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REVIEW ARTICLE

The UK's Response to the COVID 19 pandemic Part 3 – Lessons learned?

David Slater

School of Engineering, Cardiff University, Wales, UK

dslater@cardiff.ac.uk

ABSTRACT

There are crucially important lessons that can be learned from the UK's experience during the COVID-19 pandemic, but overall, the COVID-19 pandemic has highlighted the importance of being prepared, early intervention, clear communication, collaboration, equity, and the legitimate (truthful?) use of science to guide decision-making. So, this paper tries to understand the reasons for these revealed issues –

- Adequate Preparation
- Early Intervention
- Legitimate (truthful) use of the "Science" involved.
- Basis and quality of decisions taken.
- Perceived Equity and Trust
- Clear communication of messages

There seems to be an inevitable exponential progression of the impact of these successive factors. Apparent ignorance and inertia and the inability to grasp the scale of the projected health and economic impacts, seemed to lead to overcompensation and concern for political survival over societal safety. It's also clear that the deaths in Italy, Britain and USA were heavily impacted by how we care for the elderly, and how we failed to protect them in care and nursing homes.

The paper attempts to better understand the reasons for this escalation by examining in detail each of these issues, so it can be avoided in future.

It is not clear that we have either understood or are prepared to undertake to implement the changes needed and suggested by this and most other independent analyses. The paper discusses and makes recommendations on how some of the underlying issues might be addressed.

- Recommendation 1 - We should look again at the design, effectiveness, and interactions of traditional Government Structures – particularly in the NHS.
- Recommendation 2 – The UK Government needs to rethink the status, roles and responsibilities of "Special" Advisers (SPAD's) in managing independent advice to ministers.
- Recommendation 3 – As a basis for decisions and communication Governments need to be clearer about the difference between "Objective" and "Convenient" Truth.
- Recommendation 4 – We need the commitment of decision makers to accept responsibility for following, (or interpreting?), or not, (published?) advice.
- Recommendation 5 – The public needs best available information, and reasons for choice, not polarised opinions.
- Recommendation 6 – Governments should recognise, address and communicate the uncertainty, ambiguity, and complexity inherent in difficult decisions.
- Recommendation 7 – Governments should formally require a red teaming function in their planning and response organisations.
- Recommendation 8 – Governments should encourage a culture of challenge, and independent/ enlightened thinking.
- Recommendation 9 – In these kinds of pandemic challenges, Governments should adopt (sooner?) a more "military" versus "conventional / predictable" mindset / culture as they would in "wartime".
- Recommendation 10 – In these situations, Governments should consider a mandatory requirement for inclusivity, acceptability and competence in crisis management. (War cabinet?).

STUDY DESIGN

The objective of this review is to examine systematically, the issues revealed in the record of performance, particularly in the UK, by Governments in their response to the COVID 19 pandemic. The question then addressed is whether that reveals some important underlying themes inherent in the way Governments tend to operate these days. The approach adopted is to look at the context and record and identify revealed issues; and then to probe the more important, underlying ones in more depth, such as:-

- Why we were not prepared?
- The delays before decisive interventions.
- The seeming confusion about the underlying science
- Why there was not better use made of the science?
- Why there seemed to be a loss of trust in the decisions taken?
- And why was there not better communication of the issues?

But by far the most serious failure was in the initial response, both in its nature and speed. So, to try to tease out, identify and discuss the UK's record of response, this paper first sets out what is discernible from the plethora of media and public reports and then analyses the issues which probably resulted in this behaviour. It then goes on to discuss in more depth, some underlying sociotechnical themes which emerge and makes recommendations as to lessons that could have been and perhaps should now be, learned and applied, in the spirit of adaptation, not incrimination: useful lessons

that could be helpful in (inevitable?) future pandemics.

CONTEXT

Almost universally the UK's Initial response to the pandemic has been criticized for being slow and uncoordinated, for not imposing strict lockdown measures early enough, and for not providing adequate support to healthcare and other essential workers. As a result, in 2020, in the first wave of the pandemic, the country experienced [one of the highest rates of excess deaths in the world](#). Figure 1 reproduced from the BMJ in the middle of the first wave (15 May 2020)⁽¹⁾ gives an early view of the developing differences in the observed impacts in different countries, shows the UK did not cope well.⁽²⁾

There is also a question as to whether the reluctant, but draconian impositions of lockdowns really helped. Sweden, adopting the very British maxim of "keep calm and carry on"⁽³⁾, and the mutual trust between people and politicians, emerged with one of the lower European death tolls. In contrast, in the UK, the virologists and epidemiologists admitted that they did not consider the wider and social costs of suppression, which they advised will be "high".⁽⁴⁾ Subsequently, these problems in the UK were exacerbated as [decisions to enter lockdown had consistently come late, with the government failing to learn from past mistakes, or the experiences of other countries](#). There is still disappointingly, seemingly a lack of recognition of, or admission to these mistakes

in the UK, in contrast to Denmark where a Danish newspaper, the Ekstra Bladet (ref) admitted that it should have done more due diligence in examining the government's data and conclusions, before reporting them.⁽⁵⁾

[However, on other measures such as the speed of vaccine roll-out, the UK compares well.](#) It is thus important to note that the reasons behind the UK's high excess death rate during the COVID-19 pandemic are inevitably complex and multifactorial, and there is ongoing debate and analysis about the most significant contributing factors. This paper attempts to untangle these issues.

The Record – what was actually done.

As a first step, we can immediately highlight some of the factors that may have contributed to the UK's high excess death rate during the COVID-19 pandemic, including:

1. Timing: The UK was one of the first countries in Europe to experience a surge in COVID-19 cases, which meant that the healthcare system was initially overwhelmed and struggled to cope with the high demand for treatment. This may have contributed to a higher number of deaths in the early stages of the pandemic.
2. Population density: The UK is a densely populated country, with many people living in cities and urban areas. This may have made it more difficult to contain the spread of the virus and contributed to a higher number of cases and deaths. But it is interesting that the Netherlands, which is even more densely populated, the death rate was significantly less. (0.13% vs 0.18% of the population).

3. Age of population: The UK has an aging population, with a higher proportion of people over the age of 65 compared to other countries. Older people are at a higher risk of developing severe illness and dying from COVID-19, which may have contributed to the higher death rate. But, again in comparison, the Netherlands with similar age distributions (19% vs 20%) fared significantly better.

4. Preparedness: The UK government has been criticized for not being adequately prepared for the pandemic, including a lack of personal protective equipment (PPE) for healthcare workers and a shortage of testing capacity in the early stages of the outbreak.

5. Policy decisions: Some policy decisions made by the UK government during the pandemic have been criticized, including delays in implementing lockdown measures, inadequate support for businesses and individuals, and a lack of clarity in communication.

Finally, there is the question of the suitability of the decision makers that happened to be in post at the time. An insider's view of their competence is given in a recent book⁽⁶⁾ –

“By January 2020, Boris Johnson believed that with the crises of Brexit and the snap election behind him, it would be relatively plain sailing for the next five and more years. Instead, he ran headlong into the worst health crisis since the Spanish flu epidemic of 1918-19. He proved completely unsuited to the challenge that lay ahead. Few predecessors since Lloyd George would not have handled it better”.

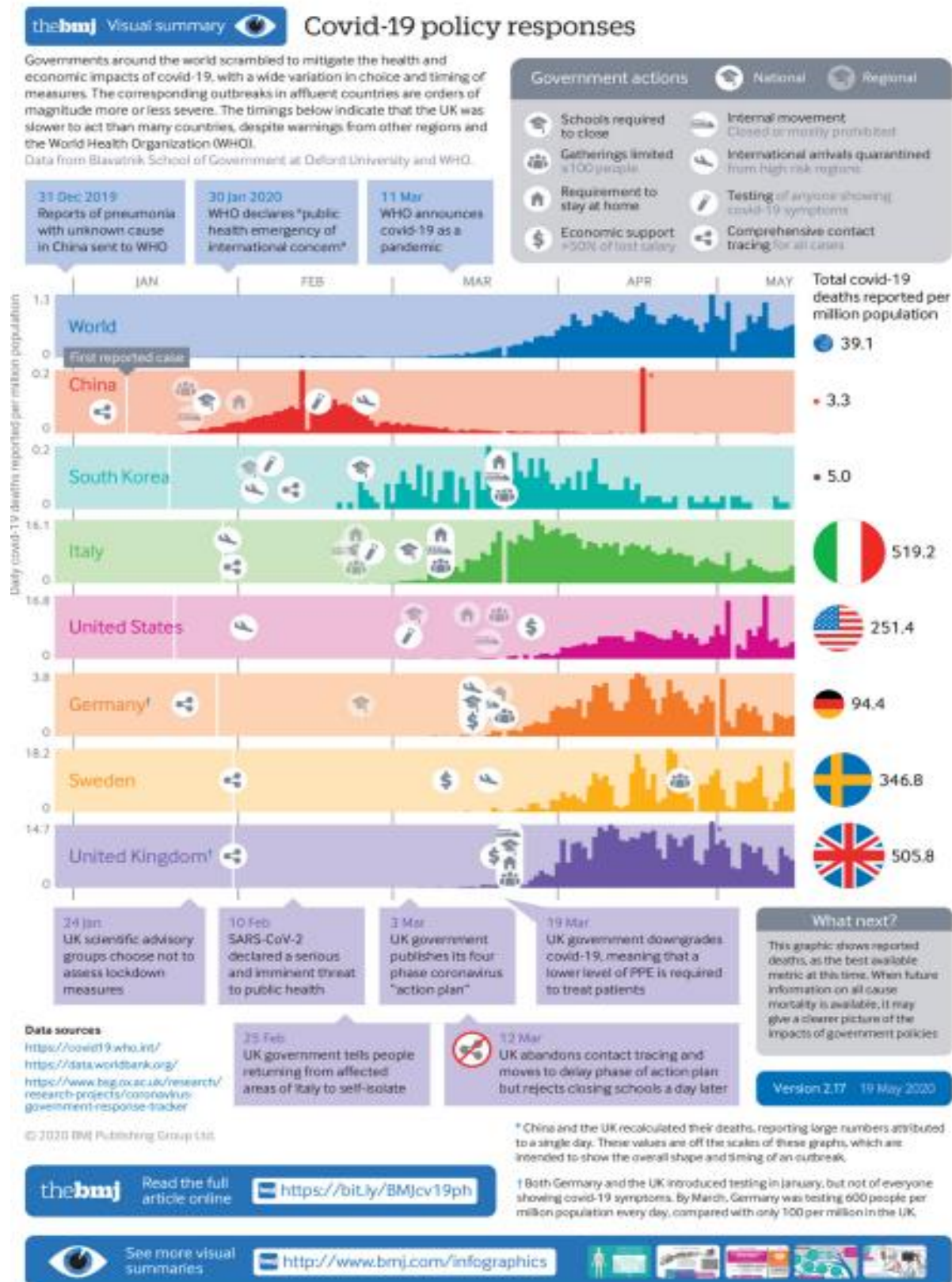


Figure 1 – A summary of the impact of the COVID 19 Pandemic in its early phases from the BMJ (1).

Public Inquiries and statements

The most common reaction to suggesting that we could learn valuable lessons now from the way the current pandemic has been handled, is to discourage the attempt as it is suggested that it can all be done more accurately and authoritatively after the inevitable Public Inquiry⁽⁷⁾.

Accordingly, the UK government announced the terms of reference for such a public inquiry into the handling of the COVID-19 pandemic on May 12, 2021,⁽⁸⁾ which unsurprisingly consists of four separate foci (or modules) of interest: preparedness, social impact, future strategies and lessons learned.

The Inquiry's investigation into the UK's pandemic preparedness has so far consisted only of preliminary hearings online. At these preliminary hearings, the Inquiry makes decisions about how investigations will run. The Inquiry does not hear evidence at these hearings. [Their public hearings will begin on Tuesday 13 June 2023 and conclude by Friday 20 July](#). This seems somewhat brief and at odds with the length of their private deliberations, which, on past records, will likely last for several years.

So, to date, some two years later, there have been no public hearings and on past form there is not likely to be a publicly available report for at least five years. By that time, the focus of attention could have been diverted by events, perhaps even by another pandemic, for which the lessons available to be learned here, probably could have been useful. But the final report is more likely to join the countless other inquiry reports gathering

dust in the extensive Whitehall archives, as apparently no particular Government Department has a specific duty to follow them up.⁽⁹⁾

An interim report by a Parliamentary Committee is however, illuminating in the questions it has raised, but not really have had answered.⁽¹⁰⁾ Their "Recommendations" are very perceptive. Each of the recommendations flags up an issue highlighted here and is examined further in the discussion. It is a very searching and perspicacious response, in contrast to the defensive and reluctant Government responses.

The Government's response to the committee,⁽¹¹⁾ as would be expected urges them to wait for fuller answers from the Public Inquiry. On the other hand, a more constructive approach, to answering these valid questions would be to review promptly all the publicly available records and reports, to capture and understand the work that was actually done. This would include normal activities, as well as positive adaptations to challenges and failures that may have occurred. Such an approach aimed at improving what worked, rather than blaming people for what went wrong, has the potential to contribute more successfully to controlling the consequences of the current crisis. Such an assessment produced days after the Grenfell fire can serve to show how little extra insight is achieved by all the pseudo legal evidence and adversarial posturing in a Public Inquiry actually adds.⁽¹²⁾

There were also controversial incidents involving the main actors in Whitehall, of

which the behaviour of the Prime Minister and his political adviser and the exposure of motivations and publicity purposes of the Testing program targets are prominent. Much has been written about these distractions so they will not be pursued here other than to interpret them as another sign that the management and organisation of the response could have been done better: and it shows just how difficult it was and what sacrifices were needed to adhere to the measures prescribed. The fact that this behaviour did not align with the public reassurances that our response capabilities “were world beating”; regularly uttered by the UK government spokespersons, especially about the NHS, for which understaffing, underfunding and over commitment was a regular theme during the winter years before the pandemic exploded. This is dealt with further, later in the discussion.

THE RESPONSE –

Were we prepared?

Those of us that have been associated with the scouting movement are very aware of Baden Powell’s motto – Be Prepared. The first question that arises is then - were we prepared, and why not? Certainly, coronavirus pandemics were high on the WHO’s list of concerns.⁽¹³⁾ But, to quote an early response in the BMJ⁽¹⁾

“The UK government and its advisers were confident that they were “well prepared” when covid-19 swept East Asia. The four-pronged plan of 3 March to contain, delay, research, and mitigate was supported by all

UK countries and backed, they claimed, by science.

1. With over 30 000 hospital and community deaths by 12 May, where did the plan go wrong?
2. What was the role of public health in the biggest public health crisis since the Spanish flu of 1918? And what now needs to be done?

What is clear is that the UK’s response has neither been well prepared nor remotely adequate.

The weakness of the preparations was exposed in 2016 by Exercise Cygnus, a pandemic simulation, and the necessary remedial steps were not taken.

On 30 January, the World Health Organization declared a public health emergency of international concern and governments were urged to prepare for global spread of covid-19 from East Asia. Detailed case studies followed showing the need for high levels of mechanical ventilation and to be prepared for high death rates.

But the UK ignored these warnings.”

A fuller account of the sequence of events and consequences is given as a timeline in a paper by Slater⁽¹⁴⁾ This fully endorses the Scally⁽¹⁾ comments quoted below.

“So, a picture starts to emerge that there are several reasons why the UK Government may have been unprepared for the COVID-19 pandemic:

1. Lack of pandemic preparedness planning: While the UK had a pandemic

preparedness plan in place, it had not been updated since 2011, and there were concerns about the adequacy of the plan in addressing a pandemic of this scale.

2. Underfunding of the healthcare system: Over the years, the UK's healthcare system has faced chronic underfunding, with reports suggesting that the system was already stretched and under-resourced before the pandemic hit.
3. Delayed response to the pandemic: The UK government's response to the pandemic was criticized for being slow, with some experts suggesting that earlier action could have mitigated the spread of the virus and reduced the number of deaths.
4. Shortages of personal protective equipment (PPE): The UK was initially unprepared for the high demand for PPE, with reports of shortages of essential equipment such as masks, gloves, and gowns.
5. Lack of testing capacity: The UK was slow to develop and roll out a comprehensive testing strategy, which hampered efforts to track and contain the spread of the virus”.

Digging deeper into these issues: -

Contributing factors

There were several factors that probably contributed to delays in the UK government's responses to the COVID-19 pandemic. Overall, the delay in responding and intervening was likely due to have been due to a combination of factors, including underestimation of the threat, communication issues, balancing public health and economic

considerations, and political factors, resulting in specifically,

1. Lack of preparedness: As noted above, the UK's pandemic preparedness plan had not been updated since 2011, and there were concerns about the adequacy of the plan in addressing a pandemic of this scale.
2. Underestimation of the threat: In the early stages of the pandemic, there was a perception that the virus was not as serious as it turned out to be. This may have led to a delay in the implementation of strict measures to contain the spread of the virus.
3. Communication issues: In the early stages of the pandemic, there were communication issues between the government and healthcare professionals, which may have delayed the response.
4. Balancing public health and economic considerations: There was a delicate balance between implementing strict measures to contain the virus and minimizing the impact on the economy. The government may have been reluctant to implement strict measures too quickly, for fear of damaging the economy.
5. Political factors: There were reports of tensions between government officials and public health experts, and some have suggested that political considerations may have unduly influenced the government's response to the pandemic.

The operative word here is unduly. There is no a priori reason why uncertain science should dictate responses. The uncertainties involved

mean that the accuracy of the predictions was inevitably not that good. The choice between being cautious, or taking the risk, has to be essentially political. (This point is further elaborated in the Discussion).

But there were other more fundamental factors that were inherent in the organisation of roles and responsibilities and the effectiveness of the management structures designed to respond to such a crisis. The response times and resilience, (adaptability) needed, seem not to be possible with traditional UK bureaucracies.

The PPE procurement scandal confirmed that such an urgent sourcing and contracting of suppliers in a very competitive world market is very open to abuse and hence subject to manipulation and shameless exploitation.

Perhaps even more importantly and urgently, Sir John Bell and Sir David King recently told the Independent – ⁽¹⁵⁾

“The [UK](#) is not ready for the next global [pandemic](#) because public services are being dismantled and key research is being defunded. More than three years [after the global outbreak](#) of coronavirus, the UK is no better prepared for a pandemic than it was in 2020.

Another epidemic on the scale of Covid-19 is inevitable, but disinvestment in infection-monitoring services, dismantling of key infrastructure, and the state of the NHS, mean the country is “losing ground”.

This prefaced a warning to *The Independent* that [a new Covid-19 variant](#) behind a surge of 10,000 new Covid cases a

day in India may turn more aggressive, and could become the dominant strain in the UK. The variant, first identified in January and known as Arcturus, has been found in 22 countries, including the UK and the US, and has prompted India [to resume its production of vaccines](#).

So, it seems that apparently not only that no lessons have been learned as yet, but that the situation is not likely to change even after a Public Inquiry will have identified, belatedly, the same issues.

INTERVENTION

Organisation Practicalities

A report by the Institute for Government,^(16,17) makes some interesting points.

- It suggests that the UK government's initial response to the Covid-19 crisis was hampered by the absence of a long-term strategy, lack of clarity about who was responsible for what and its poor use of evidence.
- It recommends that the government should clearly identify the responsibilities of different departments and agencies where those responsibilities overlap. For example, Government decisions were influenced too much by concerns over NHS capacity rather than by controlling the spread of the virus.
- The government did not think about some of the most important aspects of how it would implement its policies until after it had announced them, leaving many public services, in particular schools and the police, playing catch up.

- On Covid Testing, in making his commitment to hit 100,000 tests a day, the health secretary did not give enough thought to what the target – set without input from local public health officials, the diagnostics industry or the testing co-ordinator – was intended to achieve and how. This meant the target became a distraction from equally important matters like making it easier for NHS staff to access testing.

Slater, using a model based systemic analysis⁽¹⁴⁾ has found the same flaws in the design and operation, (or lack of coordination) in the way the different Whitehall silos were organised; and shown that it did not facilitate the efficient operation of the UK Government structures needed. It did not enable the system to learn and adapt quickly in response to unexpected events and showed no signs of being able to anticipate events and outcomes by being proactive, rather than reactive at any time. In fact, the most successful intervention, vaccines, was an opportunistic recognition and co-opting (against the instincts of the incumbents) of an ongoing academic / pharmaceutical initiative that was capable of anticipating developments.

Pt 1 and Pt 2 of this study, analysed in detail the problems encountered with the way the response was organised and managed and made a series of preliminary recommendations which are just as valid in hindsight.

A similar approach again has helped identify the reasons for the more successful South Korean response to this and earlier coronavirus pandemics,⁽¹⁸⁾

Using similar methods for modelling the behaviour of the complex sociotechnical systems involved, the main reason for the collapse of the Brazilian Health response, other than a refusal by the then President to admit that the pandemic was a problem, was similarly identified, as a lack of resilience due to political constraints.⁽¹⁹⁾ [Another study by the University of Sao Paulo and the human rights group Conectas even called its handling an "institutional strategy to spread the coronavirus in the country."](#)⁽²⁰⁾

But seemingly the UK's organisations also lacked the ability to preplan, or to take the planning seriously. Although the military knows well that "Plans" don't survive first contact with the enemy, there is no excuse for not being as prepared as possible. The process of planning involves a thorough review of all the issues and is often, as important as the plan itself.

A recent study of organisational drift⁽²¹⁾ questions the basis of the design of large organisations (Especially Government). The tragedies of unnecessary care home deaths and the shambles of the test and trace program, illustrate the pitfalls precisely.

This is underlined by the contrasting success of the vaccination program, which was largely private sector based and led.⁽²²⁾

SCIENTIFIC TRUTH AND PERCEPTION

To quote May⁽³⁹⁾ – "Much, perhaps most, of scientific advice to government policy makers is routine, based on well explored areas of science. When this happens, public

expectations – “tell us the facts” – can be fulfilled. To the contrary, there are many topics of concern, both currently and in the recent past, which lie in areas where there is still significant uncertainty. When this happens, it is essential to understand and acknowledge, that science is as much a way of asking illuminating, testing questions, as it is a collection of tidy and certain answers”.

The government needed to be clearer about the role of science advice and its limitations, set out above; particularly in the early stages of the crisis when it looked to its scientists to generate policy, not just advise on it. When making decisions on lockdown, ministers relied too much on an illusion that “following the science” would conveniently provide all the answers.

The UK's response to covid-19 was centrally coordinated through a series of scientific advisory groups. The Scientific Advisory Group for Emergencies (SAGE) (a group of scientific experts) advises the UK government during emergencies. During the COVID-19 pandemic, SAGE played a key role in “advising” the UK government on its response to the pandemic. Critical to this was the Scientific Pandemic Influenza Group on Modelling (SPI-M), which modelled the future epidemic and fed the results into SAGE. SPI-M and SAGE were dominated by modellers and epidemiologists.

SAGE was chaired by the UK government's Chief Scientific Adviser, and its membership included experts from a range of scientific disciplines, including epidemiology, virology,

public health, behavioural science, and mathematical modelling. The membership of SAGE during the COVID-19 pandemic was expanded to include additional experts in relevant fields, as well as representatives from the devolved administrations of Scotland, Wales, and Northern Ireland.

The function of SAGE during the COVID-19 pandemic was to provide scientific advice to the UK government on issues such as the transmission of the virus, the impact of interventions such as social distancing and lockdowns, and the development and deployment of vaccines. SAGE met regularly throughout the pandemic and produced a series of reports and recommendations, which were used by the UK government to inform its policies and decision-making.

SAGE's advice was advertised as based on the best available scientific evidence, but there were concerns about the transparency and openness of the group's proceedings. None of the members were experts in developing and implementing a public health response, and other relevant groups such as communicable disease experts, women, and ethnic minorities were under-represented.

The Guardian⁽⁴⁰⁾ revealed that several SAGE meetings had been attended by Dominic Cummings, the prime minister's chief political adviser, and Ben Warner, his adviser on data science. It claimed that the involvement of two influential political advisers made a mockery of SAGE's claim to provide independent scientific advice to the government. To date, we do not even know

the details of that advice. Such is the furore about SAGE's composition and operations, that Sir David King, the UK's former chief scientific adviser, established an alternative "Independent SAGE" with a diverse membership including from public health, which advised publicly on the UK's response.

These doubts about the scientific advice that the Government claimed to be following, were not helpful in establishing the trust with the Public, that in a democracy, is essential to buy into draconian measures, such as the lockdowns that were deemed necessary.

Such trust was further undermined by a series of cases where the official "scientific" explanations, clearly did not stack up. Several of these cases are highlighted below.

Examples of Abuse of the "Science"

The origin of the virus -

There is a paper published in Nature Medicine on March 17, 2020, titled "The proximal origin of SARS-CoV-2" by Kristian G. Andersen, Andrew Rambaut, W. Ian Lipkin, Edward C. Holmes & Robert F. Garry.⁽⁴¹⁾ The paper discusses the origin of SARS-CoV-2 and offers a perspective on the notable features of its genome and scenarios by which they could have arisen. Their analyses purport to show that SARS-CoV-2 cannot be a laboratory construct or a purposefully manipulated virus. There is also a letter published in The Lancet in February 2020⁽⁴²⁾, that dismissed the lab leak hypothesis as a conspiracy theory. In it Daszak and his fellow scientists, join in condemning Wuhan lab 'conspiracy theories'.

The hypothesis that SARS-CoV-2 may have originated in a laboratory was thus publicly considered a debunked conspiracy theory by leading scientists. However lately, some other experts are now revisiting these claims amid calls for a new, more thorough investigation. Paul Thacker⁽⁴³⁾ explains the dramatic U turn and the role of contemporary science journalism in propagating premature opinions. As the news media scramble to correct and reflect on what went wrong with nearly a year of reporting, the episode has also highlighted quality control issues at the ubiquitous "fact checking" services.

Prominent outlets such as PolitiFact and FactCheck.org have added editor's notes to pieces that previously "debunked" the idea that the virus was created in a laboratory or could have been bioengineered—softening their position to one of an open question that is "in dispute." For almost a year Facebook sought to control misinformation by banning stories suggesting that the coronavirus was man made. After this renewed interest in the virus's origin, Facebook has lifted the ban.

So here was a question of origin, on which there was no clear evidence of a natural infection chain of evidence, showing unambiguously the source: although admittedly there have been similar previously proven pathways to other coronavirus interspecies transmissions. On the other hand, leaks from laboratories handling pathogens are well known and documented and the circumstantial evidence including location, opportunity and timing is strong. For experienced accident investigators, Occam's

razor would point to a lab leak, and that has been a view shared by the author from the start. But for pure virologists, the correct answer surely should have been - “unproven” and should have demonstrated on the record, an open mind and a “scientific” approach. So why would 21 respected scientists go out of their way to maintain categorically that a lab leak was out of the question? Here most independents would assume that it has more to do with politics than science and does not reflect well on the credibility of scientists in general.

The effectiveness of Masks

The controversy over the effectiveness of masks in avoiding coronavirus infection stems from conflicting information and opinions on their usefulness. [Some studies have shown that masks can help reduce the spread of the virus, while others have found little to no evidence that masking at the population level, reduced COVID infections.](#) This has led to numerous debates and disagreements over mask-wearing policies and recommendations.⁽⁴⁴⁾

For example, Dutch Virologists say that the masks used by the general public do not really do anything physical/medical (even if they are worn correctly). But they do have the useful, mainly psychological effect of reminding people to behave responsibly. So perhaps, the feeling of being protected by the masks (your own and the others) is a socially positive il(de)lusion.

But for scientists, there can be no debate. If in doubt measure it. Such experimental studies are behind the design and insistence on PPE

masks for clinical situations, where not to wear one can be considered irresponsible, perhaps criminal. Whereas social scientists, using generic statistics and data from mass samples, can draw many erroneous conclusions if they don't have control of exposure conditions. A classic example is the life expectancy data from Norway, before, after and during the Nazi occupation. It actually went up during the occupation; but the result had more to do with decreased consumption of high cholesterol foods, than the casualties of war.

The goal of “Herd immunity”

In the early stages of the coronavirus pandemic, there were claims that the UK government pursued a herd immunity policy. However, this has been denied by government officials. Herd immunity is a scientific term describing the point at which a population is protected from a disease, either by enough people being vaccinated or by people having developed antibodies by having the disease.

However, the idea that this could be the government's response to Covid-19 was attributed to the Chief Scientific Advisor and has been heavily criticized in a report by MPs.⁽⁴⁵⁾ It says the government initially sought to “manage, not suppress, infection”. The report says this amounted to “herd immunity by infection” and was the wrong policy. To avoid this, the first lockdown (announced on 23 March 2020) should have been brought in earlier to save lives.

The rationale of deliberately sacrificing the most vulnerable to speed up a natural

evolutionary end point to the pandemic (the survival of the fittest), may have made pragmatic sense, but was quickly disavowed as official policy. Here they could say that perhaps they attempted to “follow the science”, but neglected to include the consideration of the human cost of the consequences of such a scientific solution?

Testing

Throughout the coronavirus (COVID-19) pandemic, the UK government has maintained it has prioritized protecting the most vulnerable and those in high-risk settings. Government-funded testing ostensibly has focused on these groups. However, there have been criticisms of the government's testing program. For example, a report by MPs stated that the Test & Trace program failed to deliver its central promise of averting lockdowns.

Due to the pressures involved in trying to reinstate the necessary facilities, that preplanning should have delivered, testing capacity, as PPE provision, was left to an inexperienced and flawed procurement program. So inevitably, there were scandals. For example, at least one brand new laboratory with no track record, or evidence of competence, was commissioned and inevitably produced incorrect and exacerbating results. There were also failures to adopt, and roll out, complementary mobile phone tracking initiatives.

The effectiveness and timing of the UK's Test and Trace program has thus been a topic of much debate. A report by the National Audit

Office examined the performance and effectiveness of test and trace services and the main criticism has been inevitably too little, too late, at unimaginable cost!⁽⁴⁶⁾

One is left with the impression that credibility and trust was sacrificed to be able to present decision makers and the public, the necessary underpinning “scientific” data to guide policy. But in some cases, this was less than satisfactory both in quality and quantity and certainly not value for money!

Modelling Statistical average versus focussed Risk

Epidemiologists use average statistics to estimate the average risks and effects of pandemics on populations. This approach provides a broad understanding of the overall impact of a pandemic and helps inform public health policies and interventions. However, an individual risk approach that takes into account specific factors such as age, underlying health conditions, and lifestyle could provide more personalized information about an individual's risk of infection and illness. This approach could potentially have helped individuals make more informed decisions about their own health and behaviour during a pandemic. However, implementing such an approach on a large scale would be challenging due to the need for detailed information about individuals and the resources required to analyze and communicate this information. The NHS on the other hand has now available, probably one of the most extensive databases on individual health records in the world. Perhaps

for the next pandemic, a more focussed approach could be possible.

Public response nudging?

England's chief medical officer Chris Whitty mentioned the idea of "behavioural fatigue" in a briefing on March 9, 2020. He said that "It is not just a matter of what you do but when you do it. Anything we do, we have got to be able to sustain. Once we have started these things, we have to continue them through the peak, and there is a risk that, if we go too early, people will understandably get fatigued, and it will be difficult to sustain this over time". However, it is unclear whether this idea was based on sound scientific studies, or if it was just an opinion. In the event, the British public showed much more discipline and behaved more responsibly and for longer than expected. Nevertheless, there is no doubting that one needs ways of encouraging / motivating the continued maintenance of harsh measures (such as lockdowns) for extended periods of time, for people confined to their houses and people not being able to attend to dying relatives.

DECISION MAKING

- the Politics.

The Institute for Government report also urges the Government to develop and decide its strategy before setting targets that will be hard to resile from. It also points out that [waiting for certainty from SAGE, itself struggling to get timely data, deferred and delayed important and needed decisions on lockdown. The lesson here should be to use](#)

scientific advice to inform rather than determine policy.⁽²³⁾

Ale et al in a series of papers,⁽²⁴⁻³²⁾ discuss the issues, problems ethics and challenges that governments face in making decisions involving levels of "risk" that people exposed to hazards, ranging from industry to pandemics, should face. For most politicians it boils down to balancing the costs involved against the expected benefits (economically, or politically) and the attractions / implications of doing nothing. Reducing it to economics, i.e., cost benefit analysis (CBA), then highlights the dilemma of whether the risks and benefits are to individuals (Deontological), or more broadly spread amongst populations, or communities (Utilitarian or "greater good"). In health cases such as pandemics, it is particularly difficult as the primary carers are bound by the Hippocratic Oath of a commitment to an individual's well-being. In these situations, governments are inevitably utilitarian in their approach and the impact advice from healthcare monitoring and epidemiological reports is therefore based on broad statistical assumptions. (R numbers, Fatality rates, etc.). While convenient, these broad-brush approaches overlook (deliberately?), some of the more difficult issues a balanced risk impact assessment should include. We are each of us, individuals, not averages. There is a finer and very important structure to the impact depending on age, social grouping, ethnicity etc. and an even finer resolution to individual genetic variabilities and hence vulnerabilities.

If you add to this the need to admit the uncertainties and confidence in assumption validities inherent in the assessment and interpretation of risks, the level of sophistication in the data produced and utilised in the decision making smacked of “keep it simple ----”. Much of the “antivax” fake news was therefore fuelled by unacknowledged impacts, side effects and many of the excess deaths in care homes stemmed from failure to weigh the benefits of identifying, protecting and ringfencing the most vulnerable.

But most damning of all seemed to be the reluctance to accept the magnitude of the potential consequences until forced to, as with the leaked Imperial College impact assessment.⁽³³⁾

It seems that politicians ought to be given a basic education on Risk, how to expect the unexpected and to deal with the improbable as a possibility, not a convenient boundary of knowledge.⁽³⁴⁻³⁶⁾

Sherlock Holmes said that:

“Once you eliminate the impossible, whatever remains, no matter how improbable, must be the truth.”

This statement is applicable to forecasting because it is important to understand that improbability does not imply impossibility. Most scenarios about the future consider an expected or probable future and then move on to include other possible futures. But unless improbable futures are also considered, significant opportunities or vulnerabilities will remain unseen. A classic

case is seen in the recent belated resolve to tackle risks from asteroid impacts.⁽³⁷⁾

But when making decisions on lockdown, the report finds, ministers relied too much on an illusion that “following the science” would provide the answers. Waiting for certainty from SAGE, itself struggling to get timely data, inevitably deferred decisions on lockdown.

But there can be no excuse for treating this risk as a Black Swan⁽³⁸⁾. There had been two previous coronavirus pandemics before the COVID-19 pandemic: Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS).

1. SARS: The SARS outbreak began in China in 2002 and quickly spread to other countries, causing more than 8,000 cases and nearly 800 deaths worldwide. SARS is caused by a coronavirus known as SARS-CoV.
2. MERS: The MERS outbreak began in Saudi Arabia in 2012 and has since spread to other countries in the Middle East, Asia, and Europe, causing over 2,000 cases and nearly 900 deaths. MERS is caused by a coronavirus known as MERS-CoV.

It's important to note that SARS, MERS, and COVID-19 are all caused by coronaviruses, they differ only in terms of their transmission, symptoms, and mortality rates. Nevertheless, COVID-19 has been more contagious and has caused more deaths than either SARS or MERS.

In addition to SARS and MERS, there have been other coronavirus outbreaks in recent history, including the H1N1 swine flu

pandemic in 2009, which was caused by a type A influenza virus that also contained genetic material from pig and bird flu viruses. The H1N1 pandemic caused more than 18,000 deaths worldwide.

Some have estimated that far from being inconceivable, this kind of pandemic may be expected every ten years or so.⁽³²⁾

So surely the Government must have been well aware of the risk, but it doesn't seem to have been communicated properly, or the decision makers failed to understand its significance.

In the end the final policy choice is a political negotiation between the interests and stakeholders concerned, but it requires a common and realistic view of the different issues involved. This often needs to be reduced to quantitative estimates of both the costs and the benefits implied. Needless to say, all sides have to accept the principles and methods employed. Thus, the economics, ethics and science postulated, need to be demonstrated as sound to all parties.

Politicians often claim to follow the science, but that is a misleading oversimplification. It is often a convenient way of avoiding responsibility. But it is also a dangerous approach: it politicizes science and the scientists, undermines the trust in science and this will have future negative implications for us, when science is needed next.

Science is rarely absolute. It rarely applies to every setting or every population. It doesn't make sense to slavishly follow science, or evidence. A better approach for politicians,

the publicly appointed decision makers, is to be informed and guided by science when they decide policy for their public. But even that approach retains public and professional trust only if the "science" is available for scrutiny and free of political interference, and if the system is transparent and not compromised by conflicts of interest.

COMMUNICATION

The Psychology

The above examples then had the inevitable impact of loss of Trust, in the by and large trusting and remarkably well-behaved public. The importance of trust to the success of the outcomes seemingly cannot be exaggerated. If it becomes apparent that the measures imposed and / or the scientific underpinning prove to be wrong, that will make the handling of these issues in future crises, much more difficult.⁽⁴⁷⁾

To this litany of lapses, one should now add the form and format of how the messages and policies were communicated. Using the appearance of inhouse scientific officers to put over necessarily political messages seemed to have added an extra layer of subterfuge.

There is a quote by Lewis Carroll in his book "Through the Looking Glass". It goes - "When I use a word,' Humpty Dumpty said in rather a scornful tone, 'it means just what I choose it to mean — neither more nor less.'

'The question is,' said Alice, 'whether you can make words mean so many different things.'

Despite illusions to the contrary, in a national crisis, words are important and not just campaigning slogans. Trust is essential to delivering consensus, democratic decisions, and communications need to have consistency and clarity of meaning in their message.

Transparency and accountability meant to establish this "Trust", depended on the decision makers demonstrably utilising the "facts" (following the "Science") to inform, justify and underpin their actions taken in response.

It is clear that in the latter stages of the pandemic, that trust was lost.

This disillusionment with the truthfulness of government communications seemed to accelerate a process, begun with the barely concealed untruths of the Brexit campaign and the use of social media to try and influence political outcomes, to more full-blown anti vaccination and anti-lockdown campaigns on social media. It became difficult to distinguish Fake news from True information, as objective truth had become blatantly inconvenient for some agendas.

Clumsy and contradictory abuse of power

There is evidence that suggests that the flouting of lockdown rules by senior government officials and ministers had a similar negative effect on the UK population's willingness to "trust". [For example, a study by University College London^{\(48\)} found that there was a clear and lasting "Cummings effect" on public confidence in the government's handling of coronavirus after Dominic](#)

[Cummings, a senior aide to the British prime minister, appeared to break lockdown rules. This event prompted media condemnation and many scientists spoke out about the effect of Cummings' actions and the UK Government's defence of Cummings in undermining essential public health messaging.](#)

But perhaps what was most damaging, was the impression given by the numerous reports of parties and drinking in Downing Street, underlining the feeling that there was one law for the population, but it did not necessarily apply to the lawmakers. There is also the impression that could be given, that the risks were not really as serious as Government wanted the population to believe, to ensure acquiescence (if people who know do not care.....!).

Self-justifying PR and reckless behaviour thus again have damaged possibly irrevocably in the short term, the public's trust.

DISCUSSION - POSSIBLE SOLUTIONS?

Design of Organisations –

A study of some 40 recent high profile organisational failures⁽⁴⁹⁾ has highlighted that the traditional structures of governmental and public sector institutions do not necessarily lend themselves to ensuring effective and rapid responses. This has enabled the identification and correlation of the factors proposed as influential in these organisational failures by different authors to be evaluated.⁽⁵⁰⁻⁵²⁾

The analysis found that there were only really two types of structures involved. These are

Feudal and Pseudo Feudal (i.e., Civil Service Departments) and Corporate and Pseudo corporate (i.e., Government Agencies).

The second point noted was that almost all the organisations studied here had the classic 3-layer structure typified by the NASA organisation. (Figure 2)

These are multi (- typically three) layer "Peter" pyramids,⁽⁵³⁾ consisting typically, of Micro (coal face), Meso (management level) and Macro (Executive oversight) layers respectively.

This structure has a number of drawbacks

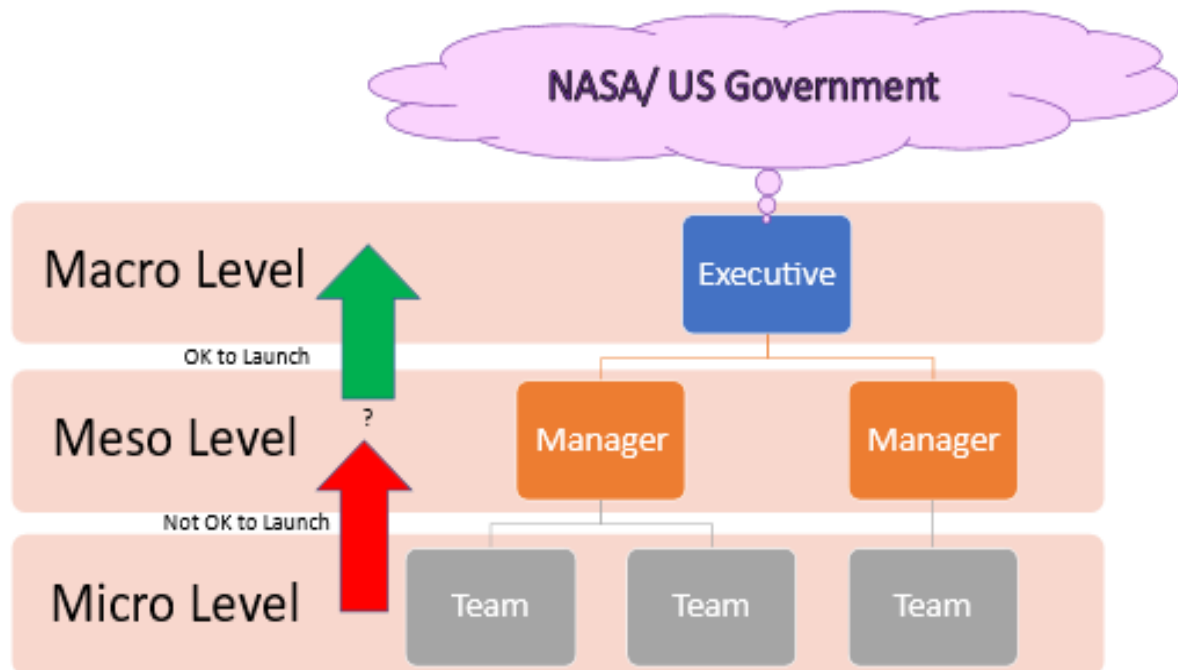


Figure 2. NASA 3-layer structure for the: Go No go Decision to launch Challenger.

To operate as a "Highly Reliable Organisation"⁽⁵⁰⁾, an organisation needs to empower and trust its expert and adaptable teams to ensure continuing successful operations. However, as Hopkins⁽⁵¹⁾ points out, in some of the accidents it is clear that the organisation needed a more centralised control over what was happening. So, there are clear examples of tensions which need to be recognised and reconciled in designing the shape of organisation best suited to that application. The study found that the

underlying "causes", seem to fall into three broad categories.

1. Where the lack of centralisation, control and management awareness was an issue
2. Where over centralisation caused an insensitivity in the meso layer, whether by culture, inertia, or conflicted demands from above and below, and
3. Where an organisation was apparently deliberately designed to provide insulation, or plausible deniability for the "controlling minds"⁽⁴⁹⁾

From this study, the dominant characteristic of the majority of incidents, (some 80%), lies in category 2 – they were due to the behaviour of the meso or “clay” layer.

Inspection also suggests that in some 10% of these cases, (primarily in the public sector), it could be thought of as by deliberate design. All three of these issues were apparent in the organisations put together to respond to the pandemic. It seems that the analysis applies particularly to the way the Government organised itself to respond to the pandemic, into a collection of multi-layered silos, over which centralised control was difficult. But it is hard to dismiss the idea that the organisation was designed deliberately to provide the insulation, and plausible deniability which are such valuable attributes to fragile political decision makers.

Recommendation 1 - We should look again at the design, effectiveness, and interactions of traditional Government Structures – particularly the NHS.

Independence of advice –

In recent years this civil service ethic and responsibility has become filtered and attenuated through the rise and rise of Special Advisers, whose role is to enhance political objectives rather than ensuring ethics and responsibilities and niceties are observed. (Stanley- Truth to Power⁽⁵⁴⁾ to advise civil servants on how to advise ministers.)

A previous Chief Scientist⁽³⁹⁾ commissioned the writing of very relevant Guidelines for providing advice – ⁽⁵⁵⁾, which should apply

both to political advisers and career civil servants as well as scientists as advised in “Science in a politicised world”.⁽⁵⁶⁾

Recommendation 2 – Rethink the status, roles and responsibilities of “Special” Advisers (SPAD’s) in managing independent advice to ministers

What is truth – the politicisation of science?

Firstly, what is science?

To quote Robert May again⁽³⁹⁾– “Real progress in understanding how the natural world works, only truly began with the enlightenment, with its guiding principle that the truth is to be found, not by appeal to authority, but by experimental tests and evidence. --- In fact, science (including social sciences, engineering, and medicine along with the more narrowly defined physical and biological sciences), is better seen as organised scepticism: a journey, over time, toward contingent understanding guided by experimental tests and sceptical questioning, --- beset by uncertainties of various kinds.”

The important caveat here, is “contingent” understanding. Today’s questions involve the behaviour of evermore complex systems, to which human involvement adds additional sociotechnical complexity. As Russel Ackoff points out⁽⁵⁷⁾, simplifying systems by studying individual components (as in traditional scientific and engineering approaches), gives you knowledge, but not necessarily an understanding of how the system works. The results of the quantification of science results (“Facts”) are fundamental, but understanding their effects on system behaviours, is not

automatic. This is particularly important in communicating the ideas of social sciences, which are generally quantified as thoughts, beliefs and interpretations of experiments, rather than facts. The facts are true, with their understanding contingent on any number of caveats.

And Truth?

This idea of "Objective" truth has been challenged by the idea that the "reality" we experience as individuals, is a fusion of the information transmitted to our brains by our senses.⁽⁵⁸⁾ This is a perceived reality and hence just as this perceived reality, is our reality, "perceived" truth is our individual truth and so is our perception of truth. So, interpretations of situations and understandings of implications are a matter of opinion? My truth is as equally valid as yours!

This might be fine for political debates, but for life and death decisions in emergencies, it is not helpful. The speed of light seems to be constant and can't be negotiated no matter how relative your position. You can't vote for the direction of entropy; the laws of thermodynamics cannot be unilaterally defied. The addition of 2 plus 2, seems to be 4, regardless of colour, class, race, or creed.

In serious, grown-up situations requiring responsible responses, we need to make clear the objective validity of the advice and the basis and inherent uncertainties implied. Blatant politicisation of either science, or truth should not be tolerated.

But this is to directly challenge the advocates of "post-modern" science, who have done a

great deal of work in recent times, to argue conveniently that "opinions" should be as equally valid as "facts"; to the extent that fact-free policies are now more easily justified, and so preferred, over policies which accept the facts as a given, (regardless of whether you let the facts determine your decisions or not).

Recommendation 3 – As a basis for decisions and communication we need to be clearer about the difference between "Objective" and "Convenient" Truths

Transparency of communication of evidence (facts)

Hiding behind "following the science" is an attractive haven for decision makers in difficult situations. But was that science disclosed (published)? Having established the truth and best available scientific advice, then that should not be used as cover for actions which are clearly not guided by the science; and solely as a means to avoid personal responsibility for the decisions (plausible deniability).

Recommendation 4 – Education of decision makers to accept responsibility for following, (or interpreting?), or not, (published?) advice.

Adversarial debate

This goes to the nub of the Select Committees concerns about the Transparency and Independence of advice on communication and use of science⁽¹⁰⁾. We are currently experiencing increasing pressure to demonstrate "balance" in our discourses and debates. Lord Reith⁽⁵⁹⁾ would be disturbed by current BBC guidelines which seem to require

seeking out opposite opinions to provide a balanced presentation of issues no matter how valid or indefensible the opposing positions. This adversarial, (pseudo legal?) debate allows protagonists to score points and supposedly is “fair and balanced” in that it allows observers (consumers) to draw their own conclusions. This naively (or deliberately?) ignores the well-established artifice of salesmen, criminals and politicians to subtly and psychologically influence their targets to fit their own convenient versions of the truth. But in the real world, if we are arguing about whether or not it's raining, it only requires going outside and observing and reporting back on whether we had got wet, (objectively). Listening to somebody trying to “balance” our perception that it is some form of illusion, may be an interesting debate but does not alter the observed facts!? Recently the obituary of a politician praised his towering intellect and insights, but in the next sentence reminds us that he was a vociferous climate change denier. It would seem that rationality is not an admired trait and in the political context, opinions coloured by vested interests are as valid and acceptable as “science” (the world is warming!). As Al Gore reminded us,⁽⁶⁰⁾ it (Science) is often an inconvenient truth.

Recommendation 5 – The public needs best available information, and reasons for choice, not polarised opinions.

Risk literacy and decision making –

It is also quite clear that our scientific and political establishments in the UK, have difficulty dealing with complexity and

uncertainty. We have a long and distinguished record in the UK of developing approaches and applications for assessing and managing risks in complicated engineering systems, from aviation to nuclear power plants. But most of these traditional approaches are focussed on breaking down complex systems into components and identifying possible failures and their consequences. These vulnerable components are then reinforced, or additional components (barriers) added to ensure reliability. Unfortunately, current systems are becoming more and more complex and increasingly include human and now AI “components”. The engineering and process diagrams that are essential and vital to showing how these components are organised and meant to perform, can only confirm predetermined and linearly sequenced and coupled design intent. The behaviour of these systems, however, is not as simple as the sum of their individual component properties. System behaviour is determined by how these interdependent components interact, with each other and the real-world environment in which they operate. Nonlinear behaviours and complex feedback have long been well known in engineering⁽⁶¹⁻⁶³⁾. But with the increasing reliance on AI, even these conventional engineering specifications become more obscure and opaque to the people who actually have to make these systems work safely. Similarly, a pandemic qualifies as complex, and the behaviour of the “system” does not necessarily obey simple predetermined rules and laws. In these complex sociotechnical systems, we must have ways of imagining the unimaginable and

expecting the unexpected if we are to try and contain let alone manage it. Our current thinking, our designs and institutions need to evolve to take on board the implications of this new complexity and uncertainty. There is

a new initiative by the Royal Academy of Engineering to address these issues,⁽⁶⁴⁾; it is to be hoped they have taken these lessons on board.

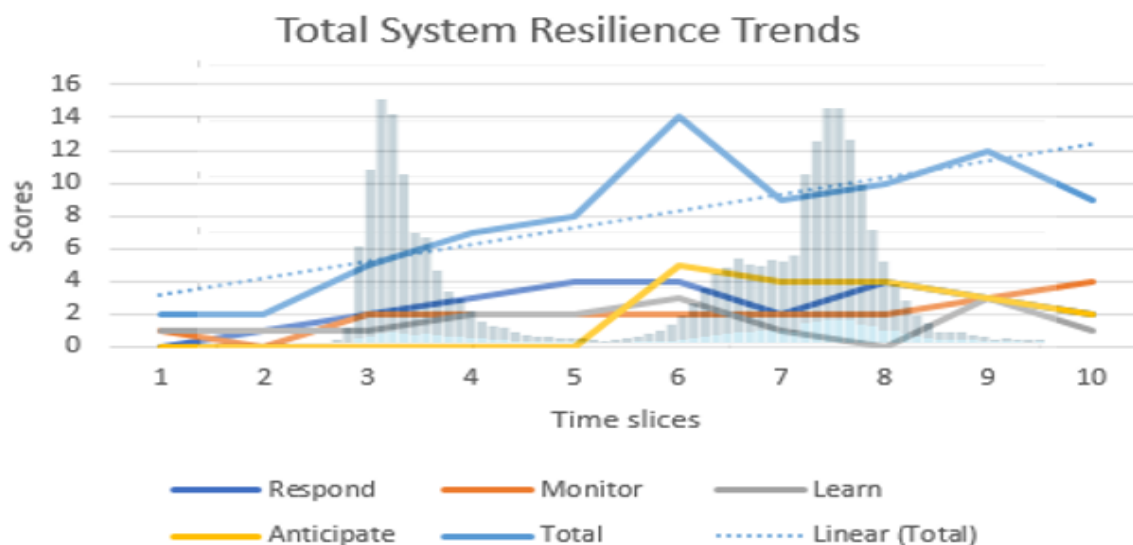


Figure 3 – Resilience analysis of the UK's response from Slater (Pt 2)

Recommendation 6 – Government should recognise, address and communicate uncertainty, ambiguity, and complexity in decisions.

Resilience, red teaming and adaptability

One of the key points from an early analysis of how the UK system coped,⁽¹⁴⁾ showed clearly the lack of resilience in its response and how slowly the system learned and adapted. This is illustrated in Figure 3 above from that report. But perhaps the most disappointing aspect, was the seeming inability to recognise and adapt to significant trends and their implications (Virus mutations are a classic example). This would have allowed focus on emerging behaviours and vulnerabilities to

continuously update policy and actions to pre-empt rather than just respond to real life experiences.

Epidemiologists predict and deal with statistical averages in their modelling and consequence expectations. Perhaps that is the reason they seemed to ignore a response focused on protecting the most vulnerable and likely to die, rather than measures which treated everybody as "average". Again, when doing risk analyses of vulnerable infrastructure, barriers to counter the normal expected "failures" are often considered sufficient, whereas more malicious threats, or adversarial (competitive) interventions, both internal and externally initiated, are rarely

included / considered. Similarly, with these “enemy” viruses, we should expect similarly adversarial intent (Darwin?) and expect the unexpected. Thus, the risk analyst needs to expect this kind of variability in human responses and performances and perhaps, best of all, run an internal “Red Teaming” process,⁽⁶⁵⁾ effectively wargaming situations, to find the gaps before they do. This is a different mindset which was palpably missing from the UK Government’s arsenal. Get your retaliation in first!

Recommendation 7– Government should formally require a red teaming function in their planning and response organisations.

Pressure to Conform

Again, from Darwin, our survival depends on our adaptability (evolution) – Animal studies⁽⁶⁶⁾ show we seem as a species to be mostly followers and herd animals, but there is a significant minority of “loners”, which these studies seem to show, are very necessary for the survival of the species. As a species then, we seem to be at a crucial point, where we are in danger of letting populism iron out this needed diversity: by –

- Shouting down the inconvenient truths for political ends - Trolling, woke and anti-woke.
- Silencing the independent thinkers and challengers. (Typical brainwashed cult behaviour).

Do we need to re-establish a basis for rationality to offset this survival / enlightenment threatening browbeating, all too apparent in current political debate.

Recommendation 8 – Encourage a culture of challenge, and independent/ enlightened thinking.

“Enigma” war footing (vaccines)

There can be insights gleaned for how the Bureaucracies of Government respond best to national emergencies, from the UK’s response to the World Wars of the last century. Initial setbacks inherent in the “amateur” and bureaucratic infrastructure, caused rethinks from leaders. Looming defeats focussed the minds and allowed the development of technological and intelligence breakthroughs (Tanks, Enigma, Atomic weapons, etc.), which ensured survival. The vaccine development by external organisations serves to underline this point. Pandemics threaten life and limb, trying to protect communities thus is more akin to wars than political campaigns. The reluctance, or selfishness of leaders to recognise the difference, may explain much.

Recommendation 9 – Adopt (sooner?) a more “military” versus “conventional / predictable” culture in “wartime”

Overall Lesson – There is no substitute for the highest quality leadership and standards in our politicians, in a National crisis

But to paraphrase a caution about trusting single sources of expertise, in this case generals - survival is too important to leave just in the hands of politicians. (c’est magnifique, mais ce n’est pas la guerre).⁽⁶⁷⁾

The unfortunate timing of the pandemic in the UK meant that that the machinations and exigencies of the BREXIT campaigns had

resulted in a large majority right-wing populist government that was needed to finesse / deliver the undeliverable legally and a weak left-wing opposition trying unsuccessfully, to hold them to account. What the pandemic needed was consensus and centrist, statesmanlike leadership, to unite the country against a common enemy of the people.

Recommendation 10 – The Government should consider a mandatory requirement for inclusivity, acceptability and competence in crisis management. (War cabinet?).

CONCLUSIONS

The lessons are plain – but will we learn them? The reluctant conclusion of this review is – probably not. Whatever the final response is to the Public Inquiry, in the current fiscal and political difficulties the measures needed will be – inconvenient, incompatible, unaffordable! – and hence not on the political agendas.

But quoting Winston Churchill, “Those that fail to learn from history are doomed to repeat it.”⁽⁶⁸⁾

And it seems to be a consensus of independent risk analysts that other pandemics are inevitable and possibly to be expected more frequently, as these coronaviruses evolve naturally and / or artificially.

But can we afford to live with the threat of again experiencing so many casualties, excess deaths, and their economic impacts? Have we lost irrevocably our trust in and expectations of our political leaders – high standards of honesty, ethics, honour, statesmanship!

As the Lancet opines,⁽⁶⁹⁾ we should not need to wait indefinitely for the Public Inquiry report to learn and apply lessons –

How do we now underline the predictability and inevitability of the next one? If we can't agree on what we should do on climate change, it may be that there is no hope of an urgent review of our plans for pandemics?

Perhaps our politicians ought to be cognizant with the ideas of Lovelock,⁽⁷⁰⁾ who correctly diagnosed the complex sociotechnical system which is our current world, as a self-correcting set of geotechnical equilibria, whose swings and corrections have seen many cycles adapting to phases in our planetary ageing, which entail extinction of species causing irreversible perturbations, and unable to adapt to the new conditions, result in the establishment of new equilibria; evolving new species that can adapt and don't threaten the new equilibrium? It would seem that either a pandemic, or irreversible climate change, could be such an extinction threat to us, as Gaia adjusts to remove a troublesome meddler.

As Gutenschwager⁽⁷¹⁾ observes –

“Indeed, we seem to be at a turning point⁽⁷²⁾ in our evolution as a species as illustrated by the world-wide crisis brought on by this pandemic. Do we see the search for a vaccine as a competitive process among companies and countries like a football match, as so many immature politicians do? And in the same spirit do we continue to use many of our scientific advances to build ever more sophisticated technologies to conquer others and possibly annihilate ourselves in the process? This is what our tribalist instincts along with the vision of a perfect society brought on by everyone pursuing his own

individual interests would suggest. Or do we seek to find ways to cooperate at an international level, recognizing that we are all in the same terrestrial boat?"

CORRESPONDING AUTHOR

David Slater
School of Engineering, Cardiff University
Carey Dene, Carey, Herefordshire,
UK HR2 6NG
Email: dslater@cardiff.ac.uk

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