healthcare services for other diseases that needed to make way for Covid-19 units, and the inequality in access to these services. Governments must be careful not to expect that technology will solve all issues, without thinking about their societal consequences and other ways to deal with the issues. The development of the contact-tracing app shows that sustainable solutions require work on complexity in all its facets. For example, digitization must be designed in a socially responsible way in

[31] https://www.vpro.nl/programmas/tegenlicht/lees/artikelen/2021/nederland-deed-in-2020-niets-om-nieuwe-pandemieen-te-voorkomen.html
[32] https://www.vpro.nl/programmas/tegenlicht/lees/artikelen/2021/nederland-deed-in-2020-niets-om-nieuwe-pandemieen-te-voorkomen.html
[33] https://platformoverheid.nl/artikel/nederland-na-de-crisis

preparation for the next similar pandemic with its development being transparent to its users.

The pandemic has reinforced the digitization of many central aspects of society (health care, education, banking, etc.), the influence of Big Tech, and the data hunger of corporations and governments. On the one hand, the benefits of emerging digital practices need to be preserved. On the other hand, digitization should not be allowed to contribute to further impoverishment of social contacts and quality of care, education and public administration.[34, 35] As a TA community, we should promote a type of digitization that stimulates public values such as social cohesion, quality of life, democracy, economy and security.

Although the signs were there, the current pandemic took the Dutch by surprise. Existing knowledge infrastructures and systems of care faltered under the pressure of the pandemic, yet few structural changes have taken place to prepare for a next disaster. Advisors to the government, such as the ethics committee for the Corona app, frequently did not receive funding. It is possible to be better prepared for such events with small probability but high impact and move beyond ad hoc crisis management. Herein, European cooperation and the guiding role of governments play a vital role.[36,37]

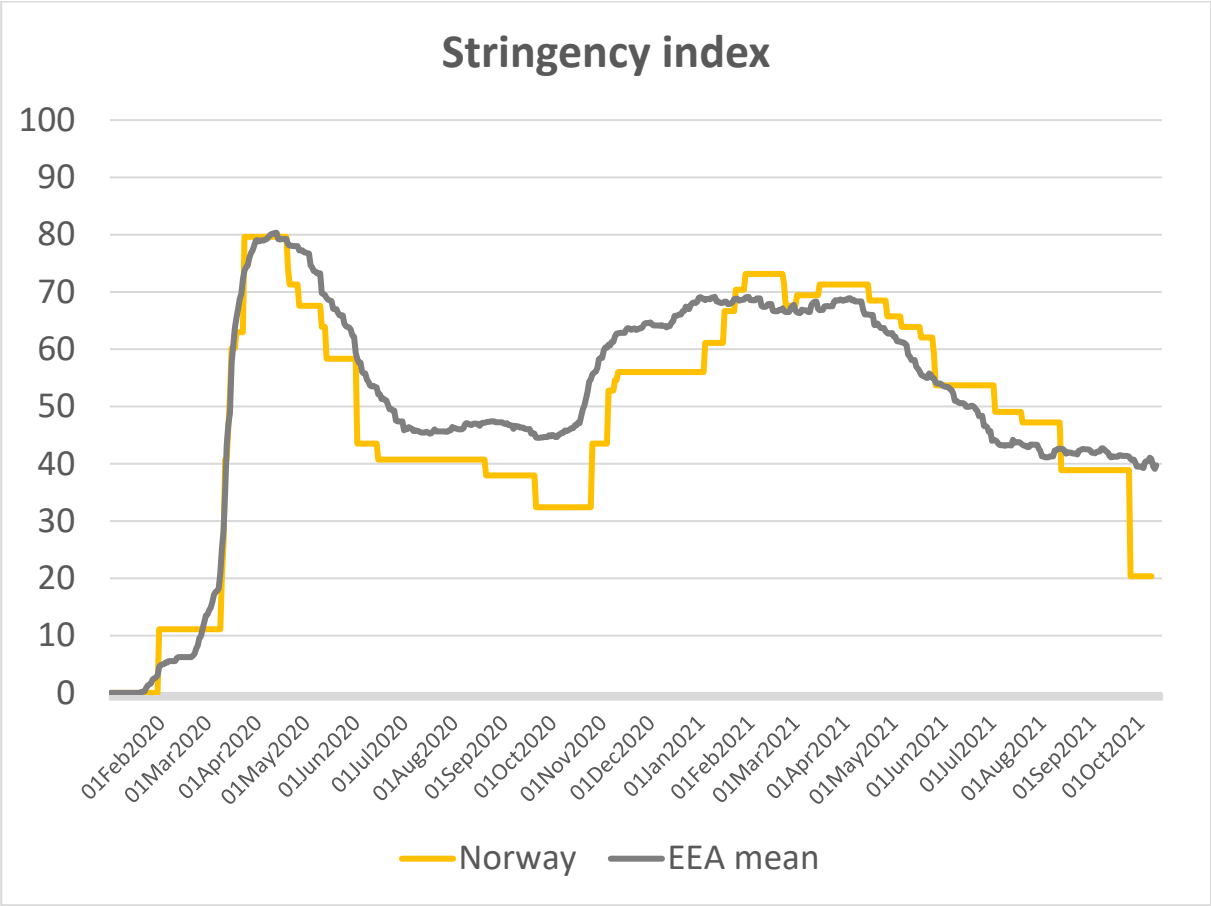
Finally, there are lessons to be learned from the way knowledge has been incorporated into decision making during the pandemic. A lack of open communication about the knowledge basis and existing uncertainties, in addition to a lack of understanding of the context in which measures take place, have led to social unrest and loss of trust. Furthermore, decision makers should be more transparent about the role of values, which guide decisions in times of uncertainty. Trust is paramount in combatting misinformation and disinformation.

[34] https://www.wrr.nl/publicaties/publicaties/2021/09/02/navigeren-en-anticiperen-in-onzekere-tijden
[35] https://english.wrr.nl/wrr-en-corona/publications/publications/2020/06/22/vulnerability-and-resilience

Norway

Norwegian Board of Technology (NBT), Joakim Valevatn, Anne-Siri Bekkelund, Jonas Engestøl Wettre, Tore Tennøe

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

Norway held the pandemic at bay, while avoiding the strictest measures

Norway has had among the lower death and infection rates in the pandemic. Overall, the country has suffered relatively mild consequences, compared to others, and has remained one of the more domestically open countries.[1]

At the onset of the pandemic, though, the Norwegian government quickly introduced a broad range of lockdown measures. In March 2020, the authorities closed schools and kindergartens, restricted private gatherings, adopted travel bans, and restricted travel. While upholding strict entry and quarantine duties, other measures were gradually released from the end of April. In the second wave of infections, late 2020, schools and

[1] https://ourworldindata.org/covid-stringency-index

kindergartens stayed open under strict regulations, while in the third wave, March 2021, some middle and high schools closed again. Densely populated areas like Oslo had stricter local measures, but never curfews. On September 25, 2021, government lifted all remaining domestic measures.

The economy has recovered quickly, with solid help from Parliament

Experts expect GDP to return to pre-pandemic levels by late 2021, and restored employment rates by 2023.[2] From March 2020 to October 2021, unemployment decreased from 10,6 per cent to 2,3 per cent.[3] Parliament adopted economic relief packages of at least 310 billion NOK (31 billion EUR) in March 2020 to stimulate the economy.[4] It also decided to postpone collection of taxes from the oil and gas industry and adjust how investments in the sector are taxed.[5] Critics said that this measure would postpone climate adaptation.[6]

2. Using science and evidence in the crisis

Government integrated science in policy, and communicated uncertainties

Particularly two evidence-based sources informed government's bi-weekly pandemic policy reviews: Health-specific analyses and advice from the Norwegian Institute of Public Health, and socio-economic analyses and recommendations by the Holden Committee of Experts. Meanwhile, the Corona Monitor Project monitored aspects such as consumption, mental and physical health, and vaccine perceptions. The government, the Directorate of Health, and the Institute of Public Health openly communicated the uncertainties of scientific evidence and dilemmas of pandemic governance through regular and joint press conferences throughout the crisis.[7]

Science and politics clashed over school closures, 'cabin ban' and vaccine skewing

The pandemic illustrates that policy making takes scientific evidence into account, but also weighs this against other societal considerations. Science was at the core of Norwegian covid politics, but not the only input. For example, the government only partially adopted the advice of its own expert committee to skew vaccines towards densely populated areas.[8] It closed schools, despite the uncertainty of public health effects. And it banned visits to leisure properties outside one's home municipality to mitigate pressure on local health facilities,[9] again with limited scientific backing.

Initially, roles and responsibilities in decision-making were unclear

Even though the pandemic in general has been handled well in Norway, there have been some points for criticism, especially regarding the process of how decisions were made in the beginning of the pandemic. The first lockdown in March was later criticised by the public and independent Corona Commission, which evaluates the management of the pandemic by Norwegian authorities. According to the commission, the government initially

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[2] https://www.ssb.no/nasjonalregnskap-og-konjunkturer/artikler-og-publikasjoner/slik-har-koronapandemien-pavirket-norsk-okonomi
[3] https://www.nav.no/no/nav-og-samfunn/statistikk/flere-statistikkomrader/relatert-informasjon/ukentlig-statistikk-over-arbeidsledige
[4] https://www.aftenposten.no/okonomi/i/4qAmo6/krisepakkene-har-passert-310-milliarder-her-er-dagens-nye-tiltak
[5] https://www.regjeringen.no/no/dokumentarkiv/regjeringen-solberg/aktuelt-regjeringen-solberg/smk/pressemeldinger/2020/tiltak-for-olje--og-gassnaringen-og-leverandorindustrien/id2700656/
[6] https://wwf.panda.org/wwf_news/?364347/Norway-fossil-fuel-COVID-19-recovery
[7] https://files.nettsteder.regjeringen.no/wpuploads01/blogs.dir/421/files/2021/04/Koronakommisjonens_rapport_NOU.pdf, p 178
[8] https://www.nrk.no/ytring/spar-liv-med-mer-skjevfordeling-1.15452381
[9] https://www.forbes.com/sites/davidnikel/2020/03/19/norway-bans-cabin-trips-to-prevent-rural-health-service-overwhelm/

failed to assure itself of whether implemented measures were constitutional and respected human rights. Second, instead of the Directorate of Health, government itself should have made the formal decision to shut Norway down. And third, the Directorate of Health should have made better use of January and February to gather advice and prepare measures.[10]

Government quickly reclaimed the formal responsibility for implemented measures. Shortly after, Parliament granted government wider discretion to adopt regulations without parliamentary pre-approval, through the Corona Act.[11] On March 24, the government decided on a strategy to suppress the virus.[12]

3. Using technology to cope with the pandemic

Digital technologies have been used both to deal with the pandemic directly and keep society functioning.

Coronavirus-specific technologies:

Corona certificate: Norway launched its digital corona certificate on June 11, 2021. It is only used to enter large events and to cross Norway's borders.

Contact tracing smartphone app: The government and the Institute of Public Health launched Smittestopp («Infection Stop») in April 2020. After criticism of privacy and lack of clear consent, and a Parliamentary vote to dismiss the app, the Institute of Public Health developed and launched a new version, Smittestopp 2.0, in December 2020. The new version has been downloaded by 24 per cent of the population older than 16.[13] About 3,6 per cent of confirmed cases since January have been reported through the app.[14]

The corona chatbot: On March 20, 2020, helsenorge.no, Norway's official channel for public health communication, launched a chatbot that could answer COVID-related questions and guide the public towards information. The bot handled more than half a million conversations in its first year, reducing the load on other public services.

Technologies to keep society functioning:

Spike in e-consultations: In April 2020, 40 per cent of doctor visits were digital, compared to 3 per cent in January 2020. helsenorge.no registered 72,9 million visits in 2020, doubling the numbers from 2019.[15] The increase is partially attributed to changes in the financing model of primary health consultations, equating digital and physical visits to the doctor. The Norwegian Board of Technology has advocated for this change.[16]

[10] https://files.nettsteder.regjeringen.no/wpuploads01/blogs.dir/421/files/2021/04/Kommisjonens-hovedbudskap.pdf
[11] https://lovdata.no/dokument/LTI/lov/2020-03-27-17
[12] https://www.regjeringen.no/no/dokumentarkiv/regjeringen-solberg/aktuelt-regjeringen-solberg/smk/taler-og-innlegg/statsministeren/talerogartikler/2020/statsministerens-innledning-pa-pressekonferanse-om-videreforing-av-tiltak-mot-korona-spredning/id2694755/
[13] https://www.fhi.no/om/smittestopp/nokkeltall-fra-smittestopp/
[14] https://www.fhi.no/sv/smittsomme-sykdommer/corona/dags--og-ukerapporter/dags--og-ukerapporter-om-koronavirus/
[15] https://www.ehelse.no/publikasjoner/utviklingstrekk-2021
[16] https://teknologiradet.no/wp-content/uploads/sites/105/2021/04/Teknologiradets-arsrapport-med-regnskap-for-2020.pdf

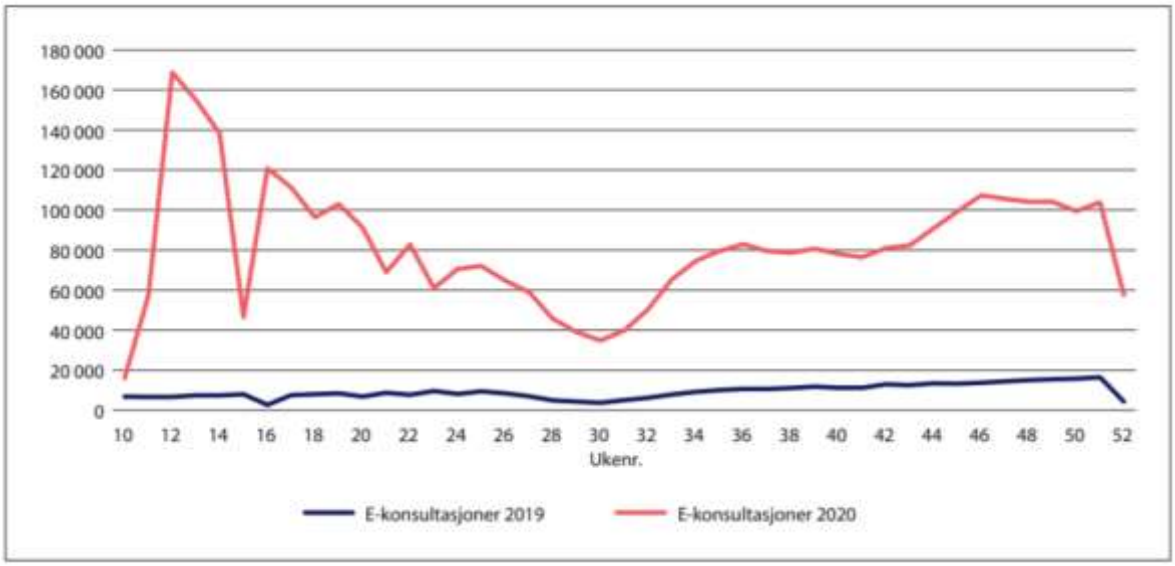

Illustration: Number of electronic consultations in primary care ("fastlege"). Week 10-52 in 2020 (red) compared to 2019 (blue).[17]

Rush to home offices: Half of Norway's work force used home office during the pandemic. 70 per cent of those would like to continue with some degree of home office in the future.[18]

Extensive use of online education: Only 5 per cent of Norwegian elementary school pupils were physically present at school during spring 2020. In middle and high schools, 4 out of 10 of pupils aged 13-19 said their learning outcome was the same or better compared to normal times, while 6 out of 10 said their situation had deteriorated.[19] In universities, digital education remained standard for a year. While this upheld education through the pandemic, a third of students said they struggled with loneliness in December 2020.[20]

4. Challenges and opportunities in dealing with STI

Scenarios for a pandemic existed, but were not prepared for[21]

Norwegian authorities handled the pandemic well. A year in, the economic impact and Norway's mortality rate was among the lowest in Europe. High levels of trust in authorities and between people are factors that explain this.

However, the lack of foresight and pandemic preparedness has been criticized. The Directorate for Civil Protection had highlighted a pandemic as the most likely high impact incident Norway could face in several reports throughout the past two decades. [22,23] Still, Norway had yet not developed a governance framework for a pandemic that was sufficiently holistic when COVID-19 hit.

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[17] https://www.regjeringen.no/contentassets/5d388acc92064389b2a4e1a449c5865e/no/pdfs/nou202120210006000dddpdfs.pdf
[18] https://oda.oslomet.no/oda-xmlui/bitstream/handle/11250/2756692/AFI_fou_2021_04_Hjemmekontor.pdf
[19] https://oda.oslomet.no/oda-xmlui/bitstream/handle/20.500.12199/4221/NOVA-rapport-12-2020.pdf
[20] https://www.fhi.no/div/helseundersokelser/fylkeshelseundersokelser/livskvalitet-og-psykisk-helse-under-koronaepidemien--nov-des-2020/
[21] Based on the Corona commission's first report: https://files.nettsteder.regjeringen.no/wpuploads01/blogs.dir/421/files/2021/04/Kommisjonens-hovedbudskap.pdf
[22] https://www.dsb.no/globalassets/dokumenter/rapporter/nrb_2014.pdf
[23] https://www.dsb.no/globalassets/dokumenter/rapporter/p1808779_aks_2018.cleaned.pdf

Norway lacked necessary infection control equipment during spring 2020, and the government could have done more in terms of emergency plans and crisis exercises in advance.

More pandemic research, but public experiments are still off the table

In March 2020, the Research Council of Norway allocated a total of NOK 30 million (EUR 3 million) to projects that will «enable us to understand and contain the new COVID-19 and improve efficient treatment of patients and (national and international) public health preparedness and response to the current and related future outbreaks». Funded projects engage with both social sciences, health/medicine, political science, and economics.[24]

But the regional research ethics committee declined requests from the Institute of Public Health to randomise the introduction of certain measures, like school closures. Randomisation could potentially have enabled more targeted research on the effects of measures.[25]

Prioritisations have raised discussions on fairness and socioeconomic differences

Government has aimed to safeguard public health, protect the economy, and avoid disruptions in society[26], meaning much attention and effort has gone to protect elderly and vulnerable citizens. Less vulnerable groups, like students, said the government did not sufficiently meet their needs. In Norway, only 10 per cent of students live with their parents, and 2 of 3 work besides studying.[27] Many of these lost their incomes to temporary layoffs.

1 in 10 pupils in Oslo has an unsatisfactory school environment at home. Among pupils with immigrant backgrounds, this problem is twice as big.[28] There is a worry that the school closures may have lasting negative effects on pupils, and that socioeconomic differences in learning outcome will increase as a consequence.[29]

Economically, certain groups were hit harder than others. The hospitality and culture industries suffered 45-55 per cent losses during 2020. When unemployment quadrupled in March 2020, it impacted toughest those with less education, lower incomes, and immigrant backgrounds.[30]

5. The Norwegian Board of Technology during the crisis

The Norwegian Board of Technology has conducted several corona-specific projects. Most of our corona-specific projects were thoroughly discussed with or by Parliament members:

- Digital contact tracing in Norway[31] – report, open meeting, and meeting in Parliament
- Vaccine passports – a way forward to reopening?[32] – report, population survey, op-eds, open meeting, several media performances, op-ed, and meeting in Parliament

[24] https://www.forskningsradet.no/en/call-for-proposals/2020/emergency-call-proposals-project-outline-covid-19/
[25] https://www.forskningsetikk.no/globalassets/dokumenter/1-uttalelser-og-vedtak/nem/vedtak-i-klagesaker/2020-106-prosjektapning-under-pandemien-sape.pdf
[26] https://www.regjeringen.no/contentassets/728fcbdf185d4d5f878dcb0fe535176f/langsiktig-strategi-for-handteringen-av-covid-19-pandemien.pdf
[27] https://www.ssb.no/utdanning/artikler-og-publikasjoner/visste-du-dette-om-studentene-i-norge
[28] https://oda.oslomet.no/oda-xmlui/bitstream/handle/20.500.12199/4221/NOVA-rapport-12-2020.pdf
[29] https://www.udir.no/contentassets/2375556970d048d09ab773e0892800ff/fylkesmennene-rapportering-av-konsekvensene-av-stengte-barnehager-og-skoler---oppsummering.pdf
[30] https://www.regjeringen.no/no/dokumenter/nou-2021-6/id2844388/
[31] https://teknologiradet.no/en/publication/digital-contact-tracing-in-norway/
[32] https://teknologiradet.no/en/publication/vaccine-passports-a-way-forward-to-reopening/

- The new normal after Covid-19[33] – trend report, meeting in Parliament, briefings for the government, and op-eds.
- Digital opportunities in mental health[34] — report, and media coverage
- Also, existing projects, such as Lifelong learning[35], Mobility and the future of the city[36], and Future of work[37] were updated with new 'pandemic' perspectives.

An active role in discussions about contact tracing apps and corona certificates

TA has proven especially relevant and effective in discussions about corona certificates, digital contact tracing, and rapid digitalisation of health services and education. When Norway introduced its corona certificate, it reflected what the Norwegian Board of Technology had found reasonable: a digital document to enable travel and large events, but not to be used in everyday situations. The NBT also highlighted the risks associated with the centralised digital contact tracing solution embedded in Smittestopp 1.0.

The Norwegian Board of Technology hosts the regular meetings of the cross-parliamentarian group for technology matters. When these meetings went digital, as a consequence of covid, they were opened up to the public. This created a space for parliamentarians, experts and interested laypeople to meet.

Strengthening future literacy in Parliament, the government, and the NBT

To prepare for future crises, the Norwegian Board of Technology plans to strengthen its skills and develop its toolkit within strategic foresight and citizen involvement and would advise Parliament and the government to do the same. Countries with advanced foresight capabilities will be better prepared for future crises.

During the pandemic, the Norwegian Board of Technology conducted participatory processes like scenario development and scenario workshops using digital tools. Online participation made it easier to include participants from across the country. Participatory foresight exercises can give politicians a better foundation for making decisions, by improving understanding of broader societal effects of crises and their countermeasures.

6. Lessons for a post-COVID world

In December 2020, The Norwegian Board of Technology published a report on relevant technology trends to discuss in a post-COVID world.[38]

A game changer for vaccines – and for resolving crises

The pandemic has shown that global action to avert immediate crises and threats is possible. How quickly COVID-19 vaccines were developed, is one example. Other threats could be confronted in a similar fashion, like the climate crisis. The use of *open and shared data and research*, swift and generous *public finance*, faster and *smoother approval procedures* for the new solutions, and models for *international cooperation*, such as the COVAX initiative, might be some important lessons.

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[33] https://teknologiradet.no/publication/teknotrender-for-stortinget-2021/
[34] https://teknologiradet.no/fem-teknologier-som-far-psykologen-pa-nett-med-pasienten/
[35] https://teknologiradet.no/en/publication/a-streaming-service-for-learning-new-visions-for-lifelong-learning-in-norway/
[36] https://teknologiradet.no/publication/digitalt-skifte-for-transport-16-nye-teknologier-og-hvordan-de-endrer-byene/
[37] https://teknologiradet.no/publication/hva-skjer-med-jobbene-vare/
[38] https://teknologiradet.no/wp-content/uploads/sites/105/2020/12/Teknotrender-for-Stortinget-2021-1.pdf

Work moves home

Before March 2020, the video chat tool Zoom was a niche product. By November, it was worth more than the world's seven largest airlines, combined. Telework proved very popular: 2 out of 3 employees with a higher education would like to continue teleworking at least once a week.[39] This might affect city planning, public transportation, and employment legislation. Meanwhile, workers in low-income jobs will less likely see the option to work from home at all. People who live in small or crowded homes may see their working conditions degrade if pressured to telework. Upcoming debates must address all these issues.

Automation accelerates

Many companies digitised or automated processes during lockdown. Both simple technologies, like QR codes in bars, and advanced robotic systems like those which now disinfect hospitals, were introduced. Whether automation will boost productivity, or rather cause jobs to disappear through so-called jobless recovery, remains open. Regardless, education and «lifelong learning» is likely to stay on top of the political agenda in Norway in coming years.

Big tech grows bigger

Tech giants saw record growth as the demand for digital services increased. The motion towards a «winner takes all» economy, through network effects, existed before the pandemic as well. It is urgent to discuss the conditions for fair and free competition in the digital economy.

Health services takes a digital leap

The pandemic triggered an overnight transition to digital and remote health services. Digital services can make health services more efficient and available. But they also raise questions about privacy, IT security, the domination of big tech and whether an IT system can ever replace human care.

A corona-triggered green shift?

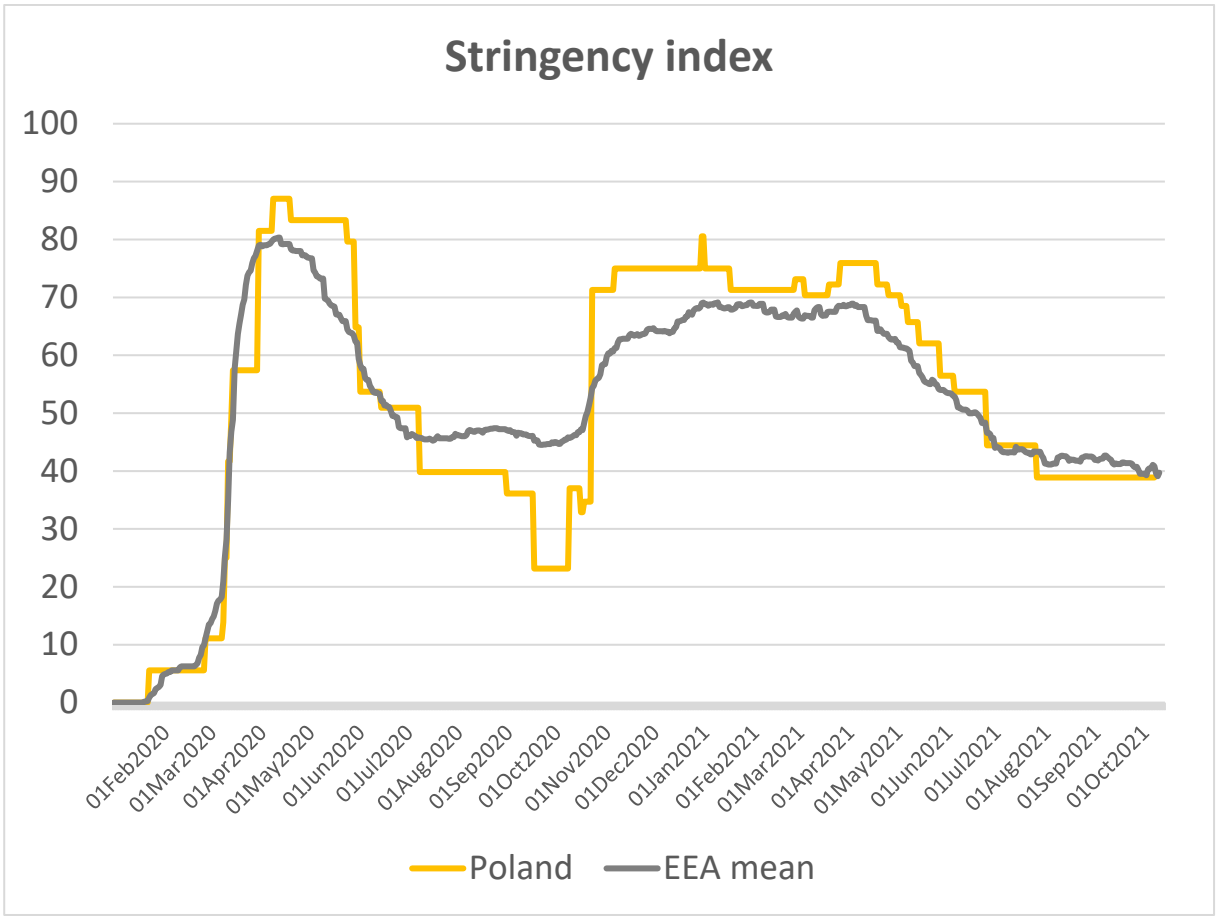
A positive side effect of the COVID-19 pandemic was that global CO_2-emissions went down by an estimated 7 % in 2020.[40] The level of global cooperation and the force of political action exhibited in the pandemic raised hope that a similar effort could be made to stop a different threat to humans: Climate change. Economic recovery packages are now used to support reductions of greenhouse gas emissions in several countries, and by the EU.[41]

[39] https://khrono.no/hver-femte-vil-ha-hjemmekontor-3-4-dager-eller-mer/587277
[40] https://www.globalcarbonproject.org/carbonbudget/20/highlights.htm
[41] https://www.reuters.com/article/us-eu-summit-climate-change-idUSKCN24N231

Poland

Parliamentary Bureau of Research (BAS) of the Polish Sejm, Wojciech S. Zgliczyński and Mirosław Sobolewski

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

On March 4, 2020, Poland reported the first laboratory-confirmed COVID-19 case. The first death was reported on March 12, 2020. By June 30, 2021, Poland has registered 2,879,912 infections resulting in 75,021 deaths and 2,651,787 convalescents.

The pandemic in Poland had a significant negative impact on population health. In 2020, compared to 2019, there were 67,000 more deaths. Of these, 43% were deaths directly caused by COVID-19, and 27% were deaths among those who had been diagnosed with SARS-CoV-2 in the past. An increase in the number of deaths was partly due to limited access to health care.

The national COVID-19 vaccination program began at the end of 2020. By the end of August 2020, only approximately 50% of the population was vaccinated. There are very significant differences in the degree of vaccination between regions (e.g. some small rural communities in eastern voivodeship with approx. 20% vaccinated and large cities and suburban municipalities with more than 65% vaccinated).

Secondary effects of the COVID-19 pandemic for society, the labour market and transportation are still unclear. Moreover, the long-term impact of those effects are difficult to determine.

Mainly due to large public expenditure, it was possible to avoid a significant increase in unemployment. Another crucial factor was the temporary closure of borders for non-citizens and other limitations of migration, including the flow of employees from other countries. The impact of those limitations was observed mainly in the construction and agriculture sectors – to some extent it resulted in an increase of housing and food prices. Other sectors particularly affected by the COVID-19 pandemic were culture, tourism, hospitality and gastronomy.

The changes observed had a dual character. For example, in the case of public transportation, at the worst moment (total lockdown), the decrease in the number of passengers reached 80%. At that time, a large number of connections were suspended. There were no school transport or tourist trips. Along with the gradual loosening of restrictions and the calming down of the epidemic, the situation began to improve, but the flows of passengers on many lines did not return to the pre-pandemic state. Moreover, some connections, especially local ones, suspended due to the pandemic, have not been restored[1]. On the other hand, we observed improvement in the road safety, air and noise pollution.

In the area of commerce, certain trends were observed. In 2020, we witnessed significant increase in e-commerce: a sharp increase in online sales, the transfer of stationary activities to the Internet and a change in consumer behaviour. The most noticeable effect is the appearance of parcel-lockers on a mass scale[2][3].

In Poland, due to pandemic, we observed an acceleration in the improvement of access to broadband internet networks. In 2020, 90.4% and 89.6% of all households had Internet access and broadband Internet access at home, respectively. Which was an increase by 3.7 and 6.3 percentage point respectively, compared to 2019. At the same time, the percentage of people who regularly use the Internet has increased, especially among older age groups[4].

Unsurprisingly, the consumption of mobile data in Poland increased over the year, compared to the period before the COVID-19 pandemic. However, the scale of this rise - 60% -was surprising[5]. A question remains, if this consumption will be maintained after the epidemic is over.

After a strong decrease in GDP in 2020 (-2.7 GDP – which in comparison with other UE countries was a relatively small decline), nowadays we observe a dynamic recovery. Nevertheless, the growing inflation rate and growing public finances deficit are considered as a risk for full recovery.

2. Using science and evidence in the crisis

In Poland, in the beginning of the pandemic, political decisions were strictly made based on scientific resources backed by solid evidence. In this process, a crucial role was played

[1] https://www.transport-publiczny.pl/wiadomosci/polbuspks-wroclaw-przewozy-nie-sa-zagrozone-ale-czesc-linii-nadal-zawieszona-70057.html
[2] https://www.shoper.pl/blog/handel-vs-koronawirus-jak-sprzedaz-przeniosla-sie-do-internetu/
[3] https://www.ideo.pl/e-commerce/wiedza/pandemia-zmienia-e-commerce,70.html
[4] https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w-2020-roku,1,14.html
[5] https://biuroprasowe.play.pl/aktualnosci/689506/raport-play-jak-pandemia-COVID-19-wplynela-na-zachowania-konsumentow-oraz-rozwoj-sieci

by the Minister of Health and the Chief Sanitary Inspectorate –both professors of medicine with a strong bond to evidence based approach.

With time, a group of scientific experts was established representing governmental institutions (Medical Board - the Prime Minister's subsidiary body which consisted of recognized medical experts) and non-governmental organisations (COVID-19 Advisory Team to the President of the Polish Academy of Sciences – interdisciplinary board consisting of experts from the fields of medicine, epidemiology, biology, public health, statistics, economy, environment, sociology and psychology). Some non-institutional (freelance) scientific experts became active - playing an important role in commercial news channels. Some non-institutional (independent) experts took action - playing an important role in the media, especially in commercial news channels.

From the beginning it was evident that we had limited knowledge about the virus SARS-CoV-2 and COVID-19 diseases. Along with the development of evidence and knowledge, it turned out that some decisions were wrong, and these have been changed as fast as possible (e.g. in the beginning of pandemic, the Ministry of Health did not recommend using face masks – this has been changed when strong scientific evidence emerged). Another important political decision which was made based on solid resources was the postponement of the presidential elections. Presidential elections in Poland, despite the ongoing COVID-19 epidemic, have been ordered for May 2020. There have been numerous voices from specialists about the need to postpone the election date. Ultimately, elections were held in August. Changing decisions, especially without proper communication, to some extent confused the public opinion – giving base to conspiracy theories and denialism.

Different values and interests were considered in the political decision-making processes after the first wave of the pandemic. Those processes were not as transparent as the public opinion would have expected. To some degree, this was driven by the need for swift decision-making in an unprecedented public health crisis.

From the beginning, the role of the Parliament in the decision making process was important. On March 2, 2020, the Lower Chamber of the Polish Parliament (Sejm) enacted the Crisis Act on special measures aimed at the prevention and control of COVID-19, other infectious diseases, and the resulting crises situations. This act provided administrative, budgetary, and epidemiological measures to manage a possible epidemic of COVID-19[6]. The above-mentioned act was amended on an ongoing basis.

3. Using technology to cope with the pandemic

In Poland technology and innovation has been used as a tool to cope with the COVID-19 pandemic. Some of the tools were established under public authorities' decisions.

The tools can be grouped in the following categories:

- informational, allowing to easily find facts about COVID-19 (e.g. governmental website[7]),

[6] *Act of March 2, 2020, on special arrangements for the prevention and combating of COVID-19, other infectious diseases and crisis situations caused by them.* URL: http://prawo.sejm.gov.pl/isap.nsf/download.xsp/WDU20200000374/T/D20200374L.pdf [in Polish]

[7] https://www.gov.pl/web/koronawirus

- personalized, allowing to quickly find out and use personalized information in the area of health (e.g. COVID-19 test result, prescription, doctor referral, EU COVID certificate[8]),
- transactional (e.g. allowing registration for COVID-19 vaccination or telemedicine consultation[9]),
- locational (e.g. applications that facilitate and monitor quarantine at home[10] or voluntary applications monitoring individuals' surroundings by Bluetooth[11]),
- diagnostic (SARS-CoV-2 detections tests invented by researchers from ICHB PAN[12]).

4. Challenges and opportunities in dealing with STI

In the beginning of 2020, the World Health Organization pointed out that "A pandemic of a new, highly infectious, airborne virus - most likely a strain of influenza - to which most people lack immunity is inevitable. In the WHO's opinion it was "not a matter of if another pandemic will strike, but when, and when it strikes it will spread fast, potentially threatening millions of lives"[13]. Despite this warning, no country was prepared for COVID-19 pandemic.

Poland was relatively mildly hit by the first wave of the pandemic in March 2020, thanks to fast political decisions to close the borders and introduce lockdown. The time bought in this way allowed Polish decision-makers to closely follow developments in other countries and make decisions based on their experience. Therefore, the measures/activities undertaken in Poland were similar to those in other countries. As such, it is difficult to say that they were innovative.

While in the first period, decisions were based on scientific knowledge about the coronavirus (albeit limited), in the later period, public opinion became increasingly important. For this reason, among others, it was decided not to introduce restrictions on civil rights as severe as in Western European countries. Compliance with hand hygiene and sanitary rules as well as social distancing were encouraged. The result of this approach was on the one hand, a relatively mild economic collapse, and on the other hand, a relatively high number of infections and deaths.

5. The BAS during the crisis

The COVID-19 pandemic is not only a health issue, but also a socio-economic, legal and political phenomenon. Most of the activities related to the ad-hoc pandemic response were carried out by the government on the basis of secondary legislation (implementing acts adopted by the Council of Ministers or individual ministers). Nevertheless, the scale of the necessary adjustments fuelled intensive legislative work in the Parliament. The three main areas of activity of the Sejm related to the pandemic included:

- Ensuring the statutory conditions for the Parliament's activity during a pandemic, including the implementation of legal and technical solutions enabling remote meetings and voting, both in committees and during plenary sessions;
- Conducting rapid legislative work related to the adoption of special "anti-COVID" legislation, including adopting regulations on the organization of the health care

[8] https://pacjent.gov.pl/
[9] https://www.gov.pl/web/eKolejka
[10] https://www.gov.pl/web/koronawirus/kwarantanna-domowa
[11] https://www.gov.pl/web/protegosafe
[12] https://portal.ibch.poznan.pl/en/
[13] https://www.who.int/news-room/photo-story/photo-story-detail/urgent-health-challenges-for-the-next-decade

system, the operation of educational institutions, ad hoc assistance for entrepreneurs, etc.;
- Adoption of financial measures aimed at economic recovery after the pandemic, including the adoption of the National Recovery Plan.

The Bureau of Research (BAS), as part of its statutory duties, was involved in the above-mentioned activities and prepared expert opinions on all of the above-mentioned areas. Such expert opinions were commissioned by deputies, parliamentary committees or the management of the Chancellery of the Sejm. The largest number of opinions concerned economic and legal assessment of government bills related to counteracting the COVID-19 pandemic, opinions on the compliance with European Union law of the proposed statutory solutions as well as information on actions, measures and good practices applied in other countries. In total, we have prepared over 150 such opinions, but to a very small extent they concerned issues in the field of science, technology and innovation.

During the pandemic, BAS did not experience increased demand for scientific advice on issues related to new technologies and their use in the process of counteracting COVID-19. The BAS activity was within the scope of the previously developed, routine methods of proceeding. We have not taken steps to create new information products or other forms of knowledge transfer.
As part of the Bureau's own initiatives, a collection of articles analysing the effects of the COVID-19 pandemic on society, the economy and the market has been planned for the first quarter of 2022. One of the topics is the impact of the pandemic on the development of remote communication technologies and other innovations, as well as the consequences for the labour market and changes in education.

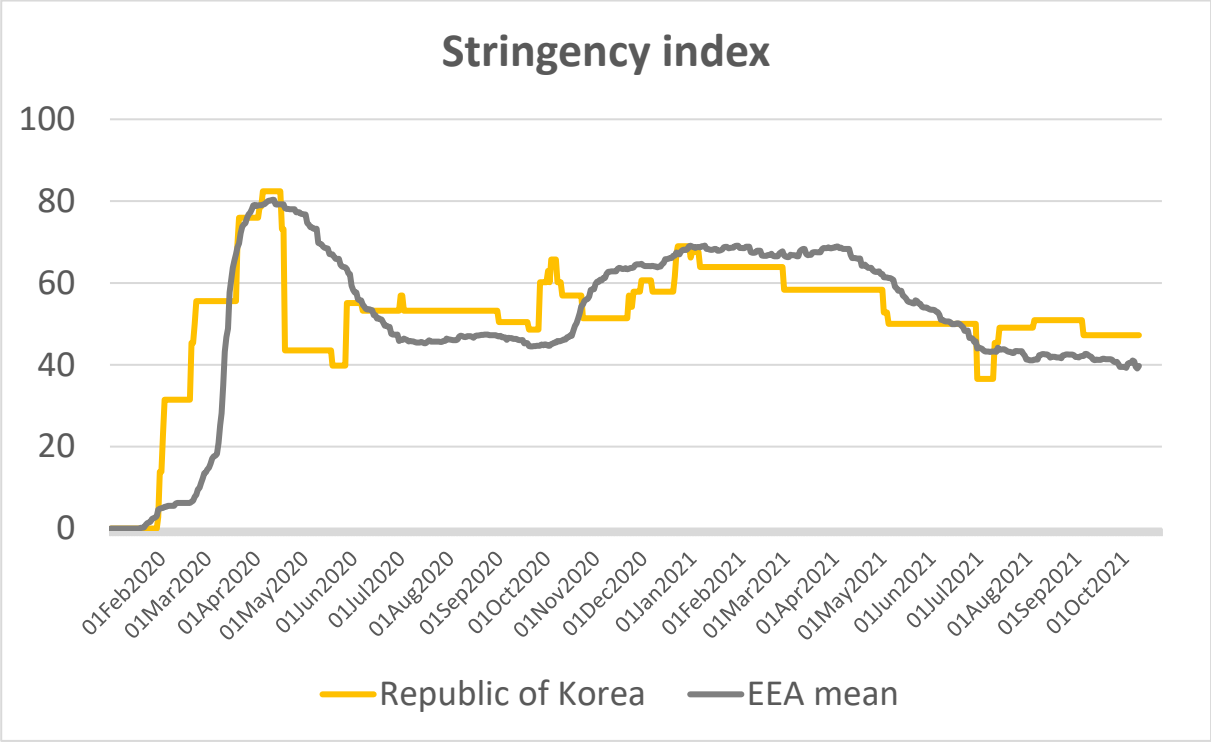
6. Lessons for a post-COVID world

During the COVID-19 pandemic, Poland and the Polish population underwent a fast digital transformation. Most public institutions have modernised the way they operate by making greater use of digital solutions, although the effects may be questionable. People who previously did not have the opportunity to use digital services, or consciously did not want to use them, are now forced to do so (in for example medical care, administration, school and work).
The current situation and the rapid digitization of society have shown how many people in Poland do not have access to the Internet or do not have sufficient digital skills, and thus become disconnected from the world. There is also the issue of adequate computer equipment in households.
The pandemic raised the issue of the importance of people-to-people contacts and their impact on the development of individuals and their mental health - especially in case of children and adolescents. Particularly in the case of Poland, the pandemic showed the need for urgent changes in the health- and education sector. Other issues are effective protection against disinformation and denialism as well as improving digital literacy.

Republic of Korea

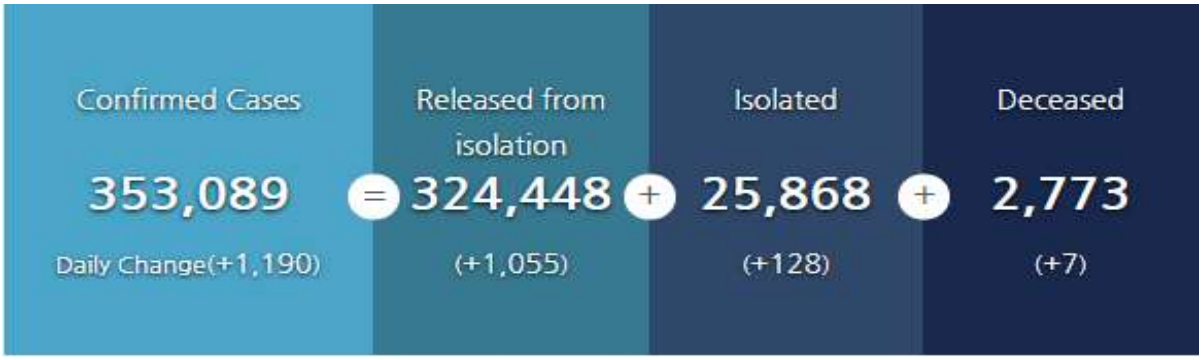
National Assembly Futures Institute (NAFI), Byoung Soo Kim

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

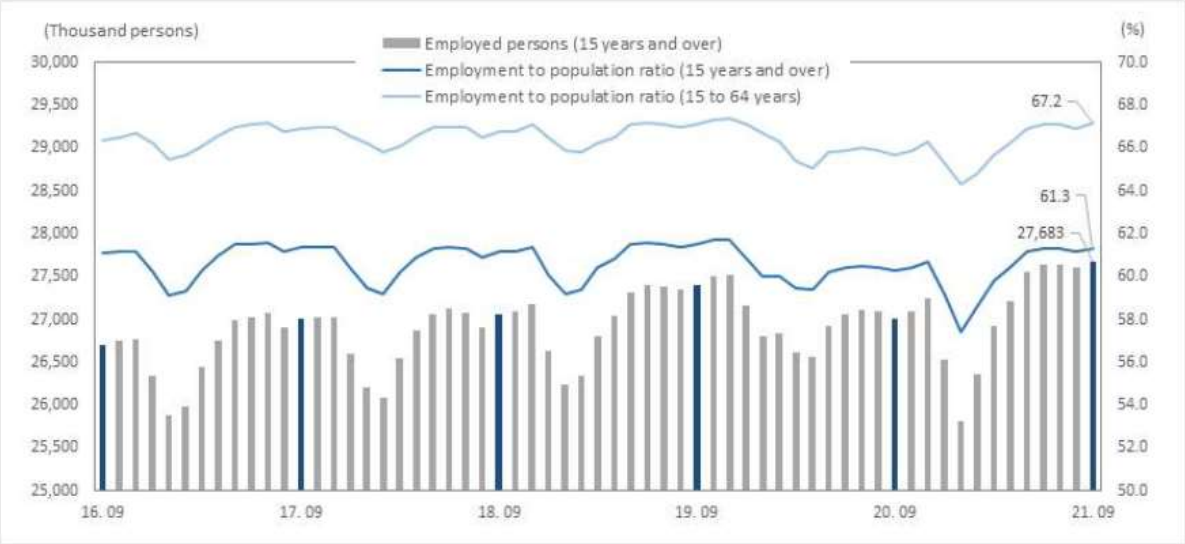
Cases in Korea, as of October 25, 2021[1]



[1] Source: Ministry of Health and Welfare, South-Korea

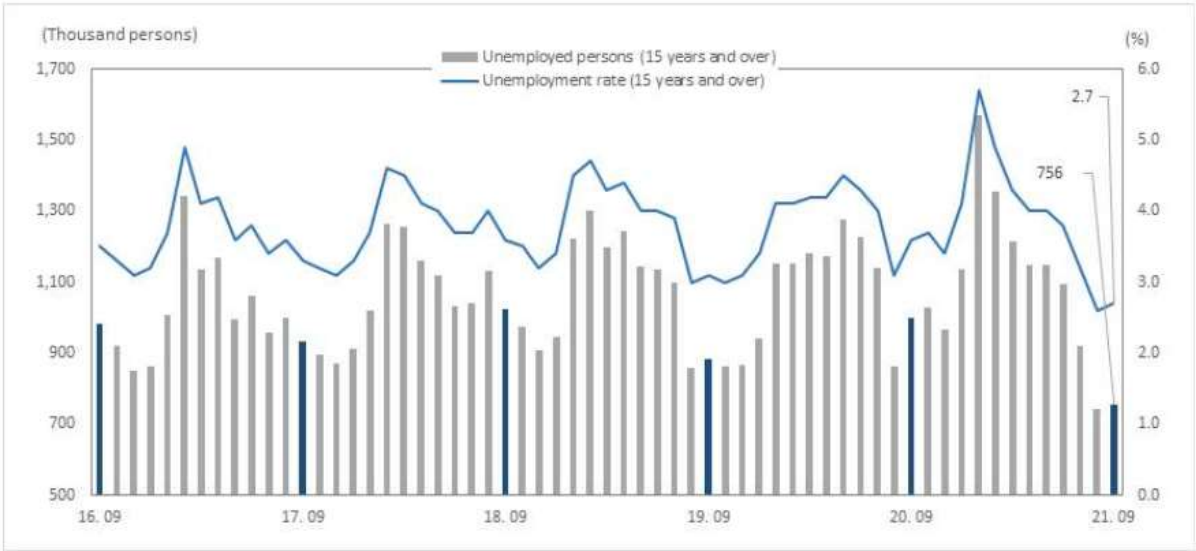
Employed persons and employment to population ratio[2]:

The number of employed persons totaled 27.683 million people in September, which went up 671 thousand persons or 2.5% year-on-year.



Unemployed persons and unemployment ratio[2]:

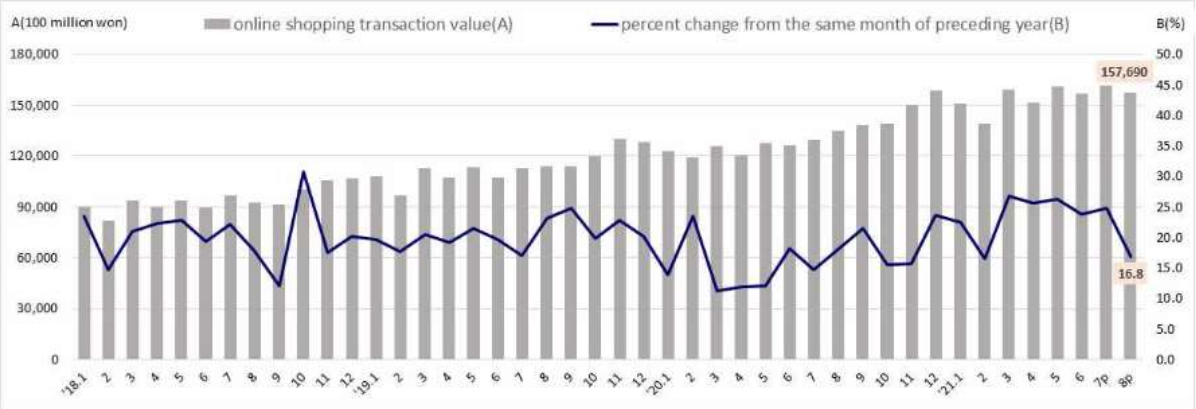
The number of unemployed persons totaled 756 thousand people in September, which decreased 244 thousand persons or 24.4% year-on-year.



The online shopping transaction value[2]:

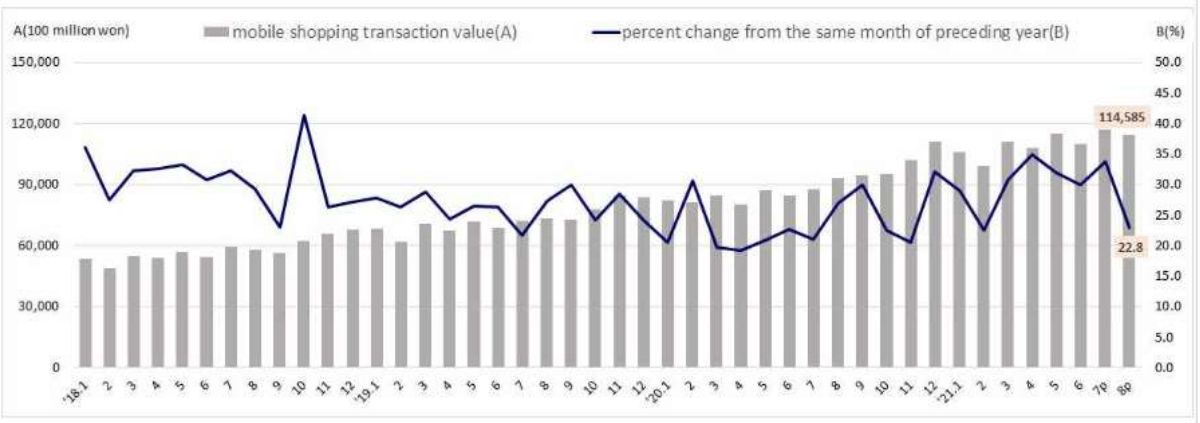
[2] Source: Kosis.kr

The online shopping transaction value marked 15.7690 trillion won in August 2021, rising 18.8% from the August 2020.



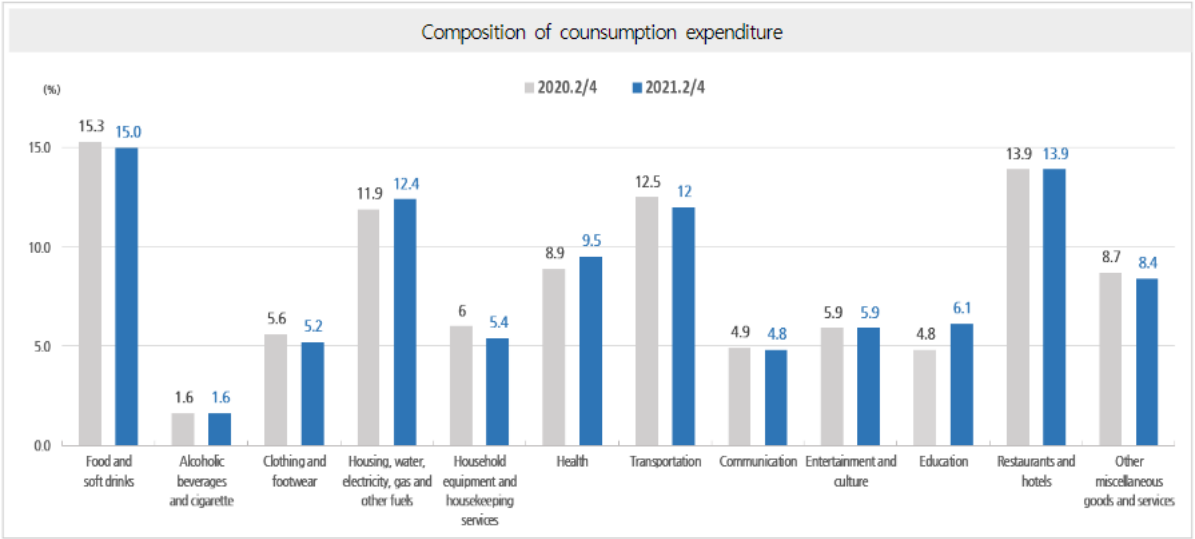
The mobile shopping transaction value[2]:

The mobile shopping transaction value marked 11.4585 trillion won in August 2021, rising 22.8% from the August 2020.

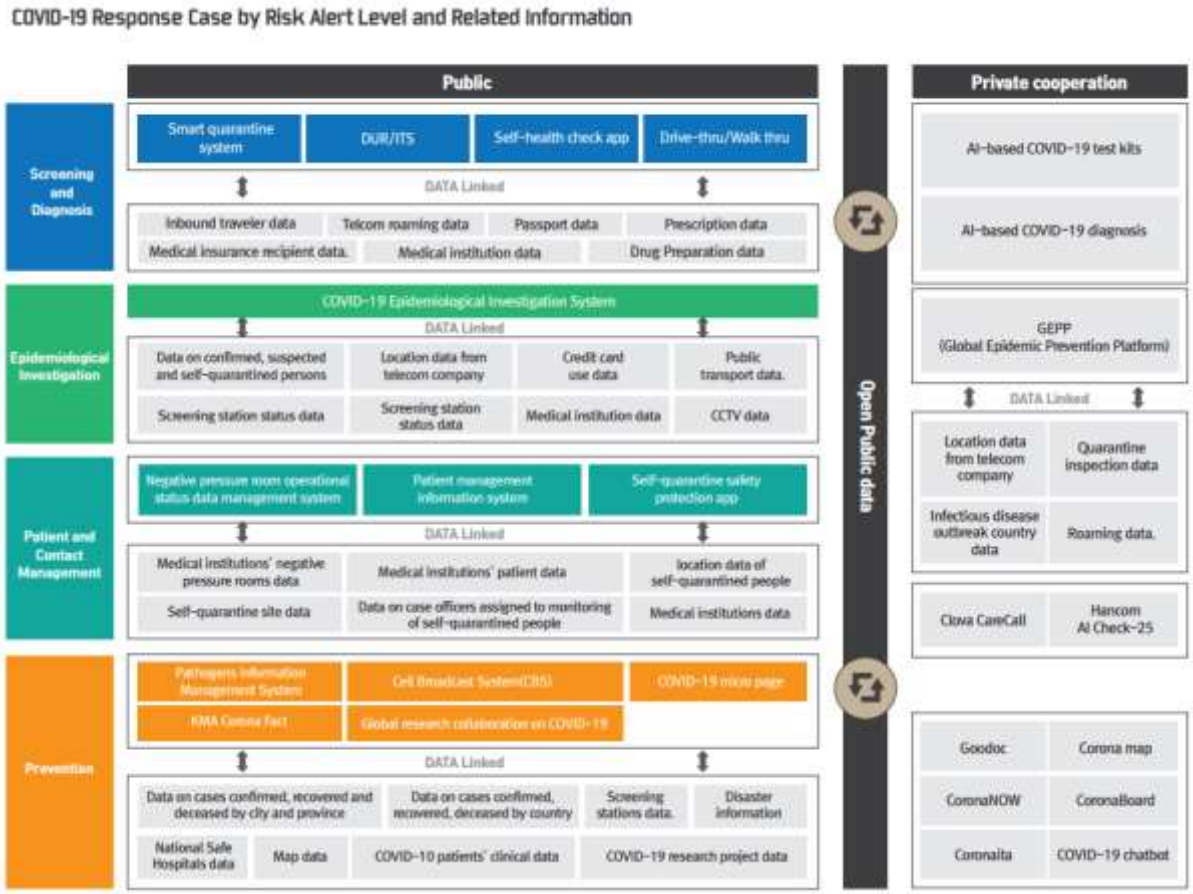


Household expenditure[2]:

Average monthly consumption expenditure per household marked 2.475 million won in the second quarter of 2021, which rose by 3.8% from the second quarter of 2020.



2. Using science and evidence in the crisis



Source: National Information Society Agency)

Korea actively utilizes ICT to respond to the COVID-19 crisis and takes innovative approaches to control the infectious disease by developing AI-based testing kits promptly, tracing and monitoring confirmed patients with GPS, managing and monitoring patients and people confirmed positive to the disease via mobile apps, and quickly providing information by opening public data while ensuring transparency (see picture above).

In the stage of screening and diagnosis, the country uses Drug Utilization Review (DUR) and International Traveler Information System (ITS), allowing medical institutions to have access to data on entrants from countries affected by COVID-19. By using DUR and ITS, all medical institutions in Korea can identify patients having a high probability of COVID-19 infection.

Also, the Korean government takes preventive measures in the fight against the disease via smart quarantine system which enables one to efficiently check the extensive information of travelers entering Korea via a third country. It links passport information, countries of visit, information of inbound travelers, and data usage of international roaming services by telecom companies all together. Domestic residents and long-term staying foreigners, who did not have any abnormal symptoms upon entry or were confirmed negative to the test, should install the 'self-quarantine safety protection app' released by the Ministry of the Interior and Safety (MOIS) and foreigners staying in Korea for a short-term without symptoms or confirmed negative upon entry should install the 'self-health check app' by MOHW to check their health conditions daily.

In the stage of epidemiological investigation, credit card statements, CCTV analysis, location data of mobile phones are used to precisely identify recent travels of people confirmed with COVID-19 and track the spread of infection by carrying out prompt epidemiological investigations

In the stage of patient and contact management, the national hospital ward management support system is used to effectively manage hospital wards and prepare for the shortage, and the mobile safety protection app for people under self-quarantine is applied to monitor and prevent them not to leave the isolation location.

In the stage of prevention, the government disclosed public data including face mask sales and available masks in the form of open application programming interface (API) and developers in the private sector developed a series of 'face mask notification apps and web-based services' in an effort to solve problems related to face mask shortage. Based on this, various services including Mask App, Mask-Nearby, Gooddoc, Ddocdoc were launched and began to provide services simultaneously.

Key information such as the accumulated count by region and number of tests performed is summarized and provided as visualization data on the main page of the website. Information on providing overseas travel history, finding COVID-19 screening centers, earlydetecting of patients, using epidemiologic surveys and isolating the close contacts of a patient are also provided accordingly. The website is available in 3 languages (Korean, English, and Chinese).[3]

Using open government data, private sector developers such as civic hackers, startups, community of developers, portal service were able to launch an application and web services that help the public find national security hospitals and screening centers. The Korean government provides various dataset such as public mask sales data and national and international confirmed cases to local government websites and the open data portal. IT engineers and the general public utilize the data to create for public interest data which have been shared globally.

What role did the parliament have in political decision-making[4]?

The National Assembly's Special Committee for the response to COVID-19 was officially launched on March 2, 2020. The committee was created with a view to introducing measures aimed at combating and containing the spread of the current COVID-19 epidemic.

The National Assembly Secretariat enacted 'situation-specific response scenarios' to upgrade its countermeasures against Covid-19, July 31, 2020. The secretariat recently developed a set of scenarios containing action plans that vary based on specific situation.

Legislative bills concern the introduction of stronger measures to prevent the spread of infectious diseases, as COVID-19 spreads rapidly across the country. Among them, an amendment bill to the National Assembly Act seeks to establish legal grounds for adopting remote attendance and voting systems in parliamentary meetings to help lawmakers in examining and passing urgent bills during a pandemic.

An amendment to the Infectious Disease Control and Prevention Act was submitted, seeking to impose tougher punishments for not following a disease control officer's instruction or not responding to an epidemiological investigation, and to more clearly

[3] How Korea Responded to a Pandemic Using ICT. The Government of Korea. 2020.
[4] Source: Korea.assembly.go.kr

stipulate provisions on claims for compensatory damages. Also, an amendment to the Higher Education Act was proposed to ensure that when colleges and universities cannot provide classes in a normal manner because of a disaster, they shall refund students' tuition.

Also submitted were: an amendment to the Restriction of Special Taxation Act to increase the tax credit rate for monthly rent to 20 percent and to limit the amount of deposit and monthly rent under housing lease contracts; and an amendment to the Income Tax Act to provide a global income tax reduction to persons, or their child/children, who got married during a specific taxation period by deducting up to five million won from their global income.

Amendment: Under the existing Framework Act on the Management of Disasters and Safety, central and local governments may provide financial or other types of support to citizens who have suffered from damage in a disaster for the purpose of stabilizing their livelihoods. The proposed bill seeks to amend the Framework Act on the Management of Disasters and Safety so as to diversify the means of provision of financial support, in order to broaden the range of beneficiaries; and to absolve employees at relevant government agencies and financial institutions from the results of proactive work.

3. Using technology to cope with the pandemic

The answers are provided in the question 2.

4. Challenges and opportunities in dealing with STI

Handling the concomitant risk factors[5]:

The government's focus is:

① Special management of infection prevention/control programs dedicated to high-risk groups: Preemptive testing will continue for staff at public baths, child-care facilities, and entertainment facilities. This will be expanded to include regular preemptive testing centering around regions reporting mass disease transmission incidents. In addition, monitoring efforts will be implemented at facilities vulnerable to the virus such as high-risk workplaces and schools where regular sample inspections will be performed. Further, where local situation allows, preemptive testing will also be expanded by the local governments.

② Enhancing the efficiency of testing efforts: Leveraging the increased testing capacity that allows for as many as 500,000 tests per day, testing is now available at screening centers in community health centers irrespective of* social distancing levels, address of residence, symptoms, and epidemiological connection.

③ Early testing of those showing symptoms: Authorities prepare simplified forms for ordering tests, writing prescriptions, and providing guidance, which is hoped to make these actions easier for doctors/pharmacists to take.

④ Stopping the spread of variants: Stricter rules are applied when determining exemptions from mandatory isolation requirements for international travelers entering Korea. Stronger monitoring measures will be put in place such as a PCR testing requirement after five to seven days in the country for everyone.

⑤ Rapid and safe rollout of the vaccination program: The 2021 Second Quarter COVID-19 Vaccination Program was administered smoothly so as to stay on target for herd immunity by November. Based on scientific evidence, the AstraZeneca

[5] Source: The Ministry of Health and Welfare

COVID-19 vaccine will be recommended to individuals 30 years or older. The vaccines excluded from the initial vaccination plans are to be rapidly utilized for inoculation of seniors, while also strengthening monitoring of adverse reactions such as those related to blood clots.

⑥ Active engagement regarding the use of antibody treatments: New COVID-19 cases requiring antibody treatments will be admitted to hospitals dedicated to infection disease where this medication is available for administration.

Active measures will be pursued to secure technology to rapidly develop mRNA vaccines in response to emerging infectious diseases. The government will form an mRNA Expert Panel from both the public and private sectors, while reinforcing plans to support the acquisition of foundational technology through interdepartmental cooperation.

Department roles (suggested) : Ministry of Science and ICT (patent circumvention foundational technology such as mrna transmission technology), Ministry of Health and Welfare (support clinical trials/non-clinical lab studies), Korea Disease Control and Prevention Agency (identify candidate vaccine molecules, efficacy testing, technology hybridization), Ministry of Trade, Industry and Energy (develop industrial base for raw materials, production technology, etc.), Ministry of Food and Drug Safety (develop evaluation technology for safety and efficacy (quality))

These initiatives will be accompanied by a continued effort for R&D cooperation and technology acquisition through various channels, such as, MOU negotiations between the National Infectious Disease Research Institute and the National Institute of Allergy and Infectious Disease of the United States, in addition to the creation of a consultative body in healthcare between Korea and Germany.

The changing conditions surrounding infection prevention/control programs are creating a setting where the probability of needing at-home tests is growing. Therefore, the authorities are supporting the rapid adoption of such at-home test kits.

Working with relevant departments, the Ministry will take supportive action to raise the probability of successfully developing an at-home test kit. At-home testing guidelines, review and consultations from a designated medical officer before submission is filed, and assistance in acquiring clinical specimen through collaborations with residential treatment centers and clinical facilities are some of the actions that can potentially reduce to two months, the typical eight-month period it used to take to bring such products to the market.

Until such a product is developed, authorities will examine products which have been approved for expert use, that have records (data and information) of private use in other countries for special instances like emergencies. Where deemed appropriate, some of these kits may receive conditional approval with follow-up submission of domestic clinical data, so as enable rapid public response to the changing demands on COVID-19 testing strategies.

Specifically for education[6]:

As the Ministry of Education decided to substitute the opening of physical schools with online learning, the first step that was taken was expanding the ICT infrastructure. This may sound strange to some, given South Korea's long-standing reputation as a global ICT pioneer. Prior to the COVID-19 pandemic, 99.7% of South Korean households had full access to the internet, and 99.9% of teenagers used high-speed internet in their daily lives, according to a 2019 report from the Korean Ministry of Science and ICT.

[6] Responding to COVID-19 in South Korea: Discovering Online Education as a Key for Future Education - Enfoque Educación (iadb.org)

Yet, the Ministry of Education realized that they haven't tried allowing huge numbers of users to simultaneously access the online learning platforms before. This is because, to some extent, online learning was not perceived as the preferred means of learning. And, this is also because the online learning was not initially designed with a server volume that could support all students across the nation connected at once. To cope with the new situation, extra servers were added for the two major online learning platforms, the Korea Education and Research Information Service's (KERIS) e-Learning Site, and the Education Broadcasting System's (EBS) Online Class Platform. With the additional servers, each platform can now host 3 million students simultaneously, making them the two main pillars responsible for bringing primary and secondary education online across South Korea during the pandemic.

All students from elementary, middle, and high schools fully joined their online classes, with roughly 470,000 online classrooms made on the KERIS e-Learning Site and the EBS Online Class Platform combined. In addition to the online classes, the EBS created more TV channels to meet the education needs of students differing circumstances or special needs. For instance, the EBS created exclusive television channels designated for first and second-grade students who are likely to have difficulty with online learning, given their young age and lack of experience in even the physical classroom setting.

5. The NAFI during the crisis

NAFI (National Assembly Futures Institute) has been providing information on global epidemics since 2020 to help legislative activities of lawmakers in Korea Parliament. For example, we addressed the social changes undergone by the world after the four global infectious diseases that have occurred since 2000. This is something the world has experienced in common, and we have seen that the experiences can help us forecast future events that will occur after COVID-19.

Examples of the lessons learned since 2000 include the fact the government's trust and the voluntary participation of the people in anti-virus activities are the key to overcoming pandemics; there is a need for policies to alleviate social fear and psychological anxiety; and the importance of science and technology in vaccine and therapeutic development and epidemiological research.

We analyzed the cases since the emergence of COVID-19 through an analysis of 1830 articles found in SCOPUS DB last year after the COVID-19 pandemic began. In the UK and India, for example, a public health crisis has created new social underdogs; in Peru and Kenya, domestic violence and child abuse have increased since the regional lockdowns. Black Americans have been suffering from poverty, poor housing, and uncomfortable transportation, and the supply chains of renewable energy and related companies have suffered from economic deterioration since COVID-19. Unexpected events were found everywhere.

We also noted positive changes after the outbreak of global infectious diseases. Revisions of the law to expand support for the socially vulnerable, the regional innovation of local cooperatives, and various simulations performed by the scientific community for daily recovery are making the world hope for a better future. In conclusion, we provided implications on what changes should be anticipated through ten significant questions that forecast the future.

NAFI held seminars with lawmakers to forecast social changes after Covid-19 and discuss countermeasures.

6. Lessons for a post-COVID world

We forecast that surveillance is going to be very important regarding technology and society in a post-COVID world. As well as monitoring the movements of the people infected, the paths on which they moved were disclosed, calling attention to these infected cases. During this period, some scholars used the term biosurveillance, which means that not only humans, but also animals and plants should be included as targets to detect abnormalities.

Social media plays a very important role in a society. With the widespread use of smartphones, information related to infected people and medical information about pandemic had rapidly spread through social networks. This is why many rumors were being spread. At that time of MERS, the Korean government failed to respond in the initial stage, and this situation was greatly criticized through social networks. The government did not disclose information on infected people in a timely manner, which resulted in the ongoing spread of the epidemic. We realized that the response to infectious diseases is effective when the government discloses all information transparently to citizens.

We should also pay attention to new social changes that have emerged recently. These emerging issues are currently difficult to evaluate. Continuous observation is required. It is expected that a biological surveillance system that monitors not only people but also animals and plants will be eventually installed in each country and around the world. Observation should be made to ensure that such biosurveillance systems do not violate individual privacy. In addition, it is necessary to consider to what extent it is possible to limit individual freedom for public health.

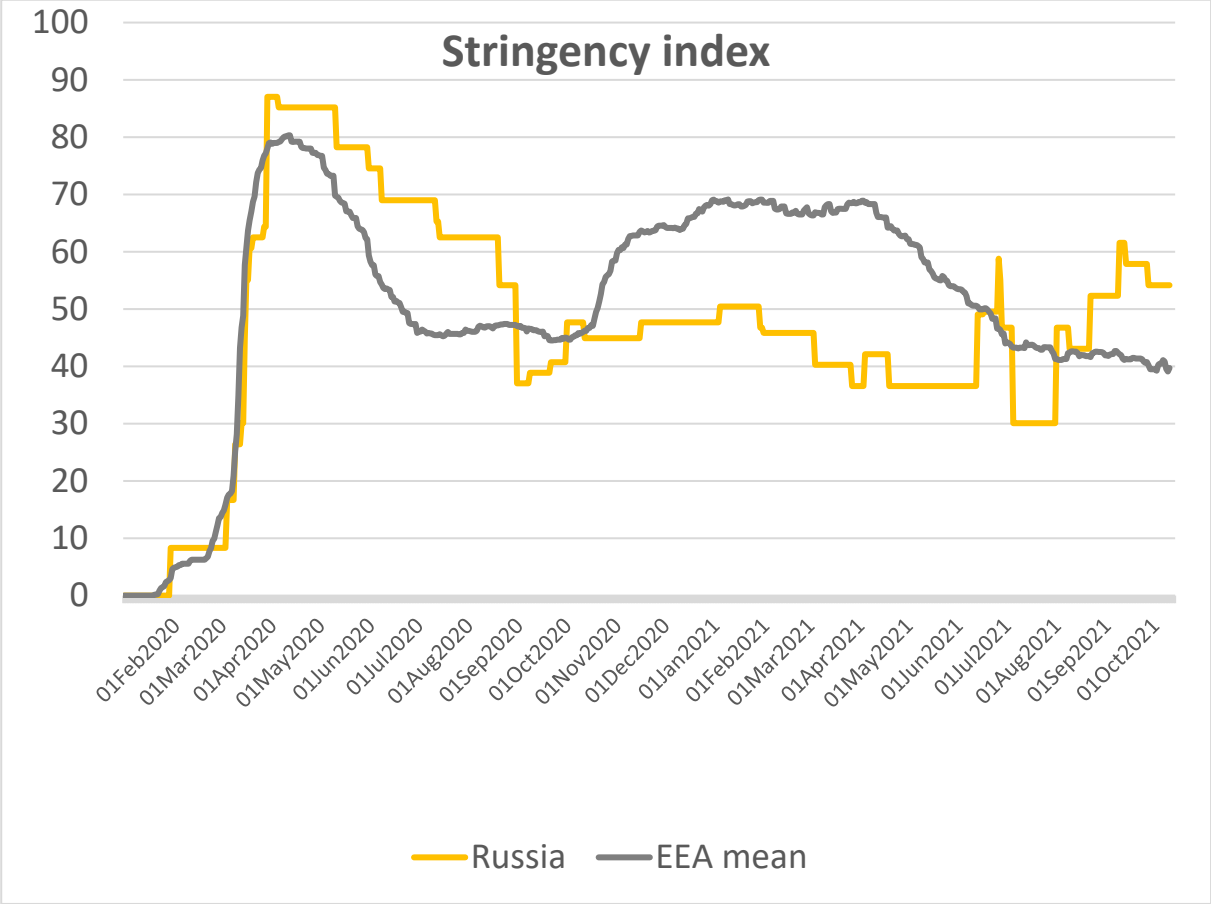
With the rise in contactless communication, telemedicine, distance education, and telecommuting are spreading. A serious discussion is needed on how this trend will change our lives. The developments of distance medicine and distance education are asking us what values and goals medical practice and education should pursue.

We should also be wary of the spread of fake news online. The WHO defines fake news as that which has not been scientifically verified as infodemic and calls for caution. In addition, there will be a cure and vaccine for COVID-19 in the future, and rumors may spread for various political purposes. In 2003, rumors related to the polio vaccine hit Nigeria, and the vaccine was not administered for 11 months. In the meantime, the poliovirus had spread to more than 20 countries. Rumors at the time were that the United States had laced polio vaccines with infertility hormones with the aim to bring the Islamic race to extinction.

Russia

Prepared by Timur Semenov, Analytical Department, Federation Council; Pavel Yakutseni and Sergey Kozyrev, Center for Advanced Studies in Peter the Great St. Petersburg Polytechnical University & Natalya Serebryanaya, Institute of Experimental Medicine (Russian Academy of Sciences).

1. Facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

- Total number of cases as of September 12 – 7,140,070
- Total number fully vaccinated as of September 12 – 39,903,659 (27,33%)[2,1].

2. Decision-making during the pandemic

Both chambers of the Russian Parliament, with the involvement of experts and analytical structures, have repeatedly developed and sent to the Government of the Russian Federation proposals for improving the legislation of the Russian Federation aimed at preventing the spread of coronavirus infections on the territory of country.

[1] RIA “Interfax”: http://interfax.ru/russia/788393

Political decision-making was sufficiently justified by the recommendations of scientists and specialists (doctors, virologists, epidemiologists). However, public assessments of the validity of these decisions often remain vague.

3. Using technology to cope with the pandemic

Russian vaccines

Six out of ten existing technological platforms for the production of vaccines known in are used in Russia. In total, Russia is developing more than 10 vaccines against COVID – 19, the most famous of which is Sputnik-V. Currently, 5 vaccines are pre-approved for use in Russia on various technological platforms, and research on their effectiveness is actively continuing.

Other technological developments in Russia related to the pandemic:

- Devices and technologies for inhalation therapy with helium mixtures and nitrous oxide;
- Vaccines based on genetically modified fermented milk probiotic microorganisms, on the basis of which it is possible to create preventive fermented milk products using the production facilities already available in the country (dairies, that is, without the cost of creating new high-tech industries);
- Medications based on recombinant interferon "alpha" in suppositories and liposomal fractions for administration through the mucous membranes (rectal and oral forms, respectively), which can provide a mild/asymptomatic course of the disease when used from the initial stage of any acute viral disease;
- Medications based on recombinant cytokine IL-2 Roncoleukin (Biotech, St. Petersburg), effective for prolonged and chronic forms of viral diseases, bacterial sepsis and other infectious and inflammatory conditions.

4. Lessons learned for a post-COVID world

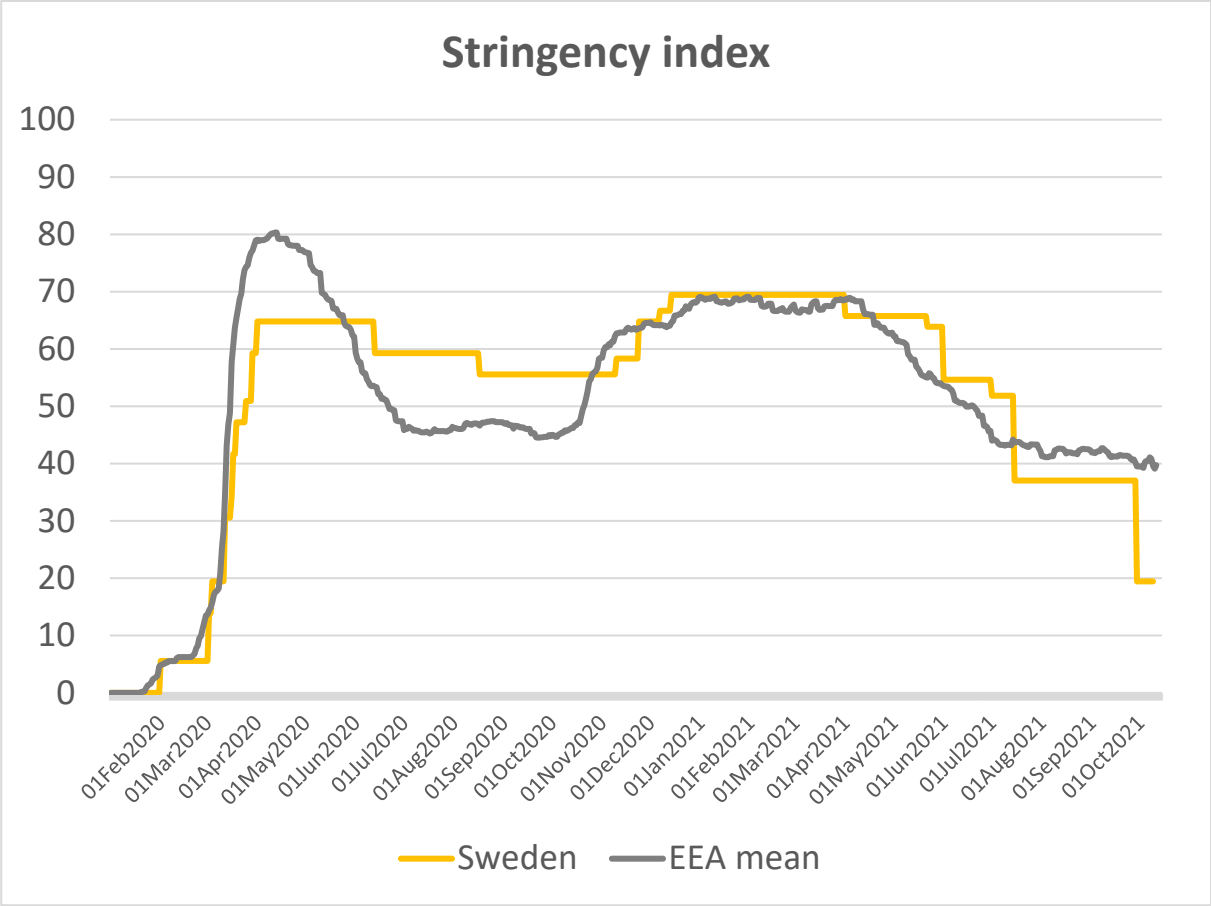
The most relevant topic of discussion can be expected to be the development of socially-oriented technologies in the treatment, prevention and rehabilitation of patients, regardless of their market status. With the development of the pandemic, the idea of the priority of market relations could decline, while the concept of a social state and a solidary society may gain more support.

It is also extremely relevant to develop social technologies that increase the prestige of a healthy lifestyle, taking care of one's own physical and mental health and the health of the entire society. In other words, we are talking about the priority of a socially responsible worldview and behaviour. In this context, in particular, a negative attitude towards the "anti-vaccination" movement is growing. There is a growing trend in society to create unobtrusive, but convincing science-based content that is accessible to schoolchildren, students and other age groups.

Sweden

The Swedish Parliament Evaluation and Research Secretariat (ERA), Thomas Larue, Petra Jonvallen, & Lars Eriksson

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

The following facts and figures from August 11, 2021, illustrate the situation in Sweden:

- Total number of cases: 1,108,057
- Cases per 100,000 inhabitants: 10,173
- Total number of patients in intensive care: 7,643
- Total number of deceased: 14,658

The pandemic has had serious effects on the Swedish economy. Unemployment was 10.3 percent in June 2021. Business turnover has decreased in all areas, although more so in the service sector than in the manufacturing industry. Increase of production is also relatively weak. However, the economic recovery has been good in 2021 and the latest economic figures point upwards.

The pandemic has also created a backlog in health and medical services in general, e.g. as measured by amount of visits to medical and care facilities, amount of surgeries performed, etc.

When it comes to daily working life, the increase in telework is likely the most significant change as a result of the pandemic.

It is too early to draw firm conclusions about the long-term consequences of the coronavirus pandemic. One conclusion is that the pandemic has had negative consequences for many children and young adults. Children and youth from disadvantaged environments, with a weak socio-economic background and an inadequate social safety net, are more likely to be severely affected.

2. Using science and evidence in the crisis

In contrast to countries with ministerial rule, there is an organizational divide between the governmental ministries and central governmental agencies in Sweden. The major part of the Swedish national executive is organized in separate units outside the ministries, i.e. the executive is organized into small-sized government offices (ministries), on the one hand, and 340 semi-autonomous government agencies, on the other. The Government depends on documentation and information from the government agencies, and consequently, has based its action on advice and recommendations from the agencies.[1]

Different types of experts have been involved as advisors to government and to government agencies. Three large government agencies have mainly been central in developing and disseminating evidence and knowledge during the pandemic, namely the Public Health Agency of Sweden, *Folkhälsomyndigheten*, The National Board of Health and Welfare, *Socialstyrelsen,* and *The Swedish Civil Contingencies Agency (MSB)*. Advisors to *Folkhälsomyndigheten* include experts from clinical microbiology, clinical virology, and infectious disease physicians. A central task of The National Board of Health and Welfare, *Socialstyrelsen*, is to generate knowledge based on the best available research and experience, part of which includes to direct a committee for knowledge-based guidance, and to chair a group of organisers with representatives from municipalities and county councils.

The government has also appointed a Corona-commission containing experts representing medicine, political science, management, and economics, as well as representatives from the religious community and local and regional authorities.

3. Using technology to cope with the pandemic

There has been a large increase in digital meetings during the pandemic which has provided platforms for government agencies to cooperate and coordinate events related to handling of the pandemic.

The use of IT in distance education has been used to a large extent at every level of the education system. Teaching at upper secondary schools and universities has taken place entirely at a distance using IT. In compulsory school, teaching has mainly taken place on the premises, but with an element of IT.

The national vaccination program has largely been based on IT solutions, with information, bookings and implementation via the internet.

[1] The Swedish Agency for Public Management, 2020. The Swedish public administration model in the corona pandemic. English summary: https://www.statskontoret.se/In-English/publications/2020---summaries-of-publications/the-swedish-public-administration-model-in-the-corona-pandemic/

4. Challenges and opportunities in dealing with STI

The pandemic revealed flaws in the distribution system of safety equipment for personnel in health care facilities. At the onset of the pandemic, the medical technology industry warned about a shortage of safety equipment for healthcare professionals in the event of an increased spread of the coronavirus, given the lack of national stocks of protective equipment and other medical supplies. Provision of safety equipment was instead based on so called just-in-time deliveries. Such a system was sensitive to the sudden changes in demand in the face of the pandemic. In March, the National Board of Health and Welfare was given the mandate to ensure access to protective equipment in regions and municipalities and ensuring access to medical devices and more at national level. The Agency does not normally work to purchase or coordinate the purchase of medical devices, protective equipment or medicines or to decide to redistribute equipment or medicines. The assignment to the National Board of Health and Welfare to ensure access to protective equipment was decided after the regions had requested that the government urgently instruct the National Board of Health and Welfare and MSB to ensure at national level the availability and distribution of it between the regions.

5. The ERA during the crisis

Our organisation has not been directly involved in this process.

6. Lessons for a post-COVID world

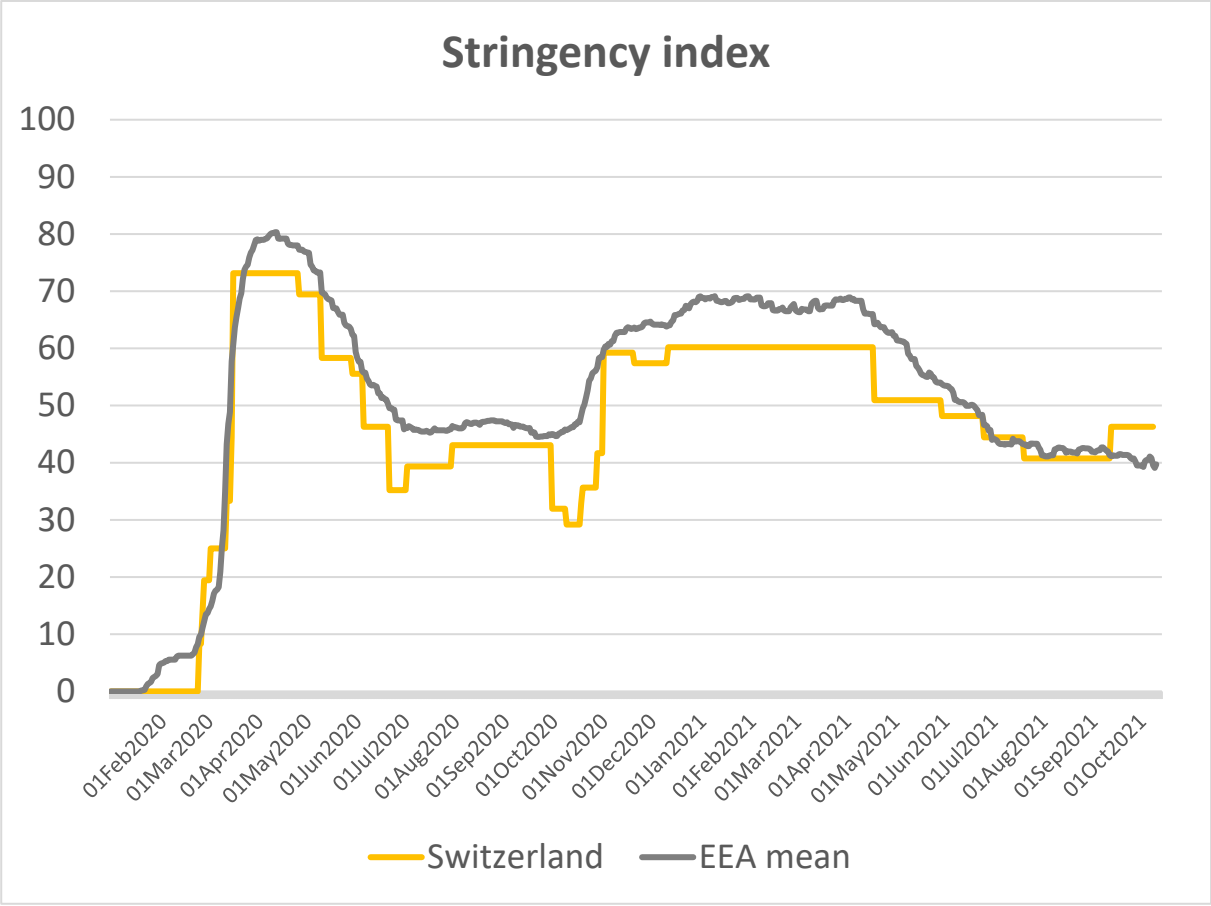
Those able to work from home with the help of digital technology have become accustomed to working outside the office, which will likely change work patterns. Work and other travel patterns will likely also remain changed.

Issues about society's readiness to deal with various crises have come to the fore and are likely to live on.

Switzerland

Swiss Foundation for Technology Assessment (TA-SWISS), Elisabeth Ehrensperger, Christine D'Anna-Huber, Christina Tobler

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

The first case of COVID-19 in Switzerland was confirmed in February 2020. In March, the Federal Council declared an 'extraordinary situation' in terms of the Epidemics Act and introduced stringent measures to protect the public.[1] Schools, shops (except for food stores) and restaurants were closed nationwide, and gatherings of more than five people were banned. The lockdown lasted until the end of April and was then gradually eased.

In October, the number of cases skyrocketed and the Federal Council re-introduced several measures to combat the rapid rise in coronavirus infections. Amongst other measures, people were recommended to work from home[2]– in January, this

[1] https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-78454.html
[2] https://www.bag.admin.ch/bag/en/home/das-bag/aktuell/news/news-18-10-2020.html

recommendation was even turned into a home-office obligation[3]. The restrictions have now been gradually eased again since February.

Switzerland's vaccination program has been under way since January 2021.[4] By now, all adults can register for a vaccination. A COVID certificate provides documentary evidence of the COVID-19 vaccination, a recovery from the disease or a negative test.[5]

Swiss National COVID-19 Science Task Force

After the installation of a political state of emergency in March 2020, the Confederation set up a science task force of researchers to seek advice on how to best manage the pandemic.[6] The strong and almost exclusive media presence of epidemiologists and medical experts gave way after a few weeks to a broader discussion, which also involved other disciplines, parliamentarians, the cantons and the Swiss electorate.

After the state of emergency was lifted – i.e. after the decision-making authority was no longer concentrated in the national government, but in many areas passed back to the cantons (as is customary in federal Switzerland), after parliament was able to meet again and after there was already more knowledge and experience in dealing with the virus – criticism of the task force grew increasingly louder, not least because members of the task force had contradicted each other or the Federal Council in the media and had voiced criticism of policies (politics listens too little to science). There were high-profile resignations from the task force. Its legitimacy was questioned and its media communication in particular was criticized. There was talk of an unworldly 'expertocracy'. Parliament considered a motion that sought to prohibit the members of the task force – except for its president – from speaking to the media. The motion was rejected, but it has fuelled the debate on the relationship between science and politics.

TA-SWISS followed the development of the discussions closely – the President of the Swiss Academies and member of the Foundation Board of TA-SWISS, Marcel Tanner, was a member of the scientific task force – he very prudently pleaded for a clear division of tasks between science and politics in various interviews. According to his assessment, the task force is not responsible for political measures. It only provides the scientific basis. Conversely, the same applies to politics: Their task is to make decisions considering all scientific, social and economic factors – and not to develop scientific facts.

2. The TA-SWISS during the crisis

Many of the technological problems that our societies are grappling with today did not arise during the crisis, but have been exacerbated by Corona. Therefore, in the field of technology assessment, it is of particular interest to note that technologies are playing a highly prominent role in managing the crisis. As a long-established, independent liaison between the world of research and the political sphere, TA-SWISS assesses the opportunities and risks of new technologies, clarifies issues, sheds light on the intricate web of cause and effect, and analyses the consequences of potential decisions. In doing so, and in accordance with its stated purpose, TA-SWISS provides the foundation for careful and considered political action.

In principle, TA-SWISS does not consider it the task of TA to become involved in the crisis debate in the short term – not least for political reasons and to preserve its independence.

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[3] https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-81967.html
[4] https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/impfen.html
[5] https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/covid-zertifikat/covid-zertifikat-grundlagen.html
[6] https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-78626.html

Rather, TA should conduct a balancing analysis of the crisis from a certain distance in time – to examine what remains of the technological developments triggered by COVID after the crises.

Overall, TA-SWISS has preferred not to impose itself as an advisor to politics during the crisis and not to take the word of expertocracy, but to express a clear partisanship for democracy wherever possible. Moreover, a meaningful distance from both science and politics seems necessary to us in order to be able to fulfil our mandate – assessing the opportunities and also the risks of new technologies.

Applying existing knowledge to the current crisis

Many COVID-related technological problems have already been addressed by TA-SWISS in the past.[7] For example, during the Corona crisis, the topics of home office and health tracking were increasingly discussed in society and politics. These issues have already been taken up, investigated and discussed by TA-SWISS in past studies. The results are still relevant today.

From the real world into the internet

While a large percentage of the population in industrialised countries was home on lockdown, working and learning have shifted to the internet as has social and political life. Virtual ways of communicating and collaborating are being tried out, making it possible to hold meetings with work colleagues, attend lectures, have a drink with friends and even go to a reading group, yoga lesson or cooking class, while small businesses are opening digital shop fronts and online commerce is booming.

Nevertheless, the emergency measures that were adopted on extremely short notice raise serious questions regarding data protection, our private sphere and the security of IT – particularly in the world of work. At the same time, future employment may change permanently in light of the current surge in working from home, which many employers have traditionally viewed with suspicion despite paying lip service to the option. TA-SWISS considered the advantages and disadvantages of flexible online work models already at an early stage of this development.[8] Although the advantages of an online economy are currently highly visible, the TA-SWISS study also pointed to the dangers facing self-employed individuals whose income derives entirely from internet platforms and who have waived all employment law protections.

The crisis caused by the coronavirus pandemic has also made problems surrounding equal access apparent: not all professional activities can be transferred to the internet, and not all employees can benefit from the opportunities of flexible online work. For instance, shop assistants, staff at cash registers, nurses and cleaners can and must continue to perform their jobs solely in the real world, where they may be exposed to the virus. And there are differences among even those employees able to work from home, as not everyone has the same access to a good-quality technical device or high-speed internet. This is where digital technologies have the potential to open alarming social divides that cannot be readily anticipated.

The problems regarding equal access are particularly critical in education. The corona crisis has created a testing ground for digital teaching and learning, yet here, too, not all students are on equal footing. Digital distance learning on a smartphone is more difficult to manage than when a large computer screen and a printer are available at home. That digital teaching materials – which are in principle open to everyone, all over the world –

[7] https://www.ta-swiss.ch/en/corona-and-ta
[8] https://www.ta-swiss.ch/en/flexible-work

could actually undermine equal opportunity in education is one of the potential risks observed in the preliminary study on Massive Open Online Courses (MOOCs).

Privacy and data protection

Many countries have met with considerable success in slowing the coronavirus outbreak by using digital surveillance and artificial intelligence. These technologies include: tracking tools that use mobile data to trace contact between infected and healthy individuals and to reconstruct transmission of the virus; location data to enforce rules on public and social gatherings and to monitor people in quarantine; smart thermal cameras with facial recognition software that send an alert when a temperature over 37.3 is detected. Due to the urgency and extraordinary nature of the situation, however, data protection principles are not always respected. For instance, personal data are usually not anonymised, data collection is not limited to a minimum, no additional protection in the form of data encryption or restricted access rights is available, and no guarantee is given that data will be destroyed after being used. At the same time, this situation has motivated a large number of researchers and app developers in Switzerland and other areas to devise the technological framework for tracking apps that comply with data protection rules.

Prior to the crisis, people used fitness trackers and smartphone apps mainly to monitor their own health and to improve their physical fitness. The TA-SWISS study 'Quantified self' on self-tracking in the health sector, however, already observed that even those tracking technologies used primarily for personal fitness and health goals open the door to potential new ways to gather information.[9] The study emphasised the absolute importance of respecting and protecting human dignity, while also pointing out that making private life choices is a fundamental right and that end-to-end registration of all movements and life-style decisions is therefore not acceptable.

Do such reservations become redundant in a crisis? In 2014, in the scope of a large-scale European research project in which TA-SWISS took part, citizens of nine European countries were asked whether they were prepared to give up some of their privacy for increased safety.[10] The answer was a clear 'No'. Would the response change, however, if 'health' replaced 'safety', as in the coronavirus pandemic? Does the well-being of society at large justify restrictions to our individual freedoms? Will a 'health dictatorship' be introduced under the guise of disease prevention? Schopenhauer said, 'Health isn't everything, but without health, everything is nothing.'

TA after the crisis: An outlook

The rather tired buzzword of an all-pervasive 'digitisation' has suddenly become much more than an empty catchphrase: the crisis has triggered a veritable digitisation boom. Work and commerce as well as our social and political lives are shifting to online solutions. The parliamentary session of the Swiss government had to be adjourned, and citizens are confined to their homes. How will this impact social structures, social cohesion and democracy in the long term? Is it desirable, possible or perhaps even essential that everything returns to normal? How will our culture, our identity as a country and thus our social environment be impacted by digitisation, which is by nature borderless? This will be the focus of a new TA-SWISS study on digitization and culture. Another facet consists in if we will find new, digital solutions to create a more stable, resilient and sustainable democratic community. A current TA-SWISS study on digital democracy explores exactly this problematic.[11]

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[9] https://www.ta-swiss.ch/en/quantified-self
[10] http://surprise-project.eu/
[11] https://www.ta-swiss.ch/en/digital-democracy

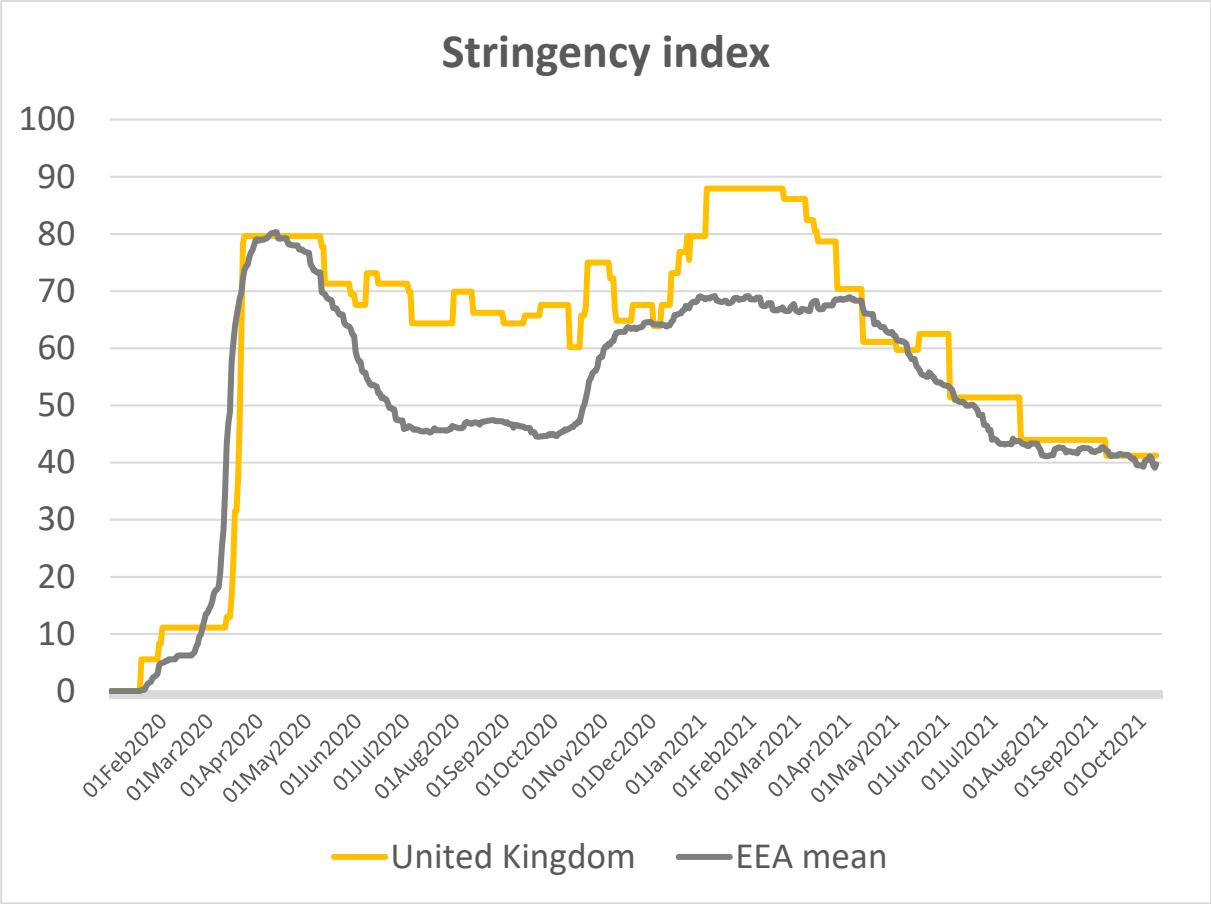
Indeed, the COVID-19 pandemic appears to have strengthened the will in the executive and legislative branches of government – even in the political parties and media – to go beyond partisan and ideological divides and to seek responsible solutions. To do so, the often-complex facts and their interdependencies must first be understood; only then can we begin the more difficult debate on the values we believe are important. In such matters, technology assessment as a scientific and evidence-based advisory service to the political sphere can help to introduce new technologies that support constructive solutions.

Policy decisions are taken in a grey zone where science and conscience intersect, which is why it is crucial that evidence-based technology assessment does not limit its investigation of potential 'technological futures' to feasibility. Essential is also meticulous consideration of both desired and unwanted consequences for society, the political sphere and the economy; the resulting understanding enables the formulation of viable recommendations for evidence-based policies. For precisely this reason, TA-SWISS will also continue to pay very close attention in the current crisis.

United Kingdom

Parliamentary Office of Science and Technology (POST), Oliver Bennett, Sarah Bunn, Cristiana Vagnoni

1. Introduction: facts and figures



The stringency index is a composite measure based on nine response indicators including school closures, workplace closures, and travel bans, rescaled to a value from 0 to 100 (100 = strictest). If policies vary at the subnational level, the index shows the response level of the strictest subregion.

All information regarding the UK was correct as at 22 September 2021, unless otherwise stated.

Health data on the COVID-19 pandemic in the UK comes from the UK Government's Coronavirus (COVID-19) Data Dashboard which is updated daily. The data collates information from the four UK nations. As of 16 September 2021:

- 157,669 deaths, where COVID-19 is cited as the cause of death on the death certificate (daily deaths were in single figures in June 2021 but have been increasing steadily since then, with the latest 7 day average at 130 deaths per day).
- 89.2% of people eligible for vaccination have had their first dose (48.5m people).
- 81.3% of people eligible for vaccination have had their second dose (44.1m people).
- 8,340 people were in hospital, of which 1,060 patients required mechanical ventilation (hospital admissions have been increasing since August).

- national case rate of 360 cases per 100,000 people (total active infection cases estimated at 7.3m across the UK).

The pandemic has had far-reaching indirect impacts on society. It caused a severe recession in the UK. The magnitude of the recession caused by the pandemic is unprecedented in modern times. According to the House of Commons Library, "GDP declined by 9.8% in 2020, the steepest drop since consistent records began in 1948 and the most in over three hundred years on some estimates."

The impact of the pandemic and the response to it has had implications for all parts of society such as jobs, businesses, and education. Indirect health effects are of particular concern. For example, indirect health impacts include reduced access to healthcare and decreased healthcare seeking behaviours by the public. The National Health Service now faces a backlog of care, across all its major services, with long waiting times for many services and particular pressures on mental healthcare services, especially services for children and adolescents. A recent report from the Department of Health and Social Care sets out the main direct and indirect health impacts.

Large amounts of research on the impacts of the pandemic has been published by POST and the House of Commons Library to inform Parliament. All the research has been published on a dedicated briefing hub on our website.

2. Using science and evidence in the crisis

The main source of scientific advice for the UK Government on COVID-19 comes from a standing committee called the Scientific Advisory Group for Emergencies (SAGE). Chaired by the Government Chief Scientific Adviser (CSA), the committee's membership is flexible, depending on the expertise required for the emergency in question. The membership of SAGE for the COVID response includes experts from a range of scientific disciplines and representatives of the health service. The SAGE group was originally supported by three other advisory groups, all of which existed prior to the pandemic, and which look at different aspects of infectious disease, with a focus on viruses. They are NERVTAG (New and Emerging Respiratory Threats Advisory Group), SPI-M (Scientific Pandemic Influenza Group on Modelling) and SPI-B (Scientific Pandemic Insights Group on Behaviour). As the pandemic has evolved, a further eight scientific advisory groups to support SAGE have been established to focus on certain issues (COVID in children; care homes; ethnicity; environmental modelling). Memberships of all these expert groups and the reports they produce are published on the Government's website.

The Chief Scientific Adviser has promoted transparency of the scientific advice to Government; therefore all supporting document prepared by these expert committees is published online (the publication of some such material is delayed insofar as it relates to ongoing policy decisions by Government). The Government's Chief Medical Officer (CMO) is also a key figure in the COVID response, and is responsible for health policy advice based on SAGE's scientific analysis. Both the CSA and the CMO (and other senior scientific staff in Government) have made regular public TV appearances with the Prime Minister and senior government Minsters to discuss the scientific and medical aspects of the pandemic. The public visibility of senior officials working on science advice for Government is notable. The devolved nations of the UK retain their own independent science advice officials and mechanisms which are largely equivalent to those described here.

The UK Parliament and the devolved parliaments of Northern Ireland, Scotland and Wales have undertaken a significant amount of work to scrutinise their respective governments' response to the pandemic. Health policy is a devolved policy area in the UK, with each

nation retaining control over its own decisions. Other policy areas are not devolved, and this has created some friction in respect of agreeing common positions, with differences emerging in areas such as international and domestic travel restrictions, in the absence of borders between, for example Scotland and England.

In the UK Parliament in Westminster the work on COVID-19 has included:

- POST and the Libraries have been producing syntheses of both the scientific evidence and policy announcements continuously since the pandemic started, covering all of the themes associated with the evolving situation.
- COVID-19 has been continually debated in both House of Commons and House of Lords business and has been the subject of numerous select committee inquiries. This work has been supported by POST through the provision of briefings for committees, with other support provided by connecting committees to relevant experts. This has been facilitated through Parliament's Knowledge Exchange Unit which created (on 25 March 2021) a unique COVID-19 expert database of 5,500 people, 1,100 of whom responded to a survey looking at the short, medium and long-term impacts of COVID-19 and the research we need from Government. These findings were published as 16 horizon scanning reports.
- The Knowledge Exchange Unit has provided other functional mechanisms throughout the pandemic for experts to work with Parliament. These have included a dedicated webpage of current open select committee inquiries on COVID-19.

3. Using technology to cope with the pandemic

Apps that are used in order to trace infections

The NHS COVID-19 Test and Trace app is available for over 16-year-olds in England and Wales for the purposes of contact tracing, recording and demonstrating vaccination status, and accessing information about symptoms and testing. Similar apps are available in Scotland and Northern Ireland. The use of the apps is voluntary.

The research community has also innovated to collect health data about the pandemic from citizens. Most notably, the ZOE COVID study deployed a smartphone app to ask people (and other members of their household including children) to report symptoms, test results and vaccination status. Data and research from the app has been shared with scientific advice committees, governments and health systems across the UK. Insights include changing patterns of infections, emerging COVID-19 hotspots and the impact of immunisation on the pandemic. The success of the app has led the research team behind it to expand the scope of data collection with a view to collecting information about a wider group of infectious diseases.

Vaccination passports

There has been an ongoing political debate about whether the UK Government will adopt vaccine passports. In the UK, a vaccine certificate for travel, the NHS COVID Pass, was introduced on 17 May 2021. Since 19 July 2021 it has also been possible to use it in certain domestic settings, with 'high risk' venues including nightclubs and large events encouraged to use the pass. At present, the NHS COVID Pass certifies individuals based on vaccination, testing or natural immunity status. On 14 September 2021 the Government announced that it reserved the option to introduce mandatory vaccine-only COVID-status certification if it became a necessary tool with which to manage infections. The devolved nations are pursuing different approaches to the use of proof of immunisation status.

Data analysis for traffic/populations/etc.

A rich set of data on population movements and travel behaviours, such as use of public transport networks and air travel is available. The data comes from government monitoring, as well as from the private sector and research institutes.

4. Challenges and opportunities in dealing with STI

The Government had an existing pandemic preparedness plan, the focus of which was on an outbreak of influenza. Related to this this, the Government conducted a cross-government and multi-agency preparedness exercise in 2016 called Exercise Cygnus.

The UK has a high quality infrastructure for the science advice and operational delivery of national immunisation programmes. The approach to the COVID-19 immunisation programme has not differed from the usual way in which vaccines are delivered to people. The exception has been expediting vaccine research and development, manufacture and regulatory approval in parallel in order to make safe and effective vaccines available as quickly as possible. The scientific committee that advises the UK Government on the use of vaccines (the Joint Committee on Vaccination and Immunisation) has published its advice and the scientific rationale decisions, in the same transparent way it has for all other disease areas. The JCVI's approach to immunising groups by stratifying age cohorts and frontline health and care workers, in line with clinical vulnerability and viral exposure, was not without criticism from some in the scientific and policy communities.

5. POST during the crisis

POST has continued to use its in-house scientific expertise to produce numerous parliamentary briefings on scientific aspects of COVID-19, to support parliamentarians' understanding. POST developed a new rapid response publication format, in order that briefing could be produced in a few days (rather than over 3 months, which is the typical timeframe for POSTnotes). All POST's COVID-19 work is publicly available on https://post.parliament.uk/tag/COVID-19/. This flexible approach to producing briefings in a shorter timeframe has meant that we have been able to deliver high quality accessible information quickly, in the context of a rapidly changing situation, both scientifically and from a policy perspective.

POST has also played an important role in supporting Parliament's own organisational and corporate response to COVID-19. POST's former Head, Dr Grant Hill-Cawthorne regularly attends planning meetings of Parliament's incidence management team to provide scientific and medical input. He also briefs the Strategy Development Group (the senior group of officials in the House of Commons).

The current POST Head Oliver Bennett chairs the Future Resilience Group, a new cross-House parliamentary group that identifies the areas where strategic planning in the COVID-19 response needs to be focused. In the longer term this group will become part of Parliament's Business Resilience Group – assessing potential future risks and providing challenge on current resilience plans.

POSTnotes published briefings on a range of topics are intended to highlight issue that are likely to be of future relevance. Therefore, we would expect that there would be some briefing material available that would be relevant. Furthermore, staff in the POST team have specialist knowledge across the scientific disciplines which allows them to respond quickly as topics of interest emerge.

6. Lessons for a post-COVID world

POST has outlined the ways in which the COVID-19 pandemic will continue to impact society, when the virus becomes endemic and the government response to the virus shifts to manage it in the same way as is the case for other infectious diseases. The scale and breadth of the impacts of the pandemic are outlined in POST's most recent 2021 horizon scanning exercise.

One of the most widely discussed issues are the societal inequalities that have been exposed by the pandemic. While many such inequalities (health; socio-economic) were well documented beforehand, many have been intensified by the pandemic and have had been a significant theme in the media and in political debate. The greatest mortality impact of COVID-19 has been in people from the most deprived backgrounds.

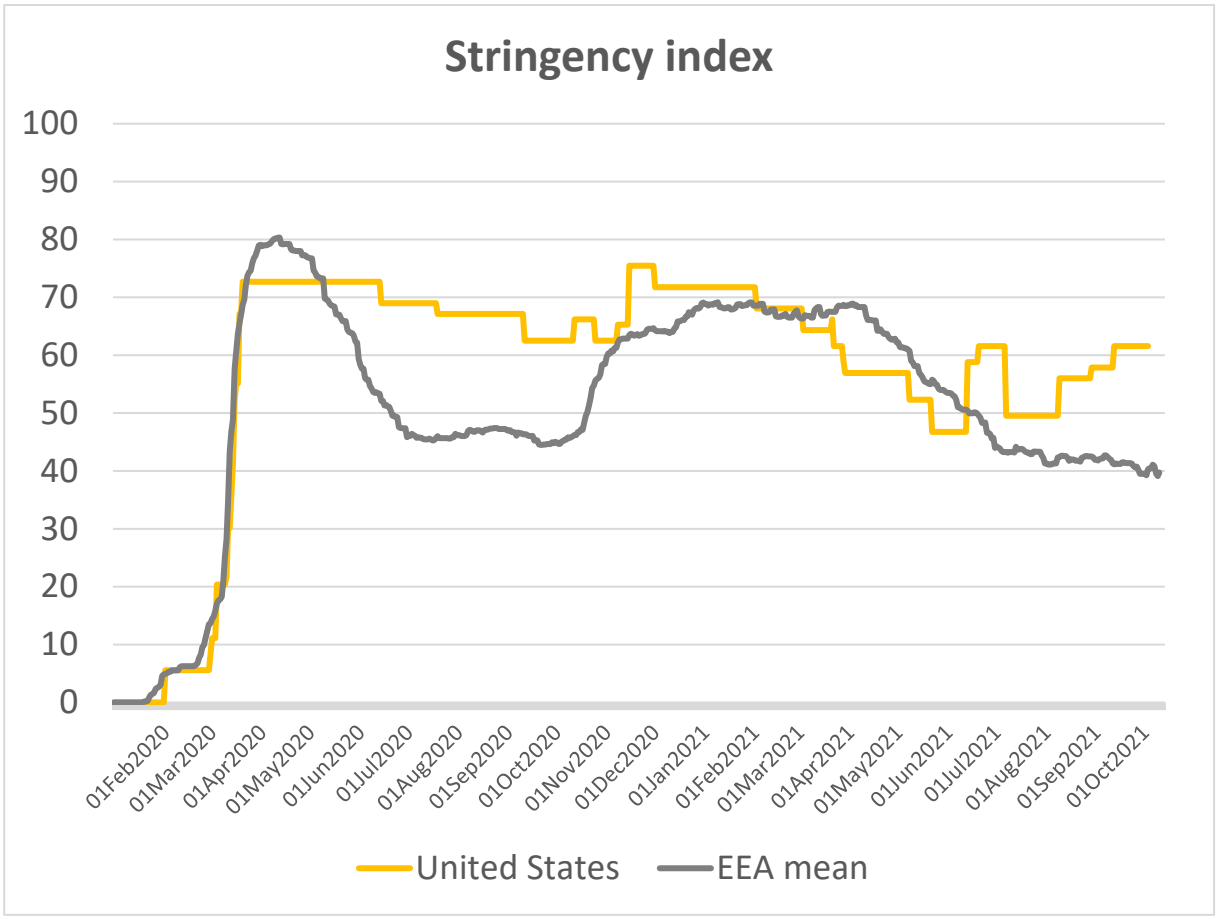
Further, the role of the UK's scientific community has been at the forefront of the response. The UK's role in developing the Astra Zeneca Oxford vaccine, the national capacity in genomic sequencing that has been part of the global effort to monitor new viral variants are widely seen as key strengths. This has enhanced the importance of research and development investments, with strengthened commitments to supporting scientific discovery, such as developing new vaccines and enhancing national and international participation in public health organisations and programmes, such as international disease surveillance.

Some aspects of the Government's science advisory mechanisms has been the subject of debate. While the advice from SAGE is regarded as high quality, it has been criticised for a lack of diversity in its membership, with respect to the range of scientific disciplines that are represented on its panel. For example, there has been little representation of ethicists on SAGE, even though many of the issues considered by the group relate to important ethical issues, such as balancing the interests of the public and those of individuals. Other criticism has been that SAGE focused too heavily on certain sources of expertise, particularly at the beginning of the pandemic.

United States

Science, Technology Assessment, and Analytics team (STAA) of the U.S. Government Accountability Office (GAO), Karen Howard & Timothy Persons

1. Introduction: facts and figures



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As of June 30, 2021, the United States had a cumulative total of nearly 34 million reported cases of COVID-19 and about 604,000 COVID-related deaths. At that date, the U.S. was in a bit of a plateau of cases but cases and deaths have increased lately with the arrival of the Delta variant, which now makes up more than 99 percent of U.S. COVID-19 cases. The latest reported totals are nearly 42 million cases and about 670,000 deaths as of mid-September.

More than 181 million people in the U.S. (about 55 percent of the population), are fully vaccinated, and another 30 million (9 percent) have received one dose of a two-dose regimen, as of September 2021.

2. Using technology to cope with the pandemic

Exposure notification apps have been deployed by about half of U.S. states and territories in an attempt to help mitigate the spread of COVID-19. We did an assessment of these technologies and found a number of challenges that limit app use, as well as a lack of evidence to determine whether they have been effective. We propose several policy options to help address these challenges for COVID-19 and future pandemics (see here and here).

A handful of U.S. states have also deployed digital health credentials that can be used voluntarily to store verification of vaccination and/or testing status. (These are also known as 'vaccination passports,' although the government does not recommend that term due to confusion with citizenship documentation.) Some cities and businesses have required the use of these digital health credentials for access to restaurants, sports arenas, and other facilities. We issued a Science & Tech Spotlight on this technology.

3. GAO/STAA support to Congress in the crisis

In addition to publishing numerous reports on various aspects of the pandemic and the government response, GAO and STAA were also able to provide extensive support to Congress and the broader public through an interactive, public dashboard on vaccine development (now retired) and through frequent informal interactions with members of Congress and their staffs. We responded to many phone calls and requests for briefings on a variety of scientific and technical topics. We also undertook a variety of studies at the direct request of various congressional committees and members. As a team that was fairly new when the pandemic started, the crisis provided many opportunities to expand congressional awareness of our work, the technical expertise of our staff of scientists, engineers, and science policy experts, and the various ways we are available to support members and their staffs.

Council of Europe publications

The Parliamentary Assembly of the Council of Europe (PACE), Roberto Fasino

1. Reports on COVID-19, prepared by PACE

Adopted by the Standing Committee/Assembly

Lessons for future public health emergencies from an effective and rights-based response to the COVID-19 pandemic

(adopted 26 June 2020)

Committee on Social Affairs, Health and Sustainable Development

Mr Hunko, Germany, UEL

Democracies facing the COVID-19 pandemic

(adopted 13 October 2020)

Committee on Political Affairs and Democracy

Mr Liddell-Grainger, UK, EC/DA

Opinion by Monitoring Committee

Ms Lovochkina, Ukraine, SOC

The Impact of the COVID-19 pandemic on human rights and rule of law

(adopted 13 October 2020)

Committee on Legal Affairs and Human Rights

Mr Vardanyan, Armenia, EPP/CD

Opinion by the Committee on Culture, Science, Education and Media

Mr Sonik, Poland, EPP/CD

Upholding human rights in times of crisis and pandemics: gender equality and non-discrimination

(adopted 13 October 2020)

Committee on Equality and Non-Discrimination

Ms Stienen, the Netherlands, ALDE

Humanitarian consequences of the COVID-19 pandemic for migrants and refugees

(adopted 13 October 2020)

Committee on Migration, Refugees and Displaced Persons

Mr Fridez, Switzerland, SOC

Towards a COVID-19 vaccine: ethical, legal and practical considerations

(adopted 27 January 2021)

Committee on Social Affairs, Health and Sustainable Development

Ms de Temmerman, France, ALDE

Under preparation

The impact of the COVID-19 pandemic on education and culture

Committee on Culture, Science, Education and Media

Mr Efstathiou,Cyprus, SOC

Impact of COVID-19 on children´s rights

Committee on Social Affairs, Health and Sustainable Development

Baroness Massey, UK, SOC

Overcoming the socio-economic crisis sparked by the COVID-19 pandemic

Committee on Social Affairs, Health and Sustainable Development

Mr Hunko, Germany, SOC

Protecting the pillars of democracy during health crises

Committee on Political Affairs and Democracy

Ms Karamanli, France, SOC

Taking into consideration the impact of the fight against the COVID-19 pandemic on the mental health of minors and young adults

Committee on Social Affairs, Health and Sustainable Development

The impact of the COVID-19 pandemic on prison population in Europe

Committee on Legal Affairs and Human Rights

Track and trace applications: ethical, cultural and educational challenges

Committee on Culture, Science, Education and Media

Mr Duncan Baker, United Kingdom, EC/DA

Also relevant

Vaccine hesitancy: a major public health issue

Committee on Social Affairs, Health and Sustainable Development

Mr Kruglyi, Russian Federation, NR

Socio-economic inequalities in Europe: time to restore social trust by strengthening social rights

Committee on Social Affairs, Health and Sustainable Development

Ms Sayek Böke, Turkey, SOC

The role of media in times of crisis

Committee on Culture, Science, Education and Media

Ms Engblom, Sweden, EPP/CD

Sport policies in times of crisis

Committee on Culture, Science, Education and Media

Mr Gonçalves, Portugal, EPP/CD

Appendix 1: Contributors to this report

Country/ Region	EPTA member	Authors of country reports
Austria	Institute of Technology Assessment of the Austrian Academy of Sciences (OeAW ITA) https://www.oeaw.ac.at/en/ita/	*Michael Nentwich*
Chile	Parliamentery Technical Advisory (ATP) of the Library of the National Congress of Chile https://www.bcn.cl/concurso_publico_historico/que-es-atp	*Raimundo Roberts* *Christine Weidenslaufer*
European Parliament	Panel for the Future of Science and Technology (STOA) for the European Parliament https://www.europarl.europa.eu/stoa/en/home/highlights	*Nera Kuljanic* *Virginia Mahieu* *Carl Pierer* *Gianluca Quaglio* *Svetla Tanova-Enck* *Theo Karapiperis*
Finland	Committee for the Future, Parliament of Finland https://www.eduskunta.fi/EN/valiokunnat/tulevaisuusvaliokunta/Pages/default.aspx	*Maria Höyssä* *Olli Hietanen*
France	Office Parlementaire d'Evaluation des Choixs Scientifiques et Technologiques (OPECST) https://www2.assemblee-nationale.fr/15/les-delegations-comite-et-office-parlementaire/office-parlementaire-d-evaluation-des-choix-scientifiques-et-technologiques	*Bénédicte Rougé*

Germany	 Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag (TAB) https://www.tab-beim-bundestag.de/en/	*Michaela Evers-Wölk* *Armin Grunwald* *Reinhard Grünwald* *Matthias Sonk* *André Uhl*
Greece	 Greek Permanent Committee on Research and Technology (GPCRT) https://www.hellenicparliament.gr/en/Koinovouleftikes-Epitropes/CommiteeDetailView?CommitteeId=983767d2-0b12-48c6-910d-ad74b8d0ca6e&period=26c28f97-f651-4937-85dc-a52600fb148e	*Mina Gerasidi* *Kostas Papadimitriou*
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Poland	 Bureau of Research (BAS) of the Polish Sejm http://www.bas.sejm.gov.pl/about_us.php	*Wojciech S. Zgliczyński* *Mirosław Sobolewski*
Russian Federation	 Analytical Department of the Council of Federations	*Timur Semenov* *Pavel Yakutseni* *Sergey Kozyrev* *Natalya Serebryanaya*

Republic of Korea	 The National Assembly Futures Institute https://www.nafi.re.kr/english/index.do	*Byoung Soo Kim*
Sweden	 The Swedish Parliament Evaluation and Research Secretariat https://riksdagen.se/en/how-the-riksdag-works/the-work-of-the-riksdag/the-parliamentary-committees-at-work/	*Thomas Larue* *Petra Jonvallen* *Lars Eriksson*
Switzerland	 Swiss Foundation for Technology Assessment https://www.ta-swiss.ch/en	*Elisabeth Ehrensperger* *Christine D'Anna-Huber* *Christina Tobler*
United Kingdom	 Parliamentary Office for Science and Technology https://post.parliament.uk/	*Oliver Bennett* *Sarah Bunn* *Christiana Vagnoni*
United States	 Science, Technology Assessment, and Analytics team (STAA) of the U.S. Government Accountability Office (GAO) https://www.gao.gov/science-technology	*Karen Howard* *Timothy Persons*
Council of Europe	 The Parliamentary Assembly of the Council of Europe (PACE) https://pace.coe.int/en/	*Roberto Fasino*
Japan	 Research and Legislative Reference Bureau (RLRB), National Diet (NDL) https://www.ndl.go.jp/en/diet/service/works.html	*Chifuyu HIYAMA*

Appendix 2: Template for country reports

Template for member contributions to report

In the report we would like to describe the events, responses and opportunities for innovations between countries, and the different ways that EPTA institutes have supported their parliaments to deal with the crisis. The questions below are intended to uncover the variety of approaches and situations between countries and the different roles that EPTA institutes have fulfilled. In the synthesis, we will draw on this variety to address lessons learned from the covid-19 about the role of parliaments in dealing with crises. And analyze which roles TA institutes can play to support parliaments, taking into account the relationship between Science, Technology and Innovation (STI) and society.

Please use the questions below to write a chapter of about four pages.

The sub-questions are meant to explicate the question and need not be addressed point for point.

1. Can you give some facts and figures about the situation concerning Covid-19 in your country?

1. Statistics on the severity of the Covid-19 pandemic in the country (e.g. infection rates, death rates, other relevant health statistics, up until June 30, 2021)
2. Some statistics of the secondary effects of the Covid-19 pandemic that are particular to the situation in your country (e.g. on the economy, transportation and mobility, use of home office, education, use of technology, security situation, effects on a specific sector - such as tourism, etc.)

2. How have science/evidence-based resources been used to make political decisions during the pandemic?

- (How) was input from scientific experts organized?
- (How) was the use of up-to-date science for political decision-making warranted?
- What (types of) experts (e.g. social or behavioral scientists) were involved in advisory boards or had advisory roles? Were non-scientific experts also involved (e.g. patients, entrepreneurs, civic groups, human rights organizations)
- Were different values and interests taken into account into political decision-making? Was decision-making transparent?
- What role did the parliament have in political decision-making?

3. How has technology and innovation been used as tools to cope with the Covid-19 pandemic?

For example:

- Apps that are used to trace infections
- Vaccination passports
- Data analysis for traffic/populations/etc.
- (Other examples)

4. Has the Covid-19-crisis revealed any weaknesses or vulnerabilities in the way policy makers deal with STI in their political decision-making, and what was the impact?

- Had your government done anything to prepare for a potential pandemic before it happened?
- Has the societal (i.e. logistical, institutional, governance) context in which STI functions been considered in the process of political decision-making concerning STI? For example, in the case of vaccines: how to organize the distribution of vaccines, set priorities for vaccinations and inform the public about vaccines.
- Have social and economic differences in the population been taken into account when taking measures to cope with the pandemic? (such as quarantine rules, home schooling, home office, use of public transportation etc.)?
- Has the Covid-19-crisis revealed any strengths or resiliencies in the way policy makers use STI, and what was the impact?

5. How has your institute supported your parliament to ask questions, put issues on the agenda and consider the broader, societal embedding of STI during the Covid-19 crisis?

- Considering the mandate of your institute and the existing relationship between the institute, parliament and society, how were you able to contribute? For example, by providing regular science updates, by organizing or taking part in expert consultations, by consulting individual parliamentarians, by taking up a specific role in the public or political debate, etc.
- Does your organization have advice that could be valuable to prepare for or deal with future crises?
- Note: With this question, we are not after lists of specific projects you have taken up or products you have published. We are looking to learn from and showcase the different ways in which TA institutes have been supportive to their parliaments.

6. What, in your opinion, will be the most pressing discussions regarding technology and society in a post-COVID world? What has been changed permanently by the pandemic?

- These could be new issues, or issues that have been brought to the top of the agenda due to the pandemic.
- These could also be opportunities for innovations or improvements to public institutions or governance