

Reform *for* Resilience

Healthy Growth



Research Report

June 2021

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Contents

Introduction	4
1. Defining and Conceptualising Resilience	5
2. Pandemic Resilience: Emerging lessons (to date)	6
COVID-19 and its cross-system impact	6
The Need for Secure Foundations: Resilience <i>by-design</i>	6
Resilience <i>by-intervention</i> and <i>by-design</i> : Measures taken during COVID-19	7
Interventions: The urgent case of vaccines	8
Health Systems: The cost of incoherence	10
Data Systems: A continuing challenge	11
Urgent Innovations: <i>By design for intervention</i>	12
Resilience: Building on experience in Asia.....	13
Building on Experience: The Case of the European Union	14
3. Resilience: Challenges and Gaps	15
Transnational and Global Governance: Resilience and relationships	15
Business Resilience: A broader understanding.....	16
Communities: Understanding place-based resilience	17
4. Investments, Models and Metrics	18
Investing in Resilience.....	18
Models and Metrics	19
Annex 1: List of Submissions	20
Annex 2: Call for Evidence Feb 2021	21
Endnotes	24

Introduction

This Research Report has been written as COVID-19 still rages, ever-adapting, around the world.

It's important therefore to note that this report takes both an immediate and long-term view. As such, this report is a point-in-time summary and synthesis of a wide ranging discussion about what resilience could and should mean now and into the future.

The terms of reference for this Research Report were to bring together the evidence of the Resilience Commission's regional hubs and research partners to understand what is needed to think differently about current and future resilience. To this end, the Commission called for evidence (Annex 2) and has received a rich range of material from more than 20 submissions (Annex 1). The Commission has also undertaken its own body of research work.

There is significant global work being undertaken in other Commissions and Panels, notably the Independent Panel for Pandemic Preparedness and Response chaired by Helen Clark and Ellen Sirleaf¹; the Pan-European Commission on Health and Sustainable Development (the Monti Commission)²; and The Lancet COVID-19 Commission (the Sachs Commission)³. This work builds on the reports and recommendations of those Commissions and Panels.

However, the Commission's work is also distinctive, with broad ambition. It extends the purview to encompass not only health, but as the Cambridge model shows, the integration and coherence necessary across health, economy and environment to understand and enable current and future resilience. To this end, a central proposition is that resilience must scale from global and national to business and community.

Pandemics have potential to push prevailing policy paradigms into new perspective and new practices. Is COVID-19 creating the conditions for a resilient response and future?

Based on submissions and research, this paper overviews:

- A new definition and conception of resilience;
- Policies for resilience *by-design* and *by-intervention*;
- Emerging lessons about resilience from the pandemic;
- Challenges and gaps; and
- The need for new investment, models and metrics.

This paper is intended as a foundation for the Resilience Commission's Interim Report.

1. Defining and Conceptualising Resilience

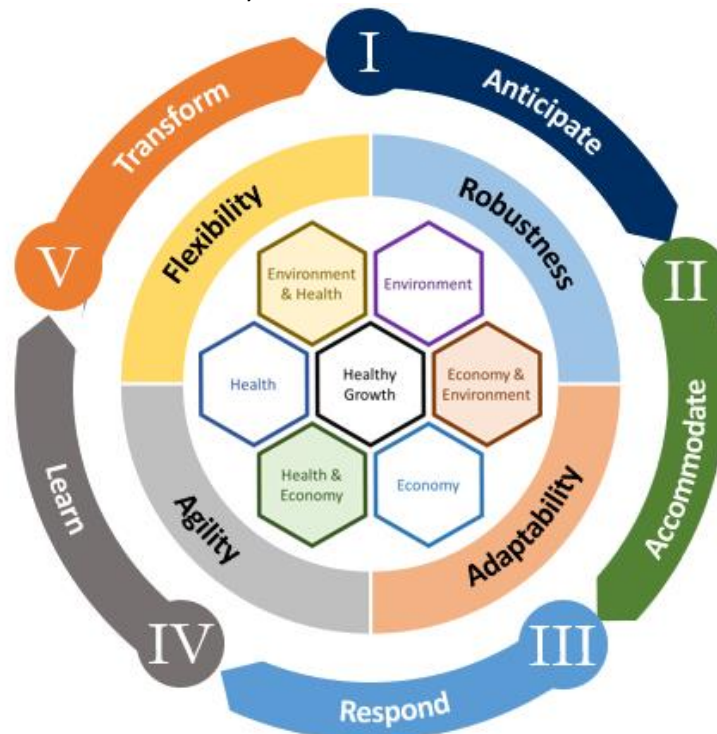
COVID-19 has had a wide ranging impact within countries, affecting just about every facet of life. For this research, we have identified three key factors for understanding resilience: health, economy and environment. This builds on the work of other global Commissions and Panels which have noted the COVID-19 has had an impact on health and lives⁴, economies, and has an environmental dimension as a zoonotic disease emerging from human-environmental interactions^{5 6}.

Recognising that there is not a current definition which spans health, economy and environment, as experienced during the pandemic, the first step for the Commission’s research has been to define resilience from a systems perspective, as proposed by the University of Cambridge:

... Resilience is the process by which health, economic and environmental systems can face change and shocks in such a way that they adapt, evolve and innovate together, to continue to deliver healthy growth for the population⁷.

This definition is unique in that it unites health, economic and environmental systems as important together in terms of resilience, consistent with current recommendations of the OECD for new conceptions “Beyond Growth”⁸. We have for this research defined the overall objective of resilience as ‘healthy growth’: a long-term objective defined for this research as focusing on achievement of rising wellbeing and, through this, better outcomes for current and future generations.

This Report also adopts a systems model which supports this definition, as developed by the University of Cambridge (‘Resilience Model’) (diagram below)⁹, which conceives health, economy and environment systems as important for the process of overall resilience. The model envisages that these three sectors must work together (‘interface’) for greater resilience. As shown in the diagram, these interfaces help to strengthen the model overall, and span ‘Health & Economy’, ‘Health & Environment’ and ‘Economy & Environment’.



2. Pandemic Resilience: Emerging lessons (to date)

COVID-19 and its cross-system impact

The Resilience Model assists with conceptualising the cross-system relationships as are important to understanding resilience (diagram below, right), work that will be taken forward for the Commission’s final report. By way of demonstration:

- The **shock** of COVID-19 itself can be shown as impacting first through health, and then across other systems. In immediate response, countries have taken a broad range of policy actions; including containment and health system actions to contain health risks, and fiscal measures to address economic risks¹⁰.
- However, COVID-19 is a zoonotic disease which emerged from **longer-term weaknesses** created by the interaction of humans and environment, shown in the model at the ‘Health & Environment’ interface. These weaknesses have been exacerbated by activities at the interface between ‘Economy & Environment’, for example, land degradation and human encroachment on wildlife populations¹¹.

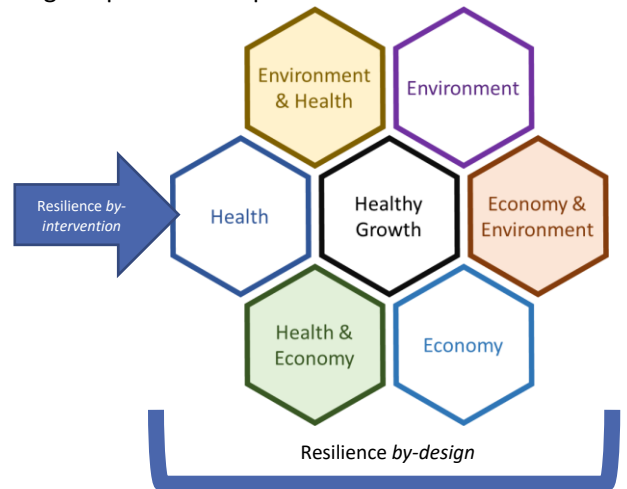


The Need for Secure Foundations: Resilience *by-design*

Resilient systems require secure foundations, the ability to understand the current state of play and to plan, as well as the capacity to rapidly adapt and transform¹². However, discussion about resilience often focuses on the immediate response to the shock, rather than the foundations and underpinnings required for response.

OECD New Approaches to Economic Challenges provided a submission which beneficially categorises resilience into two related dimensions: resilience *by-design* and *by-intervention* (diagram right).

- Resilience-by-intervention presumes that an external resource will be available as needed to support system resilience in the event of shock. In the case of COVID-19, this shock occurred in health.
- However, resilience-by-design builds the capacity for a system to recover critical functions after a disruption within the structure of the system, for example, the mobilisation of life sciences capacities and the expansion of telehealth during the coronavirus pandemic, which built on prior investments.¹³



The framework was further developed for this report by the OECD authors and the Commission to highlight how these concepts can be used to present a policy framework for resilience (box below). Further development of this work to support the Cambridge Resilience Model will be taken forward for the Commission’s final report.

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Resilience *by-intervention* and *by-design*: Measures taken during COVID-19

Resilience-by-Intervention presumes that an external resource will be available as needed to support system resilience.

Examples

- Enable Government interventions and support to safeguard strategic industries, protect against social disorder, and reduce the economic effects of shocks.
- Plan for sustaining a system’s critical functions by stockpiling resources and redundant capabilities outside of expected operating conditions.
- Develop real-time decision support tools integrating data and automating selection of management alternatives based on explicit policy trade-offs in real time.
- Plan to engage external resources and management agents outside of the system¹⁴.

At the onset of the pandemic, policy approaches focused on:

- **Containment policies**, such as hygiene, distancing, and lockdown measures, and including closure or management of businesses and borders¹⁵. These policies were health-oriented but had far reaching consequences for individuals, communities, businesses, and economies.
- **Health systems policies**, including increased surveillance, supply and use of protective equipment, ventilators and essential medicines, optimisation of hospital beds, mobilisation and protection of health workers, and additional financing for the health system^{16 17}.
- **Health and life sciences innovation**, including greater use of digital initiatives for surveillance and telemedicine; and R&D for vaccine and drug development¹⁸.
- **Broader economic and social policy decisions**, focused on communities, workers, firms, education, aged care, and mental health^{19 20}.

Resilience-by-Design builds the capacity for a system to recover critical functions after a disruption within the structure of the system.

Examples:

- Ensure that systems, including infrastructure, supply chains, economic, financial, and public health systems, are designed to be resilient, i.e., recoverable and adaptable.
- Manage system topology and structure by designing appropriate concentration, connections and communications across interconnected networks.
- Control system complexity to minimize cascading failures resulting from unexpected disruption by decoupling unnecessary connections and making necessary connections visible and controllable.
- Find an appropriate balance between a system’s efficiency and resilience by quantifying resilience and explicitly assessing resilience/efficiency trade-offs to guide investments.
- Ensure that the system can re-allocate resources endogenously in response to shocks, for instance by ensuring markets are efficient and provide incentives for firms to adapt production and ensuring fiscal buffers so governments can provide automatic stabilisers²¹.

Many pandemic interventions can be seen as building on prior policy decisions which enabled various systems to adapt, understood as creating **resilience-by-design**²².

For example:

- Health system interventions can be seen to build on prior knowledge^{23 24}, as well as decisions about health system coverage and financing.
- On the other hand, in many countries, healthcare response has been affected by long-term under-investment investment in public health^{25 26 27}.
- Some responses, such as life sciences interventions, have been founded on mature academic, private sector and government relationships^{28 29}.
- Fiscal and monetary actions built on experiences during the Global Financial Crisis³⁰.

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Interventions: The urgent case of vaccines

Vaccine development has been a remarkable example of **resilience by-intervention** during the pandemic.

- In many countries, public and private investments were rapidly mobilised for vaccine development^{31 32}, with the result that, in just over a year, more than fifty vaccines have been developed³³.
- Further, public-private partnerships have produced a vaccine as a global public good, with the Oxford-AstraZeneca partnership testing, manufacturing, and distributing their vaccine at low cost around the world³⁴.
- At global level, the creation of COVAX as a public-private partnership has been important to creating a global redistribution mechanism for COVID-19 vaccines^{35 36}, building on existing GAVI Alliance architecture.

However, at both national and international level, there have been significant challenges in the scale and speed of vaccine rollouts³⁷; including significant challenges in manufacturing and equitable distribution³⁸.

- There is extended discussion about global policy frameworks to improve vaccine development and distribution in pandemic circumstances, ranging from treatment of drugs for pandemics as ‘global public goods’, and greater co-licensing and regional manufacturing; to calls for countries with excess to donate their excess stock and waivers of intellectual property rights³⁹.
- These manufacturing and distributional challenges have been confounded by the online disinformation with profound implications for public health⁴⁰, especially in terms of ‘vaccine hesitancy’, with an estimated 30% of people indicating they may refuse COVID-19 vaccines⁴¹.
- COVAX, as a new global initiative, has been significantly affected by manufacturing uncertainties, regulation, funding availability, final contract terms and the readiness of countries to deliver their national COVID-19 vaccination programmes. As the Independent Panel noted: had COVAX had sufficient and readily available early funding it would have been better able to secure enough immediate supply to meet its aims⁴².

Vaccine development and distribution has built on foundations which have created **resilience by-design**. For example, in some countries, there were well-established manufacturing, production and procurement strategies.

‘...Countries with established vaccine industries tended to be quicker in building out manufacturing capacity; for example, by purchasing smaller manufacturing sites, and entering arrangements for local production of vaccines under licensing arrangements.... Meanwhile, countries with established bulk-purchasing and systems fared well in negotiating contracts for vaccines in the development phase within a fiercely competitive global marketplace’⁴³.

Global approaches have also built on the prior activities and investments of the GAVI Alliance, and the experiences of the Ebola outbreak with the Coalition for Epidemic Preparedness Innovations (CEPI) launched in 2017 as a non-profit organization funding basic research and early clinical trials for a list of epidemic-prone infectious diseases. When the COVID-19 emerged, CEPI sponsored some of the first vaccine candidates as early as January 2020, when there were fewer than 600 cases around the world⁴⁴. Yet there remain challenges with facilitating and redistributing vaccines globally. While these challenges exist, COVID-19 will continue to evolve and adapt. As such, there are increasing calls for attention to global vaccine redistribution, most recently from the IMF⁴⁵ and the Independent Panel⁴⁶.

Yet beyond redistribution, there is also an immediacy to addressing issues which result in vaccine hesitancy. Hesitancy can be caused by a range of factors, including lack of trust and information, politicisation, misinformation and disinformation, which has needed to be addressed both by governments and platforms such as Facebook and Google⁴⁷. According to the Lancet Commission on COVID-19 Vaccines and Therapeutics:

‘...It is imperative that government leaders prioritize evidence-driven communication strategies in their COVID-19 vaccine programs, while healthcare providers maintain situational awareness, respond to public concerns, and counter unfounded claims by those seeking to undermine public confidence in vaccines’⁴⁸.

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The challenges of vaccine distribution were the subject of a specific proposal from the Commission's Asia-Pacific Hub (below).

Proposal: G7 Resolution on Vaccine Equity

A Proposal by International Commission of Reforms for Resilience, R4R; Chang-Chuan Chan, Advisor of R4R, International Advisory Chair of APAC-Hub of R4R

'...Asia Pacific countries (APAC) has led the world of preventing major outbreaks in 2020 during this ongoing COVID-19 pandemic by implementing strict non-pharmaceutical interventions, such as border control, contact tracing, masking and social distancing at a very early stage and maintaining them until now. The success in containing COVID-19 epidemic in the APAC region, while preserving health for their own citizens, has contributed to limiting export of the threats of SARS-CoV-2 to lives and humanities globally, including the people living in the developed world of G7 countries. Though we all endured together economic loss, social exclusion, physical injury and mental distress in this pandemic, APAC people suffered most in particular from the longest border control and universal mask wearing.

As the pandemic entered into 2021, rapid vaccination of effective vaccines has become the weapon that humanity needs to overcome our common enemy, SARS-CoV-2, of this pandemic and bring us back to a safe and healthy post-COVID world. Unfortunately, significant coverage of vaccination in population occurred only in a few developed countries as currently available vaccines are developed, manufactured or controlled mainly by countries, such as United Kingdom, United States and some EU countries. The rest of world, such as APAC, has minimal vaccinations for its populations as the majority of countries in the world have no manufacturing capability and/or purchasing power of vaccines. The lack of access to vaccines can create reservoirs of unvaccinated population in parts of the world and make them ready for initiating new waves of pandemic by cultivating new variants of SARS-CoV-2. Eventually global health security will be compromised, and pandemic will be worsened. The tragedy of people in India who are suffering from the recent outbreak of COVID-19 now is exactly the result of vaccine inequality across countries.

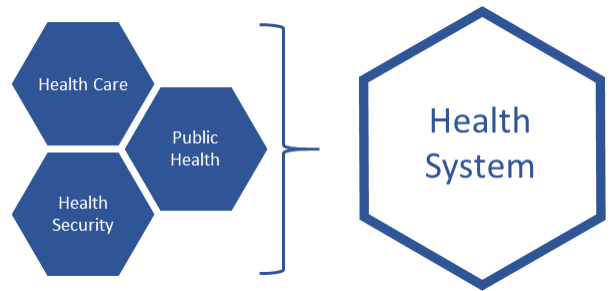
What should and can G7 countries do to alleviate the dire situation of global inequality in vaccine accessibility? We suggest the International Commission of R4R to persuade G7 to adopt a resolution on vaccine equity consisted with the following three pledges in the upcoming meeting. The first one is to adopt a one-plus-one (1+1) vaccine distribution policy. G7 countries should export one dose of vaccine to non-G7 countries for every dose they use in the G7 countries. The second one is to establish regional hubs of COVID-19 vaccine supply chain, including building manufacturing plants and organizing delivery logistics at locations close to the populations in need. The third one is to waive IP rights during the pandemic, allowing privately-own companies in developing and newly developed countries to produce COVID-19 vaccines used by local people at affordable prices. The APAC-Hub of R4R can serve as the first location for G7 to execute this resolution⁴⁹.

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Health Systems: The cost of incoherence

Arguably the greatest attention has been paid to how health systems have responded to the pandemic. Research submitted to the Commission argues that differential outcomes and experiences across countries may reflect a critical lack of **within-system** coherence across healthcare, health security and public health (diagram right).



A significant focus of immediate attention has been on health security, with interventions affected by an evident lack of preparedness in many countries⁵⁰. Underinvestment in core health security measures led to deficiencies in pandemic preparedness and response⁵¹; with lack of emergency health supply stockpiles⁵² the first signal that countries were unprepared, and that interventions may not be effective. For many countries, this lack of preparedness helped to escalate the spread of COVID-19.

However, it is imperative to understand that resilience and interventions were also undermined by significant underinvestment over time in population health approaches and public health systems^{53 54}, described as a ‘global crisis of chronic diseases and failure of public health’⁵⁵.

This underinvestment has been despite pre-pandemic evidence that public health measures yield a positive economic and social return on investment^{56 57}. In the first and consequent waves, population health vulnerabilities actively undermined health system efforts, with disproportionate infection rates, disease severity and mortality evidenced in populations with underlying health conditions^{58 59}. In addition, economic inequalities created higher rates of infection, disease severity and mortality in economically vulnerable populations^{60 61 62}.

As a result, the worst effects of the pandemic arose in situations where healthcare systems became overwhelmed, with the number of severe cases – characterised by the effects of comorbidities and inequality on health - exceeded the capacity of available health services, seen at various times in both high-, middle- and low-income countries around the world including Europe, Brazil, the United States of America and (now) India⁶³. It is well understood in the global analysis of the impact of COVID-19 that healthcare systems have for many years, have been under-funded in many countries and/or affected by austerity measures implemented after the Global Financial Crisis⁶⁴.

Health systems are complex, and in our example, span public health, health security and healthcare. Resilient response was, for many governments, hindered by lack of coherence and coordination within the healthcare system as a whole^{65 66 67 68}.

- Fragmentation within the health system required emergent remedy across non-aligned silos of health specialties⁶⁹ and national, sub-national and local governance structures⁷⁰.
- Response in many countries required significant attention to relationships between levels and types of health services; between levels of government and health administrations; between technical experts and decision makers; and between public and private actors in health⁷¹.
- For greater coherence, some countries created new cross-government political structures. In Germany, for example, the conference of state and federal leaders set national health policy in the early months⁷²; and in Australia a ‘national cabinet’ was used as decision-making forum to improve communication, co-ordination across states and territories, and joint decision making^{73 74}.
- Focussing only on pandemic interventions - healthcare or preparedness - belies how health systems can be better designed for resilience, and the important contribution that public health and health security programmes and institutions are make to health system resilience *by-design*.

Data Systems: A continuing challenge

Despite claims about ‘big data’ and the ‘digital era’, basic health data and surveillance systems can be seen as a patchy, underinvested infrastructure in many countries where data is needed to most⁷⁵. There have been deficiencies in data collection for death for some decades, with around two-thirds of deaths never registered⁷⁶.

Just as for previous outbreaks, there were significant challenges in obtaining real-time data, and as such there were spectacular failures⁷⁷; with the Independent Panel’s second progress report noting that surveillance approaches needed to be brought into the digital age⁷⁸. Beyond basic surveillance, there have been weaknesses in data production spanning statistics, public health, and research data challenges which have existed for some time^{79 80}. As a result, there have been errors and omissions in the way the data has been interpreted⁸¹.

Data challenges have been confounded by the impact of ‘extravagant disinformation’⁸².

- During epidemics, more so than any other time, people need accurate information⁸³. COVID-19 is the first pandemic of the information age; however there have been errors in the way that data has been interpreted, accompanied by the spread of ‘extravagant disinformation’⁸⁴.
- Across the multiple systems, both disinformation and misinformation can be seen to undermine efforts to develop and implement strategies to protect human health and life, with the serious risk that confusion and distrust can undermine an effective public health response, including vaccination hesitancy⁸⁵.
- When confidence in pandemic responses and interventions is reduced, this in turn affects other systems, for example, economic systems.

However, there have been gains in data system collection and use. Novel approaches to modelling and simulation leveraged emerging data sources and data analytics tools to conduct natural and other experiments may also innovation impact studies⁸⁶. In some countries, analysts needed to develop novel methods, and techniques to improve the decision-making and augment established epidemiological approaches⁸⁷:

‘... analytics that ventured beyond mere admission and outcomes data, provided much better understanding in how small differences in treatment strategies affected the trajectory of the patients in predictable ways’⁸⁸.

In addition, stronger health systems had the institutional data infrastructure required for gathering, synthesising, and interpreting evidence into technical advice, with data infrastructure therefore provided the foundation for both policy and clinical decision-making⁸⁹. For example, digital systems for surveillance in Taiwan, created through public-private partnership and established in 2019, proved critical to surveillance and response to COVID-19 (box below).

Public-Private Partnerships for Innovation in Surveillance: The Case of Taiwan CDC and Acer Incorporated

Taiwan’s Center for Disease Control (CDC) partnered with Acer e-Enabling Service Business (AEB) to create a surveillance system for real-time analyses and reporting. Established in December 2019, the surveillance system has since proven important in monitoring COVID-19 in Taiwan. The surveillance system enables collaboration between multiple health system actors including medical units, hospitals, and governmental departments, with specific focus on:

- The accuracy of data to save lives. The platform includes readily available information about cases to formulate the containment, prevention policies, and strategic measure, as well as epidemiological trends about infections.
 - The use of treatments for better understanding about efficacy and resistance.
 - Built in data protection and confidentiality. The platform is also compatible with the National Health Insurance (NHI) system.
-

Urgent Innovations: *By design for intervention*

With a strong focus on vaccine development and distribution as an urgent intervention for resilience, it is easy to overlook other activities which have contributed to resilient responses to date during the pandemic. For both current and future resilience, submissions and research identified the need to build on, and quantify the value of, both the gains *and* lessons in health and economic innovation^{90 91 92 93}.

Despite, or perhaps because of, the continuing waves of COVID-19, a range of innovations have emerged^{94 95} at the 'extended area' beyond health systems⁹⁶. For example:

- Genomic sequencing, a health / data science initiative, contributed to development of global knowledge about the virus and its variant^{97 98 99 100 101 102}, informing public health response and underpinning life science initiatives including diagnostics and vaccine research and production^{103 104}.
- Digital health initiatives have scaled for pandemic response¹⁰⁵, offering significant value to both health and the economy across the pandemic¹⁰⁶. Telemedicine has emerged as a complementary digital initiative in many health systems, building on existing or emerging digital health foundations^{107 108 109}; and demonstrating the health system's capacity for large scale system change¹¹⁰.

Well-integrated health technologies have the potential to help alleviate the massive healthcare burden faced domestically and further afield through innovation and collaboration¹¹¹. For future resilience, development of contemporary technology and innovation policy frameworks will be crucial, with systems thinking providing a methodology to better understand the behaviour of complex systems and to improve the assessment of the consequences of both innovations and policy interventions^{112 113}.

Estonia: The 'unremarkable' digital nation

Estonia has often been lauded for its comprehensive approach to digital implementation, building one of the world's most advanced digital societies, spanning most government services, including healthcare. As some remarked, Estonia's coronavirus response seems unremarkable because its digital capabilities were so ingrained¹¹⁴.

Estonia's long-term digital investments, including significant attention to governance and privacy, paid off as the pandemic hit, with management of the crisis facilitated by the existing ICT and e-government infrastructure¹¹⁵, and Estonia's digital public services continuing mostly uninterrupted¹¹⁶.

One of the most digitally advanced countries in the EU, Estonia has been recognised internationally for its innovations in eHealth¹¹⁷.

- The country's COVID-19 response built on its comprehensive digital foundation, especially its e-health capacity, which had been established since 2005 across health records, digital imaging, registration and digital prescriptions¹¹⁸.
- Estonia's Health Information Exchange enables a broad range of patient and administrative functions¹¹⁹, and at the outset of the pandemic, most patients in could view their medical records and test results electronically¹²⁰.
- Similar to other countries¹²¹, prior to the pandemic, the Estonian Health Insurance Fund had intended to make available remote appointments with healthcare specialists; and the onset of COVID-19 precipitated the greater need for telemedicine to prevent the spread of the virus and to support mental health needs¹²².
- As for many other countries¹²³, however, digital tracing proved challenging. A digital tracing app was developed as a public-private partnership; however, launched late in August 2020, only in time for the second wave. Estonia's strict privacy rules, the foundations of its digital implementation, was argued as one of the reasons for this delay¹²⁴.

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Resilience: Building on experience in Asia

It has proven crucial to respond to the pandemic quickly through mitigation, isolation, lockdown and economic disruption at the beginning of the pandemic cycle, to flatten the pandemic curve at the national and regional levels¹²⁵.

It is a critical point that many governments in Asia, with prior experience of outbreaks, had invested strategically in resilience *by-design*, with coordinated efforts across public health, preparedness, and coordination, in addition to broader system investments^{126 127}. In the case of Taiwan, preparation had taken place over two decades, with the SARS outbreak prompting improvement across health systems, and the creation of new agencies and scientific institutions at national and local levels¹²⁸. This comprehensive preparatory work and investment – spanning health and economic frameworks - appears central to COVID-19 responses in many Asian countries:

‘The four East Asian polities—Hong Kong, Korea, Taiwan, and Singapore—were able to take stringent actions early on because they had established an early warning system and put in place institutional infrastructure before the current virus outbreak. What prompted them to make such an investment? ... Hong Kong, Taiwan, and Singapore were among the hardest-hit polities by SARS in 2003. Although Korea suffered minimal damage from the same disease, the country became second to Saudi Arabia in terms of total MERS cases in 2015. Since then, all four polities overhauled their public health systems with a focus on preparing for the next round of epidemic¹²⁹.

Resilience necessitated strong policy and investment activities by these countries. The box below considers how Singapore’s policy framework has promoted resilience *by-intervention* and *by-design* during the pandemic¹³⁰.

Investing in Resilience: Singapore’s Models and Policy Foundations in the Pre-COVID years

<i>Resilience-by-Intervention:</i>	<ul style="list-style-type: none"> • Singapore’s national priority focused on keeping the epidemic curve under control and preventing a systemic shock to the economy, with border controls, screening processes, contact tracing operations, quarantine orders and community measures adjusted to respond to evolving epidemiological developments and national infrastructural capacity. • This was supported by cross-sectoral governance established through a multi-ministry taskforce of ministers established to oversee the COVID-19 response; and an inter-agency taskforce established to tackle specific issues that emerged, for example, clusters in foreign worker dormitories. • Fiscal measures accompanied the implementation of public health measures to cushion the impact of the pandemic and to create a circuit break on the economy and employment. Reserves have also enabled a fiscal stimulus to cushion the economic impact from COVID, without having to commit to high levels of debt taking generations to pay off. The sovereign wealth fund under-wrote risks.
<i>Resilience-by-Design:</i>	<ul style="list-style-type: none"> • Singapore’s response to the pandemic has been shaped by models of governance, administrative structures and policy decisions set decades earlier. • The SARS experience in 2003 led to investment in a public health intelligence unit, and the National Centre for Infectious Diseases (NCID), a purpose-built facility designed to strengthen infectious disease management. • A disease outbreak plan was developed to guide a nationwide and multi-system response through escalating stages of infectious disease spread. • Beyond health, however, both Singapore’s fiscal reserves and the sovereign wealth fund have been important to enabling resilient response. • Singapore’s biomedical capabilities is an outcome of policy established two decades earlier, when Singapore embarked in 2000 on a strategy to establish itself as a regional biomedical hub, building core capabilities in terms of key human and industrial development initiatives. Development of the biomedical sector was part of a larger economic plan creating a diversified approach.

Building on Experience: The Case of the European Union

The European Union (EU) is navigating its third crisis in the space of a decade, following the financial crisis and the migration crisis¹³¹.

Across EU Member States in the early onset of the pandemic, countries first focussed on prioritising domestic policies and restrictive measures, hesitating to provide mutual help. The result was that the pandemic response was everything but coordinated: EU countries closed their borders unilaterally without harmonisation based on Schengen area rules. In addition, they followed very different strategies against the virus with little if any inter-state coordination¹³².

The impact of the pandemic triggered what is considered a fast response by EU standards, reflecting the learnings of the eurozone crisis:

- in addition to prompt action by the European Central Bank, the Commission made proposals in May 2020 and by end-2020 an agreement at EU level had been achieved. The risk of fragmentation between EU countries, regions or sectors drove the EU response, which introduced a wide range of multi-year investment and reform programmes¹³³.

COVID-19 has sponsored new policy dialogue and policy mix, with the main policy innovations during the response having a very clear supranational status, for example, the Recovery and Resilience Facility¹³⁴.

It is an interesting point that there is a relationship between the financial crisis and COVID-19 in the EU and many other countries. Since the 2008 financial crisis, many countries, as well as the EU and its Member States, have focused on cost-containment in health systems, with a consequent risk that, even after the experience of the pandemic, health systems may be faced with greater budgetary constraints and austerity measures¹³⁵. It was this relationship which arguably shifted some of the traditional north-south policy divide within the EU. With COVID-19 unanticipated by all countries, its emergence as a shock did not reflect internal differences about economic management, different to the arguments between north and south during the eurozone crisis¹³⁶.

It has been the response of by the EU institutions that has set the stage for recovery and potentially altered the discourse on economic policy and governance moving forwards¹³⁷. COVID-19 can therefore be seen to have created a shift in relationships, policy dialogue and institutional frameworks within the European Union. What is emerging is an institutional landscape with a greater combination of rules-based and institutional features, with the potential to lead to more effective vertical coordination¹³⁸.

3. Resilience: Challenges and Gaps

As the experiences of COVID-19 consolidate, there are emerging challenges and gaps identified across submissions, relevant to improving future resilience.

Transnational and Global Governance: Resilience and relationships

Global health coordination by WHO in the face of the pandemic has arguably not been as effective as the coordination during and after the Global Financial Crisis¹³⁹. Reform or adaptation of global health governance, including global health boards, has been a key theme emerging from the reports of other Commission and Panels^{140 141 142 143}, with calls for new global boards or financing discussions to be anchored with existing global institutions such as the G7 and G20^{144 145}.

A submission to the Commission outlines how a comparative approach and experience from the global financial system can support thinking focused on resilience (box below).

'...Just imagine what would have happened if global leaders had convened a special G20 Summit to discuss what to do, as happened in Washington in November 2008, just two months after the Lehmann crash. And just imagine what would have happened if there had been a global fiscal response like that orchestrated by Gordon Brown and Barak Obama at the London G20 summit in April 2009....

....Greater international cooperation is necessary; between nation states; between health policy makers and the national Treasuries and Central Banks who deliver economic policy. ...The last time the world faced an economic and social challenge as serious as the one we now face was at the end of the World War II. At that time there was an extraordinary burst of institutional creativity: the Bretton Woods conference in 1944 at which the IMF and the World Bank were established; the foundation of the United Nations at a conference in San Francisco in 1945; the subsequent negotiations which led to the establishment of the General Agreement on Tariffs and Trade (GATT), which many years later became WTO; and the provision by the United States, through the Marshall Plan, of additional money for countries in need, something which eventually led to the creation of the Organisation for Economic Cooperation and Development (OECD) that was located in Paris.

... The OECD is an international organisation that works to shape policies that, as it says "foster prosperity, equality, opportunity and well-being for all". (OECD, 2021). It does this by working together with governments, policy makers and citizens, in order to establish evidence-based international standards, and find solutions to a range of economic, social, and environmental challenges.

.... The world also needs, in my view, another body which will contribute to the making of global health policy, and will do this in a rather different from what will be done by the WHO, even if that body is appropriately reformed. A Global Health Board would be an international body that would monitor the global health system and make recommendations for its reform. The creation of this body at the time would mirror the way in which the Global Financial Stability Board (FSB) was created out of the much less substantial Financial Stability Forum in 2008, in order to help manage the global financial system. Creating a Global Health Board would help take forward the management of the world health system, in much the same way that the creation of the FSB helped take forward the management of the global 20 financial system. And such a body would come to make recommendations about global health policy reforms in the same way that the OECD makes recommendations about global economic policy reforms'

¹⁴⁶

Reform for Resilience

Healthy Growth

Transnational and international cooperation between states have been ongoing challenges during the pandemic, with governance and cooperation was frustrated by governments closing their borders to adjacent countries or being accused of taking actions which ‘beggar thy neighbour’¹⁴⁷.

- Cooperation opportunities were therefore missed. For example, ASEAN countries delivered relief packages independently; coordination of approaches at an earlier stage could have lowered overall costs and resulted in targeted mitigation within and across countries¹⁴⁸.
- As Hanspach notes, the pandemic also revealed opportunities in Europe to strengthen transnational market integration in Europe for medical supplies¹⁴⁹.
- In some regions, transnational governance has helped to develop cooperative and integrated approaches to health security beyond borders^{150 151}. For example, Taiwan, through private-public collaboration, provided PPE to many countries during the pandemic¹⁵².

However, there is also opportunity for evolution in the understanding of governance, especially as it relates to future resilience.

- There is an increasingly pluralistic perspective on transnational governance. In an era characterized by ailing multilateralism, there is reliance on non-state actors not only for their expertise, financing and inputs to policy delivery but also in their contributions to the design and legitimation of new tools of transnational governance, including helping develop and monitor the metrics of progress, for instance, towards the SDGs.
- New modes of transnational governance have emerged in response to ‘multiplexity’¹⁵³: the great *complexity* of global challenges of health, environment and other transboundary policy problems. As a result, the leadership of bodies like the G20 or OECD in responding to global challenges is gradually being shared with *multiple* non-state actors.
- While states remain the central and crucial decision-making actors in a multiplex world, governance innovations like transnational public-private partnerships, private regulatory regimes and standard setters (e.g. the Marine Stewardship Council or the ISEAL Alliance), peak association bodies like the B20 orbiting the Group of 20 processes or large scale philanthropic initiative¹⁵⁴. During the pandemic, such public-private partnerships have been a *modus operandi* for resilience¹⁵⁵, often reflecting prior, mature, relationships between government, academic and private sectors¹⁵⁶, and mediating systems interactions and therefore resilience¹⁵⁷. In countries such as Singapore, pre-existing public-private partnerships have been a key aspect of its response¹⁵⁸.

Business Resilience: A broader understanding

With the focus on the actions of government and multilateral institutions, there has been less attention in global commissions and evaluations to the impact, or role, of business both during the pandemic, and after. Prior to the pandemic, there was a strong focus on sustainability emerging through the increasing use of ESG frameworks¹⁵⁹.

- Reporting and metrics for ESG present corporate responsibility spanning environment, social and governance factors. Arguably, environmentally responsible businesses are less exposed to systematic risks¹⁶⁰. COVID-19 has moved ESG investing strategies into the spotlight¹⁶¹, with a change of perspective shifting ESG scores from indicators of sustainability to measures of internal vulnerability¹⁶².
- These issues remain, and if anything, are more imperative given the knowledge that activities which degrade the environment also impact on the emergence of viruses and disease^{163 164 165}. With market dynamics permanently changed, corporations will not thrive if they do not focus on sustainability and health¹⁶⁶.

However, whilst ESG includes attention to workforce and communities associated with business activities, it does not incorporate a health-specific dimension or risk. As the health-related shock of COVID-19 has moved through economies worldwide, private sector activity has been severely affected by containment and mitigation policies, including lockdowns and border closures, and broader policies introduced over time to manage the impact of COVID-19¹⁶⁷. In Asia, as well as other regions, the pandemic affected supply chains, breaking down the ability of the logistics sector to move goods, leading to disruptions to production in other connected countries. This disruption had multiplier effects up and down the value chain¹⁶⁸. There is a risk of return to more protectionist approaches as a result¹⁶⁹.

Reform for Resilience

Healthy Growth

Analysis of resilience, however, should pay attention not only to the impacts and interventions within systems, but also to the contributions, evolution and innovation building on existing system foundations. From a business perspective:

- Biosecurity has become an immediate concern from *both* a health and economic perspective. Hygiene is no longer a public health concern alone: it is how many businesses continue trading nationally and internationally. As such biosecurity and hygiene measures, spanning non-pharmaceutical interventions such as handwashing, mask-wearing and social distancing, to appropriate biosecurity arrangements for the movement of goods, are important to reduce current and future impacts of epidemics and pandemics, and guaranteeing the flow of trade, particularly from quarantined areas¹⁷⁰.
- Digital initiatives have assisted many businesses to adapt their activities; including for the workforce to work from home in lockdown conditions¹⁷¹; and therefore, digital capacity in the workforce will be an even more important future asset. The growth in working from home has changed the landscape in many sectors and can be considered a mechanism for resilience; one which has implications for productivity and the future of work¹⁷². In fact, a healthy workforce is recognised as an asset for resilience, with hygiene and biosecurity arrangements therefore becoming ever more important¹⁷³.
- Private sector activity has also contributed to pandemic response efforts in many countries. For example, private health sector activities have eased pressures in some public health systems^{174 175}, and public-private or private sector actions have supported digital, drug and vaccine development¹⁷⁶, becoming a *modus operandi* for resilience^{177 178}.

Communities: Understanding place-based resilience

Communities and individuals within them have been critically and disproportionately affected by health, economic and environmental factors and risks related to the pandemic.

Access to healthcare for all in need is a major challenge in many countries, where sub-national and community health disparities in access to healthcare represented a threat to health system sustainability and resilience¹⁷⁹. If individuals are unable to access healthcare in their local communities, there is a greater risk to the community and the broader population of the risk of transmission, which could lead to, accelerate, or prolong an epidemic¹⁸⁰.

- While some countries coordinated care at local levels based on current practices, in other countries, co-ordination mechanisms were not sufficiently developed, highlighting hospital-centric systems¹⁸¹. In some countries, local public health authorities had been underfunded over lengthy periods of time^{182 183}.
- Allocation of emergency health financing did not always take account of local care needs, nor address known inequalities in local communities¹⁸⁴.
- However, there have also emerged examples of local health innovation for resilience. In France, local networks provided valuable information systems, generating local level data to support healthcare providers and patients, and thereby assuring the resilience of the healthcare system¹⁸⁵.

Beyond health service provision, many communities have been impacted by localised economic effects, including unemployment¹⁸⁶. Understanding place-based resilience is critical given economic inequality has complicated efforts at epidemic prevention and control, exposing certain populations to health-related hazards¹⁸⁷. With current indications are that prospects for future growth vary widely across countries and sectors¹⁸⁸, place-focussed actions will continue to be critical.

- Private sector actions will be important at community level. In some countries in Asia, private sector foundations are expanding financial access and education in rural areas, as well as technology and digital access¹⁸⁹. There are also complementary policies that enable social connection and self- and collective efficacy to minimise these impacts and promote community resilience¹⁹⁰.
- For future resilience, attention can be given to methods which improve both health and environment resilience, such as a greater community focus on reducing reliance on private transport, encouraging greater individual and community exercise¹⁹¹; and the local production and distribution of healthy food¹⁹².

4. Investments, Models and Metrics

Submissions included attention to what is needed in terms of future investment, models and metrics. This section summarises the themes emerging from the submission, and supplements these with additional research.

Investing in Resilience

Investments focused only on *resilience-by-intervention* are unsustainable over the longer term, and they do not guarantee continued system survival¹⁹³. In addition, financing to address resilient actions *by-intervention* will be a significant challenge, especially where there exist fiscal constraints¹⁹⁴.

Resilience *by-design* builds the capacity for a system to recover critical functions after a disruption. Systems require secure foundations, to rapidly adapt and transform¹⁹⁵.

- Pandemic preparedness is an important aspect of investing in resilience *by-design*. Many countries, however, including those assessed as having capacity, were in fact unprepared, with low stockpile reserves^{196 197}.
- In some countries, health insurance was responsive by-design; with health insurance reimbursements expanded to accommodate new service interventions, such as the use of telemedicine^{198 199}. In Singapore and Germany, financial reserves were also used to cushion the economic impact from COVID^{200 201}.
- The focus on investing in emergent interventions rather than in the foundations of preparedness has arguably affected international development assistance, with global development financing for preparedness at low levels prior to the pandemic²⁰², and donor governments therefore having to adapt their development assistance approaches to support greater COVID-19 response²⁰³.

This lack of investment in key health strategies prior to emergency reflects a broader issue that health expenditures are considered a cost to the economy and are therefore not considered productive. As such, health system contributions to the economy may not be accounted for in financial decision-making, even though contributions by the health sector can be more than 10 % of total GDP²⁰⁴. This contrasts to the way in which digital, data and life sciences are often invested as productive economic sectors, with longer term investments which have been crucial to promoting resilience during the pandemic^{205 206 207}.

However, as the pandemic shows, where health systems – including public health, health security and healthcare – are not in working order, they fail to provide an adequate buffer against the onslaught of disease. **Health systems could be considered an essential infrastructure or asset and be invested in for resilience *by-design* and *by-intervention* will be a challenge.**

Current policy and investment frameworks may therefore not be adequate to create multi-system resilience²⁰⁸. To this end, many of the submissions to the Commissions provided examples about how decision-making tools can be improved to focus on multi-system resilience, with a specific focus on better integration of epidemiology and economic approaches highlighted because of the pandemic.

- **Cost-benefit analysis (CBA)**, a commonly used tool, can under-represent risk and ignore distributional impacts²⁰⁹. CBA could be better adapted for specific use in emergent situations, to include integrated economic and epidemiological perspectives for analysis of options and allocations^{210 211}.
- **Integrated investment analysis:** More broadly, investment decision making criteria for policy appraisal could better include multi-criteria analysis, with the criteria incorporating resilience alongside other policy goals, such as sustainability. For example, policy makers struggle to assess both health and economic effects in a unified approach; and therefore, more work is needed on how to integrate epidemiological with economic research²¹².

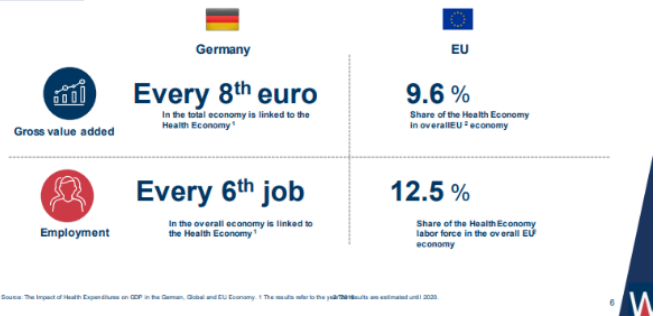
Reform for Resilience

Healthy Growth

- **Re-envisioning macro analysis:** there is a need for macro-economic models to better integrate dynamic disease transmission models²¹³. In addition, better estimating health and health-economy shares of GDP, as well as labour force shares for health, may yield important observations for policy makers making investment decisions focused on resilience, with particular importance placed not only on health, but on contributions at the ‘Health & Economy’ interface of the Resilience Model (diagram right)²¹⁴.
- **Finally, investment models could better consider how both public and private sector incentives** can align within common policy frameworks. Public health has been kept separate from corporate influence; however, collaboration could be beneficial to improve both quantitative and qualitative models needed to drive future investment²¹⁵.

Figure 1: Impact of Health-related activity in Germany and the European Union

Indicative Impacts of the Health Economy on the GDP of the German and European Economies (2020)



Models and Metrics

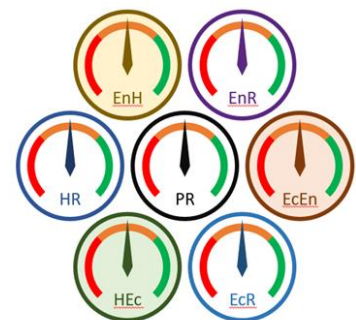
For investment approaches to be updated to focus on resilience *by-design* and *by-intervention*, and adapt their approaches to health system investments, new models must be developed based on a richer understanding about how modern, integrated systems work²¹⁶. There have been calls from the international development community in the past to develop metrics for multi-system resilience, recognizing that disasters, shocks, and stresses present cross-system challenges²¹⁷.

New models and metrics should build on, or adding to, what already exists. There is a plethora of metrics available for individual systems including health, environment, and economics. These focus on discrete targets within health, environment and economy, including thirteen targets underpinning the overarching goal to ‘Ensure healthy lives and promote wellbeing for all at all ages’²¹⁸.

- The SDGs also include targets which span multiple systems in the Cambridge Resilience Model – for example, targets related to essential medicines and vaccines and R&D have a strong economic relationship²¹⁹.
- Further, with a focus on health, experimental indices, such as the UK’s Health Index²²⁰, have developed metrics focused on an integrated range of cross-system indicators. This type of approach shows how sets of existing metrics can be used to develop a more comprehensive understanding of resilience.
- In contrast, methods such as the Global Health security Index, focus on a *within-health* system dimensions, with a strong focus on health security, some analysis of health coverage, and attention to population health as part of its risk assessment. This index is currently under review considering pandemic experience²²¹.

Interdisciplinary and other multi-dimensional perspectives promoting *by-design* ‘health resilience’ models should work to incorporate a wider range of values that structure the selection of metrics.

- The University of Cambridge provided a conceptualisation as to how metrics may be grouped, based on their multi-system resilience model, to provide an overall understanding of resilience (diagram right).
- The concept is that, in a multi-system model, key metrics may be aggregated to provide indications of overall resilience. However, taking a multi-system view of resilience requires that the assumptions which underpin models and metrics be reviewed.



Annex 1: List of Submissions

	Reference
01	OECD New Approaches to Economic Challenges (NAEC) Initiative. 2021. A Systemic Resilience Response to Covid-19: A Submission to the Resilience Commission
02	Hanspach, P., 2021. Improving Health Resilience Through Better Procurement of Medical Supplies: Lessons from the COVID-19 Pandemic, STG Resilience Papers. European University Institute, Florence, Italy
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08	Renda, A., 2020. Walking the Post-Pandemic Talk: How to Incorporate Resilience in Better Regulation Systems. STG Resilience Papers, European University Institute, Florence, Italy
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10	Šehović, A., 2021. Resilience: Health Security Beyond Borders. STG Resilience Papers, European University Institute, Florence, Italy
11	Fingerhut, H., 2021. Digital Transformation and the Role of Technology in Building Healthier Populations. Submission to the Reform for Resilience Commission Call for Evidence. Science & Innovation Unit, Tony Blair Institute for Global Change: Submission to the Resilience Commission
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13	Vines, D. 2021. Creating A Health Resilience Commission in the UK and reforming the WHO. Call for Evidence by the Post Pandemic Policy Commission University of Oxford: Submission to the Resilience Commission 7 May 2021 DRAFT
14	Asia-Pacific Hub 2021. APAC Research: Submission to the Resilience Commission
15	Chen, J., Teo, Y., and Yap, J., 2021. Policy Foundations in Singapore: Resilience in the Face of COVID. Saw Swee Hock School of Public Health, National University of Singapore. (Through Resilience Commission Asia-Pacific Hub)
16	Guillén, M., 2021 The Politics of Pandemics: Democracy, State Capacity and Economic Inequality. The Wharton School: Submission to the Resilience Commission
17	Shearer, F., Meagher, N., Marinkovic Chavez, K., Carpenter, L., Pirrone, A., Quinn, P., Alisic, E., McCaw, J., MacDougall, C., Price, D., Gibbs, L., 2021. Promoting resilience while mitigating disease transmission: An Australian COVID-19 study. University of Melbourne: Submission to the Resilience Commission
18	Imperial College London 2021. Submission to the COVID Recovery Commission
19	Future Health and King's Think Tank. Global Britain and Healthcare: Essay collection on delivering global leadership in health beyond the pandemic. DRAFT 11 May
20	RGHI Hygiene Behaviour is the Foundation of Biosecurity. Reform for Resilience - Evidence Paper May 2021.
21	Ginsborg, L., and Gori, P., 2021. Online platforms and the COVID-19 infodemic in the EU. STG Resilience Papers, European University Institute, Florence, Italy
22	Chang-Chuan Chan, Advisor of R4R, International Advisory Chair of APAC-Hub of R4R. 2021. G7 resolution on vaccine equity: A proposed by International Commission of Reforms for Resilience, R4R.BA

Annex 2: Call for Evidence Feb 2021

Call for Expert Evidence February 2021

Building on insights from the Commission's first summit and initial call for evidence, the Commission is seeking further expert evidence and insights to inform the following questions for our 2021 reports.

Defining Resilience for the Future

It is essential to ensure that a clear working definition of 'resilience' underpins all our work. The term is currently used in a multitude of ways. Taking a systems viewpoint, OECD defines *economic resilience* as the ability of a system to plan and prepare, absorb, adapt, and recover from **adverse events**²²². Similarly, the WHO defines *Health Resilience* as the process by which populations (individuals and communities) adapt in the face of adversity, trauma, tragedy, or threats; and the capacity of a system to forecast and anticipate **shocks** that bring about new challenges and opportunities, and to absorb, adapt, and transform when exposed to external threats, with the aim of recovery²²³.

However, these definitions are focused on understanding only the impact of systemic shocks. They do not explain the requisite foundations for how resilience is achieved. Resilience describes not only a key, often emergent, characteristic of a system, but also the process required to architect the origins of such resilience and their delivery over time. Robustness requires foresight, while adaptability and flexibility require planning and agility in response to change. Resilience is typically delivered in response to predefined expectations of performance and may have multiple, potentially conflicting, goals. Multi-objective resilience demands deep knowledge of a system, its components, and their interconnections, as well as clear articulation of what must be resilient to what over what timeframe, and a sense of the dynamic priority that might be ascribed to restoring conflicting performance measures.

The pandemic experience has shown that there are strong, dynamic relationships between multiple systems, including public health and health systems, life sciences and technology, the environment, and economic systems. Further, there are emerging insights that resilience during the pandemic reflects the extent to which an economy has invested in these elements as foundation systems over time. The Commission believes that the dynamic interplay between systems can be leveraged to create or improve resilience.

The Commission is therefore seeking expert advice and insights on the development of a broader definition which:

- Places Resilience within its broader system contexts;
- Synthesises and integrates systems evidence from before and during the current pandemic to identify inter relationships between systems;
- Creates a framework for future investments in resilience; and
- Develops models which can be used, for example, to model how the growth of an economy (or business) can improve the long-term resilience of its population (including its workforce).

Thematic Research Questions

In addition, the Commission is seeking expert advice and available research to inform three thematic areas.

Theme 1: Key Drivers of Resilience

The Commission proposes that innovative approaches to health economics are needed, acknowledging the intricate relationship between a population's health and the way it manages its economy. Both population and environmental health are fundamental requirements for economic health. Greater importance needs to be placed on population and environmental health as a structural driver of economic performance. It must be acknowledged that health systems are not simply a cost to economies, but an integral aspect of a nation's economic growth. Further there is a significant role for the life sciences sector and health technologies and their potential to contribute to resilience.

To this end, expert and research-based contributions are sought to respond to the following questions from an interdisciplinary perspective:

- *Current State:* Are there existing or emerging health-economic models which incorporate the concept of Health Resilience?
- *What is needed for the future?* Based on pandemic experience, how could existing government/treasury economic and financing models which inform policy be adapted or expanded to place greater emphasis on population health, life sciences and health technologies as key drivers of economic productivity and Health Resilience? How can health and economic data and analysis be better developed/used to properly value health, cost disease and track 'Health Resilience' overtime?

Theme 2: Resilience: Policy options and priorities

The Commission aims to make specific **policy recommendations** to enhance institutional commitments to resilience as a key to sustainable, more equal, and healthy growth. To this end, country case studies, formal research and expert insights and analysis are sought from before and during the pandemic, including policy development, implementation, and impact. In addition, the Commission seeks broader research and analysis about policies and business-academic-government approaches which improve resilience, which may include studies of public and private partnership mechanisms.

The Commission is *not* focusing on the state of pandemic preparedness and planning, which are the subject of other Commissions and inquiries. Rather, the Commission is focused on how broader models and policy foundations proved relevant, or not, to responses that maintain population and economic health during the pandemic. Key questions for research papers and case studies could include:

Forecasting:

- *Current State:* Were forecasting exercises and models sufficient to inform policy choices at the outset of the pandemic? Were population health factors/susceptibility (i.e., chronic disease, obesity, ageing population factors) anticipated as part of the forecasting exercise? Were health and economic forecasting linked in their approach? Was there adequate attention paid to the relationship between environment-animals-human health in forecasting models? Have businesses been engaged or consulted about health and/or economic forecasting?
- *What is needed for the future?* Are there additional forecasting approaches which should be considered across the long term? How can economics forecast benefit health forecasting? How could health and environmental forecasting approaches improve economic forecasting? How are these measures interrelated in dynamic,

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Healthy Growth

altered or 'shocked' systems?

Adapting and Transforming:

- *Current State:* In the face of the initial pandemic shock, what were the immediate health and economic policy options and choices? Were these sufficient? During subsequent waves of the pandemic, were there additional policy choices which needed to be made? What were these? Were there prior policy and governance foundations relevant to these initial and subsequent policy choices? What were these? What governance mechanisms were put in place? Did they include both health and economic policymakers? Did they include university or private sector actors? How were corporate actors and activities important?
- *What is needed for the future?* What are the short- and long-term policy lessons from the management of COVID-19? What is needed for the future? Are there additional policies and investment that would be beneficial for adaptation and transformation?

Foundations for Resilience:

- *Current State:* Was there evidence of longer-term strategy and investments (population health, health systems or other investments, for example, or investments in life sciences, or health technology) which became important to the ways in which countries adapted to the pandemic? How might these foundation elements be developed and costed into a Resilience model?
- *What is needed for the future?* What are the priority health, economic and environmental policies and investments needed for transformation and recovery? Focused on healthy growth, what population health policies and health systems policies and investments are needed to transform and recover sustainably and more fairly from the pandemic? Which are needed for the future? How can preventative strategies be better incorporated as a key aspect of resilience? Are there life science or health technology policies or investments, or partnership and collaboration models, which will benefit future resilience? How can environmental aspects including the impacts of climate change be better incorporated to improve resilience? How can government and corporate leadership be encouraged to focus on resilience?

Theme 3: Models, Indicators, Metrics

The Commission is seeking to identify and develop a **resilience model, indicators and/or index** to help drive cultural and policy change. As such we are seeking to identify key reporting processes, models, metrics and/or indices which can be established to monitor resilience for the long term. Expert contributions are therefore sought on the following questions:

- *Current State:* Which key and robust indices and measures would be best used to understand the dimensions of resilience? How are the indices in these models interrelated? Which are the best practice examples which place value on the health of a population? Are there robust indices or measures to assess population health susceptibilities, which integrate communicable and non-communicable diseases, including mental health, as well as address inequalities? With firms and industry sectors widely impacted by the pandemic, is there a different understanding of firms and industry sector activities and their roles in future resilience, based on pandemic experiences? Are there robust environmental measures or indices which can be used to identify environmental vulnerabilities which may affect outbreaks or pandemics? How are all these measures and indices interrelated? What are the data opportunities and challenges? Is there sufficient data? Could an Index be developed? How? Where are the best data investments?
- *What is needed for the future?* How can health economic models and metrics build in health and environmental dimensions, to generate an analysis of resilience for the long term?

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