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When Systems Fail

UK acute hospitals and public health after Covid-19

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About this report

This is a public interest report based on independent academic research into Covid-19 and UK healthcare systems. Our unfunded report was conceived, researched and written in the first three months of the UK lockdown between late March and late June 2020. It is unusually broad-ranging because the team of authors has varied disciplinary back grounds from critical accounting through political economy to science and technology studies

As authors we have previously worked together in different combinations on a variety of diverse projects with relevant earlier work including analysis of financialised adult residential care and the BSE public health emergency. We are members of a European academic network, the Foundational Economy Collective, which early in the present crisis produced a ten-point platform for reform after Covid-19[1].

Initially, we were puzzled by the apparent fragility of the NHS hospital system and the manifest absence of distributed laboratory testing capacity compared with other north European countries such as Germany and France. Drawing on a range of different sources we tried to understand how and why the UK found itself in this predicament. We became increasingly convinced that the problems were intrinsic to the design of our health system and so began to think constructively about how to imagine more robust ways of organising health.

In developing our analysis 'at pace' we have been helped by foundational economy collective members from many countries who read and commented on successive drafts. Thank you to John Buchanan, Cleo Chevalier, Jim Gillespie, Ian Rees Jones, Angelo Salento and Bruce Smith who will all recognise insights that they have contributed to this report.

Finally, we owe a large debt to the political scientist, Mick Moran, whose untimely death in 2018 robbed us of a creative collaborator who helped shape the *Foundational Economy*[2] book. This report takes up two of Mick's concerns about the importance of healthcare systems in high income societies and about the limits of modernist policy redesign; here we remember Mick, as collaborators should, by continuing the argument about his concerns in a radical way.

Julie Froud, Colin Haslam, Sukhdev Johal, John Law and Karel Williams
26th June 2020

[1] Foundational Economy Collective, *What Comes after the Pandemic*? https://foundationaleconomy.com/covid-19-report/ (Foundational Economy Collective 2020). Also downloadable in Dutch, German, Italian and Spanish

[2] Froud, J. et al. (2018) *Foundational Economy: the Infrastructure of Everyday Life*, Manchester: MUP (Foundational Economy Collective 2018). German edition published by Suhrkamp as *Die Okonomie des Alltaglebens* (Foundational Economy Collective 2019). Italian edition published by Einaudi as *Economia Fondamentale* (Collettivo per l'economia fondamentale 2019)

Citizens' Summary

The report's argument summarised:

What went wrong in the early stages of the Covid-19 pandemic? Why did countries such as Germany and France handle the pandemic better than the UK? There were short-term policy mistakes, but this report explores the deeper causes of failure. It shows that there are particular features of the UK's acute hospital and public laboratory systems which meant that failures in specific services proliferated into unanticipated and uncontrolled large-scale breakdowns.

To use the language of sociology, what happened was a *normal accident*; it was an accident waiting to happen because fragility was built into the system. The report shows that the reason for this was that hospitals and laboratories failed in two distinct ways. First, they were already so tightly stretched that they did not have the buffers needed to absorb a pandemic surge. Second, however, they also lacked the organisational capacity to respond to unexpected circumstances.

The report then shows that this double fragility was unintentionally caused by a combination of long-term funding shortages and a process that political scientists call *hyper-innovation*. Thus, while austerity was important, so too was a 30-year period of continuing organisational churn imposed on the NHS and public health in the name of public sector reform. This churn hollowed out these services and eroded their capacity to respond to emergencies in adaptable and resilient ways.

Recovering from this condition of chronic incapacity will be very difficult. The report shows that this will demand much greater funding than is recognised by any of the major political parties. It also argues that it will require a new approach, *the care-ful practice of policy*, which recognises the limits of the *control paradigm* – the top-down approach to policymaking that has been dominant in UK health policy for three decades. Instead, it argues that to create effective and resilient healthcare, the UK will need to find ways of creating policy iteratively and consultatively. The report concludes by exploring what such care-ful policymaking might look like in practice.

These arguments are developed and documented over five chapters with an introduction and conclusion.

A step by step overview of the report

Introduction:

- Any lessons learned from the Covid-19 pandemic are provisional, but in mid-June 2020 it is possible to take stock by asking and seeking to answer two questions: first, what do the early stages of this pandemic reveal about the fragility of the NHS hospital system and the limited capacity of the public health laboratories in the UK? and second, what actions might be taken after the pandemic to reduce this fragility? (pp. 7-9)

Chapter 1: System characteristics: when accidents become normal

- NHS acute hospitals and the public health laboratories are complex systems which we explore in this report by developing sociologist Charles Perrow's arguments about how *normal accidents* are designed into nuclear power and financial systems. He argues that complex systems are fragile because their behaviour after disruption is inherently unpredictable as failures proliferate; and control of such proliferating failures is impossible when systems are tightly coupled because they lack buffer capacity and have no back-up. (pp. 9-12)
- There were failures of management in the UK's Covid-19 pandemic, such as the delay in ordering lockdown. But more fundamentally, behind those failures this was *a normal accident* whose inevitability was in this case inscribed not in the technologies but how the systems were being structured and operated. The public laboratory system lacked redundancy or back-up because Public Health England (PHE) was over-reliant on its own limited test capacity and could only slowly bring other laboratories online. The acute hospital system lacked buffers because it was running with no margin of spare capacity and lacked the critical care or general beds to cope with disruption (p. 12).
- Hence the interconnected, proliferating, uncontrollable failures in the early months of the crisis. Too little testing meant public health buffering by test and trace had to be discontinued in mid-March. Then there were shortages of PPE, ventilators and staff in a nearly overwhelmed hospital system. The hospital system itself caused proliferating problems when it cleared beds by discharging untested elderly patients into care homes and freed up NHS staff by suspending other treatments (pp. 12-15)

Chapter 2: NHS hospitals: high flow, no buffers (and efficiency)

- The UK acute hospital system has been increasingly constructed as a low-stock, high-flow treatment system. Other North European countries have more doctors or nurses in relation to population and acute bed occupancy rates of 60-70% against 90%-plus in the UK. With limited resource, UK hospitals are unusually dependent on the continuous rapid flow of patients through the system; this is also true for critical care, where in January 2020 the margin of safety was just 700 unused and available intensive care beds for an English population of 56 million. (pp. 16-24)

- Low-stock, high-flow systems are inherently fragile and vulnerable to disruption by internal blockage or surges in demand. And fragility for the NHS was increased in the austerity years when demand grew much faster than funding so that annualised bed occupancy rates increased dangerously. By 2018-19 the English NHS had one general and acute unoccupied bed for every 6,000 of population, and the hospital trusts were protesting that all easily realisable savings had been exhausted. (pp. 16-23)
- The social irresponsibility of running an acute hospital system with no buffers was concealed by successive Health Ministers and NHS England which appropriated arguments from health economics and represented further savings as the virtuous pursuit of efficiency (which system-wide could help bridge the financial gap between income and expenditure). Confusion was compounded by consultancy discourses like Lean which rested on false analogies between car factories and hospitals. The end result was a campaign against 'unwarranted variation in costs' when there was no identifiable consistently high-productivity group of (well managed) hospitals and much of the cross-section variation in costs was unexplained. (pp. 24-28)

Chapter 3: Reorganising public health and laboratories

- In mid-March test-and-trace had to be abandoned because of limited testing capacity in the public health laboratory system, and by mid-June testing capacity had increased but not to the point where laboratories could support an effective system of test-and-trace through the lifting of lock down. A narrative history over the past 40 years shows how churning reorganisations of public health undermined a laboratory system that was previously distributed and had the potential surge capacity to handle large-scale testing. (p. 29)
- Up to the end of the 1980s, there were two parallel vertical bureaucratic hierarchies, the public health laboratory service on the one hand and the NHS on the other. Both were organised on a national, regional and area basis. This sustained a distributed laboratory system with more than 50 public health area laboratories overlapping with hospital laboratories. From 1991 onwards successive reorganisations created and pressed a quite different horizontal financialised set of relations between primary care purchasers on the one hand and hospital providers on the other. This had the effect of marginalising whatever could not be commoditised. From 2012 Public Health England concentrated on research excellence at its central laboratory and its new Harlow campus; at the same time hospital laboratories had become profit or cost centres located within hospital trusts. (pp.29-34)
- Covid-19 revealed Public Health England to have a small world-class centre without the networks or working relations to scale up testing. This was the unintended result of financialization, combined with repeated reorganisation of NHS health services and public health. After a long period of stability up until 1990, there were more than 50 organisational changes in the NHS between 1990 and 2009 and less than 40% of the component organisations of the NHS survived more than ten years during that period. (pp. 35-37)

Chapter 4: How much more money for robustness?

- Given the misorganisation of the acute hospital and public health laboratory system, adding more funding is necessary but not sufficient by itself to avoid future fragility. However, extra funding is a basic precondition of increased robustness. And the NHS needs much more funding than was offered under Theresa May's 5-year settlement of 2018 which promised an increase of 3.4% per annum; and more than was envisaged in the Labour Party's 2019 manifesto which envisaged an increase of 4.3%. (pp. 38-39)
- The May settlement offered a reversion to the pre-austerity historic mean of annual funding increases so that the NHS operations would get a funding increase of about £ 5 billion a year (Capital spending has been starved for years and remains separately dependent on the Treasury's annual spending review decisions). But, adding buffers for robustness is expensive for example, a 10% increase in the number of NHS acute beds would on our calculations incur an operating cost of £2.9 billion which would absorb more than half May's annual funding increase. (pp. 39-42)
- On OECD international comparisons, the UK spends around 1.5% less of GDP on health and care than France and Germany. If the long run target were to increase UK spending on health and care by 1.5% of GDP, then this would require a 5.4% increase in UK tax revenues to raise an extra £33 billion each year. After the Covid-19 crisis, there will be many other just demands for spending in areas such as social housing and an extra burden of debt to service; so more adequate funding of the NHS almost certainly depends on reform of the UK tax system. (pp. 42-47)

Chapter 5: After hyper-innovation: the need for care-ful policy practice

- In health and many other policy areas, the challenge is to renew and repair in ways which reduce the likelihood of future normal accidents when organisational churn has degraded capability by creating a hollowed-out post-administrative state in the UK. As with PPE procurement, testing centres and contact tracing in the present crisis, when UK central government wants anything done quickly, it now has no option but to default to distress outsourcing without any safeguards for citizen interests. The task is thus partly to reskill the central state. (pp. 48-51)
- In health systems, what political scientists call *hyper-innovation* lead to a specific problem. Top-down policy design is based on thin simplifications (like the purchaser-provider split in the NHS reforms of 1991 or the principle of collaboration introduced in the 2014 Five Year Plan). However, when objectives are not achieved, the hyper-innovative response is more rounds of top-down redesign. This increases the collateral damage that here included the undermining of public health which culminated in the creation in 2012 of Public Health England as an ineffectual executive agency. (pp. 51-55)
- The underlying problem in UK health systems is a top-down *control paradigm* together with an ideal of service effectiveness in which power relations and financial self-interest aim to turn the managers of NHS units into agents of central policy that will control clinical teams. Against this we argue that effectiveness is not about taking control but

about creating and fostering appropriate forms of practice. In particular, we suggest that the NHS might learn much by looking at the how the logic of clinical care for chronic conditions works. Chronic conditions cannot be cured but they can often be managed to achieve good life quality. The art of chronic care is to work consultatively and iteratively to manage the tensions between different concerns. And this is the approach we recommend for what we call a *care-ful practice of policy*. (pp. 55-58)

- What does this mean in practice? It is relatively easy to address practical points of failure revealed by crisis within the NHS and public health systems. On issues such as insufficient acute hospital buffers or laboratory testing surge capacity, we have to move from old ideas about efficiency to new ideas about sufficiency. And the corollary is the kind of planning by iteration in a care-ful policy practice which moves through a questioning process of inquiry and discussion to arrive at proposals which reflect the multi-dimensional complexities of NHS choices. (pp. 58-63)
- But there are also broader issues of vulnerability. These arise from the way in which the NHS interacts with other systems such as adult care which is habitually treated as subordinate partner; the absence of citizen participation in setting priorities; and the failure to embed public health priorities in other areas of public policy. Here we recommend not specific policies but the creation of a care-ful process of policymaking that begins with the delegation of power to new fora which work by turning general matters of concern into well-defined problems which explore that options are simultaneously technical, social and economic. (pp. 63-68)

Conclusion

- The implication of our analysis is that funding levels and the role of private providers of public health services are both important. But the political debate about the future of the NHS needs to be broadened to consider other issues and specifically to register the underlying problem of the control paradigm which has produced so much collateral damage through its pursuit of an efficient and disciplined health care system without recognising that this generates vulnerability and the potential for normal accidents. (pp. 69-71)
- What is needed is a new policy-making process involving decentralised experiment, delegation of responsibility, loosening of control and the creation of new fora for deliberation. If this seems unsatisfactory, readers should remember that the transformative NHS of 1947 was built on the success of the experiments of the 1930s in comprehensive whole-population health care in the two small Welsh towns of Llanelli and Tredegar. It is time to revive this tradition of local initiative as a way of reanimating a misorganised NHS (pp. 71-72)

When Systems Fail
UK acute hospitals and public health after Covid-19

Julie Froud, Colin Haslam, Sukhdev Johal, John Law, Karel Williams[3]

Introduction

> *'The NHS needs to be able to plan for, respond to and recover from a wide range of incidents, emergencies or disruptive challenges that could impact on health or patient care.'* (NHS England National Emergency Preparedness Resilience and Response Unit 2017, 5).
>
> *'(Resilience is the) ….. ability of the community, services, area or infrastructure to detect, prevent and, if necessary, to withstand, handle and recover from disruptive challenges'* (NHS England National Emergency Preparedness Resilience and Response Unit 2015, 8).

NHS England and Public Health England understood the importance of being prepared for disruptive challenges including the pandemics which are to be expected in an era of globalisation (NHS England Emergency Preparedness Resilience and Response Team 2017). Their paperwork was in order and up-to-date with elaborate plans and frameworks, but the challenge of Covid-19 has exposed fragilities in NHS health services and public health systems which both lack surge capacity.

This public interest report was planned and written in April, May and June 2020 in the lockdown phase of an ongoing crisis. As the crisis develops, we will see and learn more; it is already clear, for example, that ventilators are less efficacious in the management of Covid-19 than in pneumonia. However, if any lessons learned are provisional, it is now possible to take stock by answering two questions: first, what do the early stages of this pandemic reveal about the fragility of the NHS hospital system and the limited capacity of the public health laboratories in the UK? and second, what actions might be taken after the pandemic to reduce this fragility?

In the first wave of the crisis, the acute hospitals were not overwhelmed although there were awkward questions about how the NHS hospitals had been saved by sacrificing residents in care homes who often died without nursing care. NHS hospital capacity for Covid-19 patients was increased by repurposing acute wards and operating theatres and by adding Nightingale field hospitals; but this limited NHS hospital capacity to deal with other health conditions, and patients also had to be turned away from the London field hospital because of staffing

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shortages. At the same time, there were continuing and critical shortages of personal protective equipment and ventilators throughout the system.

Meanwhile, Public Health England (PHE) has only slowly increased its limited laboratory test capacity and even more slowly integrated laboratory testing into a public health strategy of test, trace and isolate. In March, limited test capacity forced the abandonment of a policy of tracing, testing and isolating infected contacts; then the health minister adopted an empty target of 100,000 tests a day and, at time of writing in mid-June, PHE has not begun to integrate rapid testing with efficient tracing so that lifting the lockdown is problematic and its first steps have been questioned or contested by many independent experts.

Our analysis of these issues is framed around a central argument. This is that the failures in testing and NHS acute care in the current crisis are what Charles Perrow called *normal accidents* (Perrow 1999). Accidents become 'normal' when complex systems are structured (without buffers and without time to intervene) so that a small breakdown can turn uncontrollably into a large-scale catastrophe. Perrow provides us with a framework for analysing the conditions under which breakdowns proliferate across health systems through multiple and unanticipated interactions between failures which system operators cannot control.

If the failures in NHS service delivery and public health laboratory testing are 'normal accidents', what conditioned this fragility and how could it be remedied? Political science allows us to understand the broader context of system fragility. Acute services and public health have become part of a *post administrative state* whose limited capabilities make it crisis prone. In both cases, the driver of incapacity is *hyper-innovation* through constant, churning reorganisation of structure and strategy. And in thinking about remedies, we draw on feminist sociology to develop the idea of *care-ful practice* as a way of thinking about how to tackle the crucial question of making health systems more robust.

The report which develops these arguments is divided into five chapters and a conclusion:

- The first chapter lays out Charles Perrow's argument about how no buffers and tight coupling make complex systems fragile. It then shows how health services events and outcomes in the Covid-19 crisis can be understood as normal accidents involving proliferating uncontrollable failures.
- The second chapter describes the increasing fragility of the NHS acute hospital system as a high-flow system which was pushed to operate at high capacity without buffers. The dangers were not recognised when health economics and consultancy discourses of efficiency and lean production represented flow as virtuous.
- The third chapter explains how public health laboratories had limited capacity for volume testing. Forty years of churning reorganisation of public health, culminating in the creation of Public Health England in 2013, unintentionally undermined a distributed laboratory system with sufficient surge capacity to handle large scale testing.
- The fourth chapter begins to tackle the issue of how robust health systems require larger safety margins. It argues that the whole NHS system was grossly under-resourced in the

austerity years and needs substantially more funding than is being offered under the current five-year settlement.

- The fifth chapter turns to broader lessons learned about specific points of failure exposed in this crisis, broader relational vulnerabilities, and the need for new policy-making processes. The prescription is for care-ful practice as a remedy for the incapacity caused by hyper-innovation.
- The conclusion briefly summarises the argument, resituates it in the larger history of the NHS, and argues for the need for a 'new normal' in healthcare policymaking.

This public interest report is broad ranging and the different chapters tackle these problems of fragility in different ways. The first chapter on normal accidents is descriptive and science and technology studies based; the second chapter on under-resourcing, and the fourth on funding, are built around political arithmetic from statistical tables; the third chapter includes a short narrative history of the reorganisation of public health; and the fifth chapter introduces political science and feminist sociology to articulate a care-ful process of policy making process as an antidote to hyper-innovation

In the first three chapters our focus is on acute hospitals and public health. These were the systems which immediately lacked robustness. But our 'lessons learned' analysis in the fifth chapter is set in the context of the much larger systems of health and care where adult care alone includes 400,000 residential beds and employs one million workers. The primary focus throughout is on NHS England and Public Health England. This is because health is a devolved responsibility which operates under different administrations in Wales, Scotland and Northern Ireland. But some of our statistical material, such as the OECD data on international comparisons, covers health and care in all of the UK.

Our report is thus mainly focused on England rather than the UK. But the report itself is relevant to the future of publicly funded medicine in a range of European countries because it offers lessons about the physical and financial fragility of bufferless systems, and points to the limits of supporting knowledges such as health economics and the consequences of management by re-design.

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1. System characteristics: when accidents become normal

> *'Most high-risk systems have some special characteristics…that make accidents in them inevitable, even "normal". This has to do with the way failures can interact and the system is tied together. It is possible to analyse these special characteristics and in doing so gain a much better understanding of why accidents occur in these systems, and why they always will.'* Charles Perrow (1999) *Normal Accidents*, page 4.

Charles Perrow's idea of normal accident was originally provocative and remains, to an extent, counter-intuitive. An accident surely is something harmful that happens by chance without anyone intending or planning it; as with an individual accident when the old person has a fall and ends up in hospital A&E. But Perrow argued that accidents could be inadvertently designed into systems so that small breakdowns might lead to uncontrollable consequences; as, for instance, when the acute hospital system cannot cope with a surge in demand and that failure has further unanticipated consequences. In this chapter, we explore the system characteristics which make catastrophic accidents 'normal' and then explain how the Covid-19 crisis caused the proliferating and uncontrollable failures which are the outward and visible sign of normal accident.

1.1 Normal accidents in complex systems

In thinking about the conditions of catastrophic accidents, we begin with the obvious idea of redundancy: this is about the need for a backup. Most passenger aircraft have two pilots and at least two engines, and, indeed, at take-off and landing both the pilot and the co-pilot have their hands on the throttle in case one of them suddenly becomes incapacitated. The principle of redundancy is also embedded in the design of the aircraft for safe operation; every twin-engine aircraft can take off on one engine; the engines will have completely separate hydraulic systems and there will be at least two separately routed hydraulic control lines to the tail. On the flight deck or in aircraft design, redundancy ensures that a heart attack or hydraulic fluid leakage does not cause an accident.

When considering the response to Covid-19, the principle of redundancy was most obviously breached by the absence of back-up laboratory testing provision. One of the reasons why Covid-19 testing has been slow to roll out in the UK is that Public Health England started out in January 2020 with a single laboratory at Colindale in North London. The story is complicated, but the simple version is that testing was a bottleneck because more laboratories were only slowly brought in (Grey and MacAskill 2020). It was quite different in Germany where (for admittedly controversial reasons) over 150 laboratories in a federal system were quickly available and able to do testing (Hall and Buch 2020). And, as we will argue below, this over-dependence on a single site was not a long-standing British idiosyncrasy. Instead, it was the unintended consequence of relatively recent policy and system reform.

The subsequent struggle to bring in more laboratories and increase Covid-19 testing capacity tells us something more. Redundancy is not simply about having a backup. It is also about the backup being on-line and ready to go. This is why the pilot and the co-pilot both have their

hands on the throttle so the other can take over in a fraction of a second; and, if structural damage takes out one of the hydraulic lines, the other line will simply do the job. In the same way, hospitals or computer farms have backup generators which kick in fast if the power supply fails. So, and to put it differently, redundancy is also a function of time. Or, more precisely, of relative time, because what is crucial is that there is enough slack in the system so that when something goes wrong it is possible to get in quickly enough to prevent catastrophe.

In his seminal writing on normal accidents, sociologist Charles Perrow calls this *coupling* (Perrow 1999). A system that is *tightly coupled* is like a nuclear power station with a pressurised water reactor where intervention may not be possible if something goes drastically wrong because events unfold too quickly and in a way that is not linear and predictable. This means that the required intervention is not simple like switching the machine off, cutting the power supply or isolating the failed parts. Again, it is not clock time that is important here, but rather the ability to make a difference through intervention. (Climate change is, very likely, a tightly coupled system because nothing human beings now can do will make a difference even though it will take decades to unfold.) By contrast, a *loosely coupled* system is one where there is always time enough to intervene.

There is another related way of imagining this problem about the conditions of controllability, and one that we have touched on above. This is to think in terms of *buffering* which puts stores or reserve capacity into some systems. Since the late nineteenth century most urban piped water supplies are drawn from reservoirs; in Northern Europe, these fill up in wet winters so that households can carry on using water through a dry summer. By way of contrast, historically, it has been almost impossible to store electricity in useful quantities, and the system then requires some kind of grid with controllers switching in buffer-generating capacity as required to meet morning and evening demand peaks. How buffers work depends on the system, but generally they lower the level of coupling. The components within the system become more autonomous, less likely to be disrupted by events upstream, and less likely to disrupt whatever is happening downstream if they themselves go wrong.

The current emergency devastatingly illustrates the dangers of tight coupling and the importance of buffering. Global flows have been dangerously fast and public health buffering to reduce the reproduction or R number of the virus have been too little and too late to prevent a global pandemic. In December, a small number of atypical pneumonias in a handful of hospitals in Wuhan in December were carried and multiplied by global movements so that in January and February travellers coming to the UK seeded Covid-19. On 12th March, the UK government abandoned the public health buffering technique of home testing and self-isolating individuals in the community because available laboratory test capacity and trained tracers could not cope with the number of new cases. On 23rd March, when standard infectious disease control practice had failed, the only way the UK government could create a buffer and slow down the progress of Covid-19 was through the violent and unprecedented political expedient of a national lockdown which imposed self-isolation on all households at huge cost to economy and society.

The lockdown was necessary because earlier public health buffering had failed to stop the spread of an infection that was producing rapidly increasing numbers of seriously ill patients,

so the next issue became the availability – or the lack of availability – of spare capacity and especially critical care beds in the NHS acute hospital system. As we will show in chapter 2, NHS acute hospitals have been underfunded and required to be 'efficient', so they were running close to 100% capacity utilisation of general and acute beds. In the absence of empty beds which could be used for critical or intensive care patients there was no buffer; and if acute beds were used for Covid-19 patients, then older patients would have to be decanted into care homes and most acute treatments for non Covid-19 patients would have to be postponed. In previous years, winter crises had showed the NHS hospital system lacked 'surge capacity': a predictable seasonal increase in the number of sick people means longer queues in A&E, and trolleys lined up in corridors. With the disruptive challenge of Covid-19, no buffers meant patients might die because there were not enough hospital beds, or enough frontline staff or enough personal protective equipment for the staff.

Say it how you will: the NHS is a tightly coupled system; it is a system with almost no buffers; a system with little or no redundancy. This is the first half of Perrow's argument. However, fragility is also related to *complexity*. There are different jargons for thinking about this, but the basic argument is simple. Systems are made of links, connections, flows, and feedback loops, and it is the feedback loops that are interesting here. In a relatively stable system, these loops help keep things stable. A simple version of this is the thermostat. If temperature falls too low, it switches the power on. And if it gets too high it switches it off. So, feedback is central to systems. But the feedback loops that make up systems tend to become very complex. (Think of ecological systems, human bodies, nuclear power stations, desktop computers, or the NHS)

This complexity is fine until the wrong thing goes wrong. Or one thing going wrong interacts with another that is also going wrong. As we mentioned above, the problem is that when this happens it is difficult to predict what will happen next. This unpredictability has various causes and some of them are manageable. Systems can be kept within safe working limits where feedback loops work predictably: so, the software does not crash and the computer does not freeze. Or, given time, our limited understanding can be extended by imaginative research: so, we can find out why cod stocks do not recover when catch quotas are introduced. But Perrow was concerned with the near meltdown of the Three Mile Island nuclear reactor in 1979 where he argued these management strategies of adding feedback loops would not make such systems safe. Here a series of small failures led to unpredicted consequences which ricocheted through the system and led to near-catastrophic accident (and did turn into catastrophe at Chernobyl.) The problem was that no-one had anticipated the particular sequence of interactions and failures, and so complex was the system they were never going to be able to do so in real time.

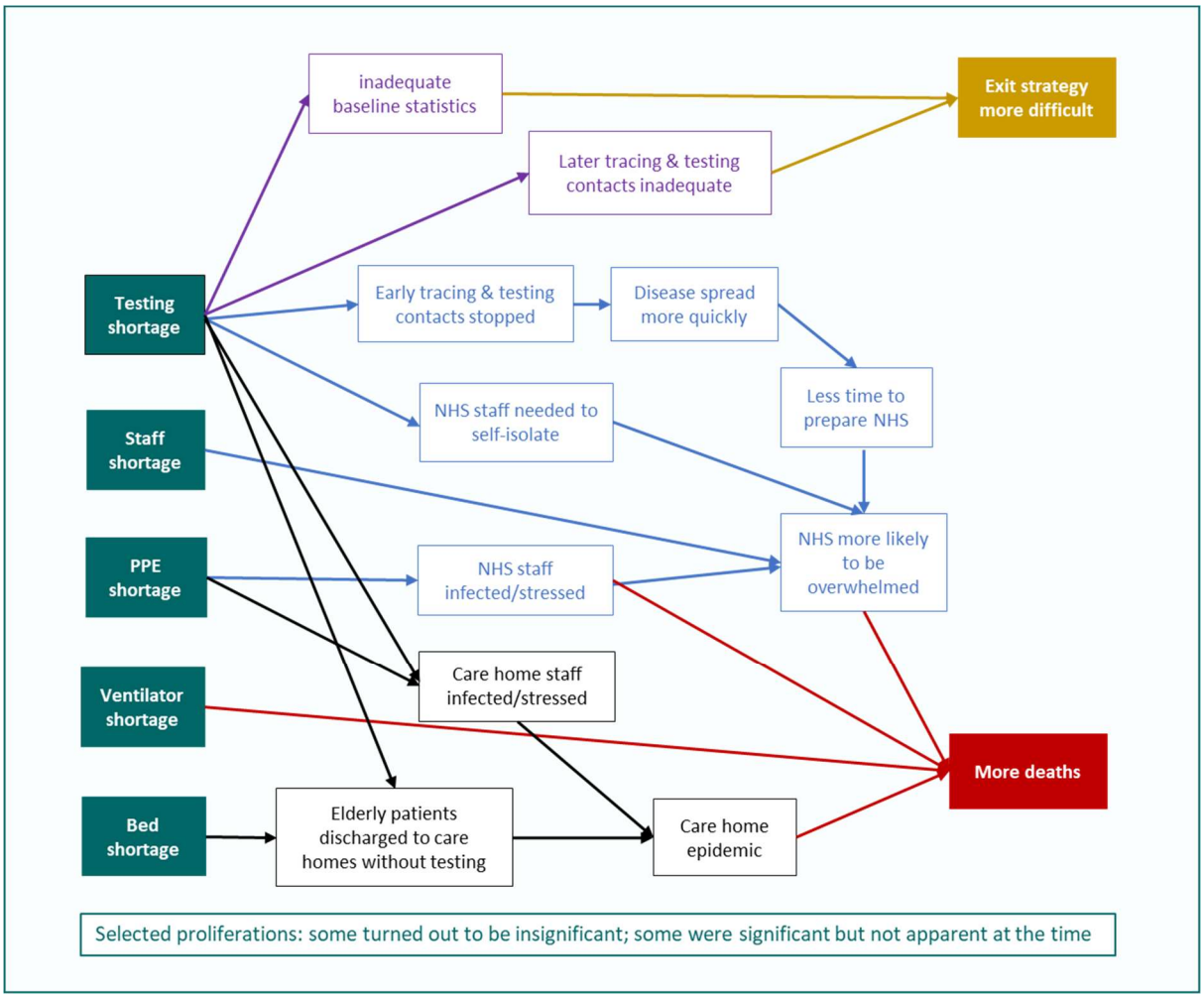
1.2 Proliferating failures

Perrow's argument is that complex systems are inherently unstable. This may not happen very often, but small errors sometimes multiply and turn into catastrophic failures which spread to neighbouring systems. Failures proliferate. So in the final move, Perrow puts these two arguments together: one, the idea that the behaviour of complex systems is inherently unpredictable, and *failure proliferates*; and two, that intervention is impossible if those systems are tightly coupled and *failure happens too quickly*. What he calls a *normal accident*

is the kind of system meltdown that happens when you put tight coupling and complexity together. It is intrinsic to the design of certain systems.

We are witnessing something like this in the Covid-19 crisis. Failures have been proliferating within – and beyond – the NHS and the public health system in England. In addition, effective intervention has been difficult, verging on impossible, because everything has been happening too quickly. Events that started as a health emergency have proliferated not only through the healthcare system, but into the economy, the financial system, politics, and the work and the personal lives of billions. And, along the way, they have revealed both the importance and the frailty of many of the systems upon which the world relies.

Exhibit 1: A normal accident? Tight coupling and complexity in the NHS and care



If we stick to the NHS acute hospitals and England's public health system what do we see? The answer is: *a series of interconnected and proliferating crises*. Here's a list

- **Testing**. As we noted above, testing has been inadequate. Throughout the World Health Organisation was saying 'test, test, test' (Payne and Hodgson 2020), but the early decision on March 12th was to stop tracing and testing contacts (Clark, Cookson and Hughes 2020). There was no alternative because the testing capacity simply wasn't there (Barker et al. 2020), and this was because there was just the one lab (no buffering). But this failure proliferated to become a classic example of a normal accident: one, the disease spread into the community and increasing numbers of people were infected; with two, this

increased the likelihood that the NHS would be overwhelmed with very sick patients in a short period of time; three, this also meant that the time available to prepare for the epidemic got shortened (tighter coupling, less buffering); the shortage of testing also meant, four, that frontline staff in the NHS and the care system needed to self-isolate if they got sick because they might have Covid-19, which further stretched frontline staffing levels; and five, it also delayed the creation of statistics about the spread of the disease, essential for sensible decisions about public health and exit policies. And that's just one set of proliferations.

- **Personal protective equipment (PPE):** Respirators, long-sleeved gowns, gloves and eye protection, were all in chronically short supply in hospitals throughout March and April, and in late May there were still difficulties about supplies to care homes (Calvert, Arbuthnott and Leake 2020). As we shall see in chapter 5, the national buffer stocks of PPE had been ill-maintained, downgraded and out-sourced so that much of the warehouse stock was not immediately usable; and the urgent task was to purchase new PPE for immediate distribution to hospitals and care homes. The absence of buffering and fitful distribution meant that front line NHS staff and care workers were being unnecessarily exposed to the virus. Even if we put aside the issue of personal stress (and we should not), this meant that some were unnecessarily catching (and indeed dying of) the disease; and here is another proliferation, this in turn added to the shortage of frontline NHS and care staffing as the disease reached its peak.

- **Ventilators:** By early March policymakers were convinced that the NHS might need 30,000 ventilators for critically ill patients. This figure was reduced to 18,000 by mid-April (Davies 2020b). But, by early April no more than around 8,000 were actually available, and the total was only just over 10,000 in mid-April (Pooler et al. 2020). The story of policy response to this absence of buffering is complicated (Foster and Pooler 2020) not least because clinicians found ventilators were less effective in treating Covid-19 patients than in treating pneumonia. But in April and May the NHS was urgently trying to increase the number of ventilators in the reasonable belief that this would prevent patients dying unnecessarily. The problem here was that, unlike gowns or gloves, ventilators are complex manufactures. Imported machines were in short supply because this was a global sellers' market and it was not easy to ramp up their domestic production in less than a couple of months. Engineering firms needed to develop or license a design, order tooling for all design specific plastic and metal items and source off-the-shelf components like motors and gauges in volume. More tight coupling; with confusion added by a 'ventilator challenge' to British manufacturers which showed that senior politicians had little understanding of what has to happen before finished products can roll off an assembly line.

- **Staffing**: This is a story that cannot yet be properly told. But again, this has been an area of crisis. This is partly because the NHS is chronically short of staff and before Covid-19 came it had a shortfall of around 100,000 FTEs in a workforce of around 1.2 million (Plimmer and Stanton 2020). And here again, as with ventilators, the country was lucky and there were just about enough staff. 35,000 were called back (Payne, Warrell and Parker 2020), non-specialists were trained to perform procedures like intubation, and the usual critical care staffing levels were relaxed. But, on staff again it was a close-run thing

– staff were working twelve-hour shifts – and it was the national lockdown that just about averted disaster.

There are some areas in which effective intervention indeed turned out to be possible, and which therefore turn out to be loosely coupled. Most obviously, there was an impressive surge in the number of intensive care beds through ward conversion in acute hospitals and construction of new field hospitals which were, in the event, not required. Field hospital staffing proved problematic in London, and it remains unclear whether the extra beds would have provided usable capacity if the number of seriously ill had increased seriously.

Against this, the list of proliferating close-coupled ramifications can be more or less indefinitely extended. Even if we simply confine ourselves to health-relevant issues, it includes the following. Millions of routine operations were postponed in order to clear beds (Stevens 2020). In part as a result of this, the treatment of serious or life-threatening conditions was impaired. It was clear that many who should be reporting to A&E departments were staying away (Marsh 2020). The NHS bed-clearing undertaken in March combined with the failure to upscale testing decanted frail patients into care homes, helped to seed the Covid-19 epidemic in the care sector. And if we add in the consequences of lockdown, then confinement of millions to their homes will likely to lead to increases in a wide range of sedentary and psychiatric diseases.

In short, in the context of UK health care and public health the response to Covid-19 looks remarkably like a normal accident.[4] The absence of buffers (beds, testing capacity, PPE, ventilators, and probably available backup staff) has had consequences that are proliferating in unpredictable ways. To be sure, a pandemic such as Covid-19 will test any healthcare system and expose its stress points. It also seems likely that short-term political mistakes have been made in the UK's response (most obviously in not responding to the developing threat more quickly). Even so, international comparisons, particularly with Germany and South Korea (Junga-a, Buseong and White 2019), suggest that there are UK lessons to be learned. Looked at from the point of view of system failure several questions suggest themselves. In particular: how did the UK come to have so little buffering in the areas that we have just described; and why were NHS acute hospitals and public health both so very tightly coupled and so lacking in redundancy?

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[4] 'Looks remarkably like' because unlike pressurised water reactors, hospital systems are not intrinsically fragile. For his take on the political implications of this see Perrow (2010).

2. NHS hospitals: high flow, no buffers (and efficiency)

> *'Trusts have consistently delivered impressive efficiency savings in each year since the beginning of austerity in 2010-11…. However, trust leaders across ambulance, community, mental health and hospitals are clear that they have now largely exhausted the 'easily realisable' savings from within their own organisations…. the evidence since 2014-15 demonstrates that an over ambitious efficiency requirement simply leads to a larger provider sector deficit.'* Making the Most of the Money: Efficiency and the Long Term Plan (NHS Providers 2018a,5)

This section analyses the fragility of the acute hospital system. We explain how acute hospitals and the whole NHS has been constructed as a low-stock, high-flow treatment system which is inherently fragile; and this system was then maxed out so that by the end of the austerity years it was running with no spare capacity buffers. In this situation, from the mid-2010s, NHS England continued to press for continued efficiency gains despite the protests of hospital trusts that they had exhausted easily realisable savings (as in the quotation above.) The social irresponsibility of this was glossed – indeed concealed – by health economics and consultancy discourses which legitimated the pursuit of efficiency which in turn pushed the system towards a normal accident.

2.1 A system with no buffers

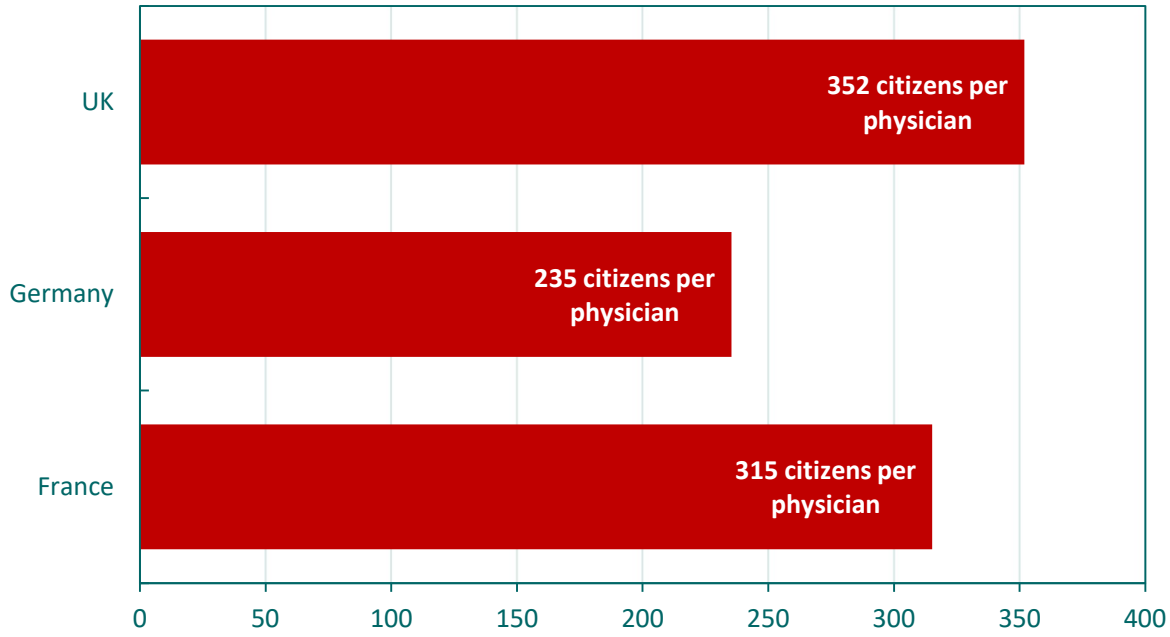
An acute hospital system, like the larger health system, can be understood as a system of stocks and flows. The hospital system is a stock of items such as beds, staff, technologies like CT scanners, and consumables like scrubs and medications. The system is also a flow of patient treatments, from A & E triage, through surgical operations performed as patients move into and out of beds. Stocks and flows are mechanically interrelated in an intuitively obvious way in every hospital system. Thus, in relation to population, the Japanese hospital system has a high stock of beds with long patient stays and low flow; and conversely the British system has a low stock of beds with short patient stays and high flow. The national peculiarity of the British hospital system over the last 25 years is that it is an exceptionally low stock high flow system which manages with a low stock of every item, including staff and equipment; and that this is covered by high flow or the rapid, continuous movement of patients through the system from first consultation to discharge. This kind of hospital system is inherently fragile because it is running without buffering safety margins, so consequences proliferate as soon as flow is interrupted (as with 'bed blocking') or demand surges (as with winter flu).

If the broad relations are obvious, the measurement of stocks and flow and judgement about buffers and safety margins is not straightforward. Items such as hospital beds, doctors and nurses are not like fungible commodities where the individual units are indistinguishable and interchangeable; the UK hospital system like every other is divided into specialisms so that little equipment and few staff are general purpose, and can without training be smoothly redeployed to a different task. International comparisons are complicated by differences in health service organisation even in the North European countries with developed free at point of use hospital systems. France and Germany, for example, have more decentralised social

insurance systems and different roles for self-employed medical professionals. But even when all these qualifications are entered, the stock and flow characteristics of the British hospital system are distinctive on all available national and international measures; so that we do not doubt the British system is different in a way that makes it fragile.

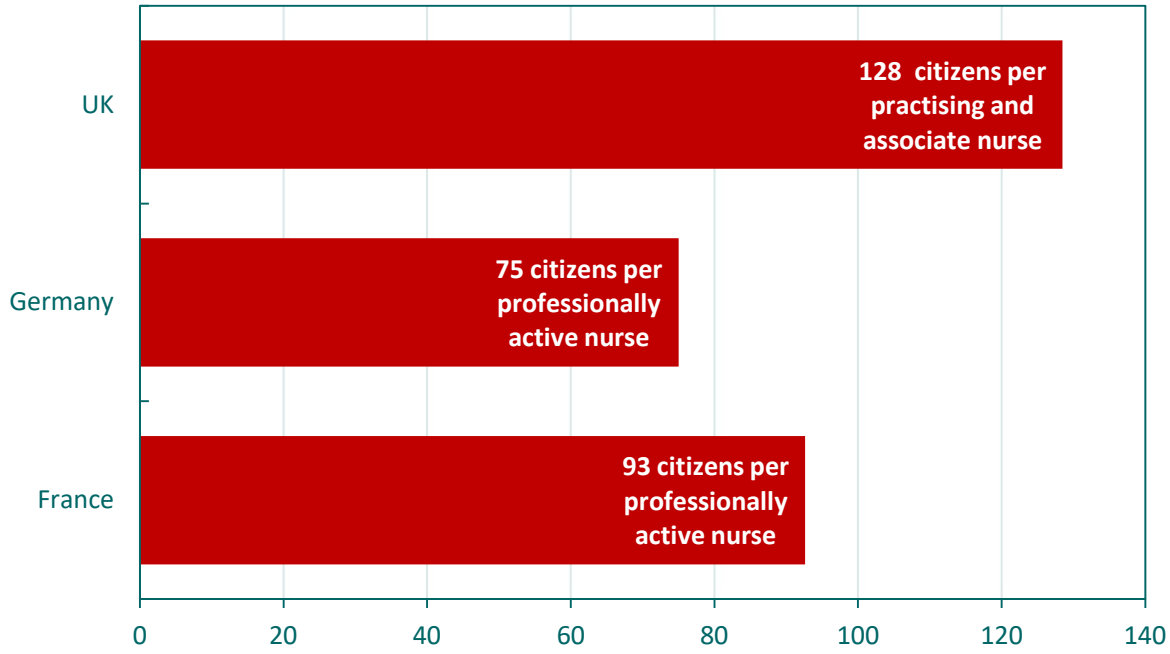
The low stock/high flow peculiarities of the whole British NHS health system emerge clearly in international comparison. The relevant comparison is not with the USA but with European countries operating some kind of socialised medicine system with universal coverage; specifically, the most relevant comparisons are with North European countries like France and Germany rather than South European countries such as Spain or Italy where public health systems are less comprehensive and/or regionally uneven in their offer. Comparisons with North European countries show that the UK has a smaller stock of every relevant service item. Thus, in 2017 the UK had one doctor for every 352 citizens; while the comparable figures were one doctor for 316 citizens in France and for 235 citizens in Germany. And the UK had one nurse for every 128 citizens; while comparable figures for France were 95 Germany and 75.

Exhibit 2: Number of people per practising physician, 2018



Source: see appendix table 1 which also provides a time series

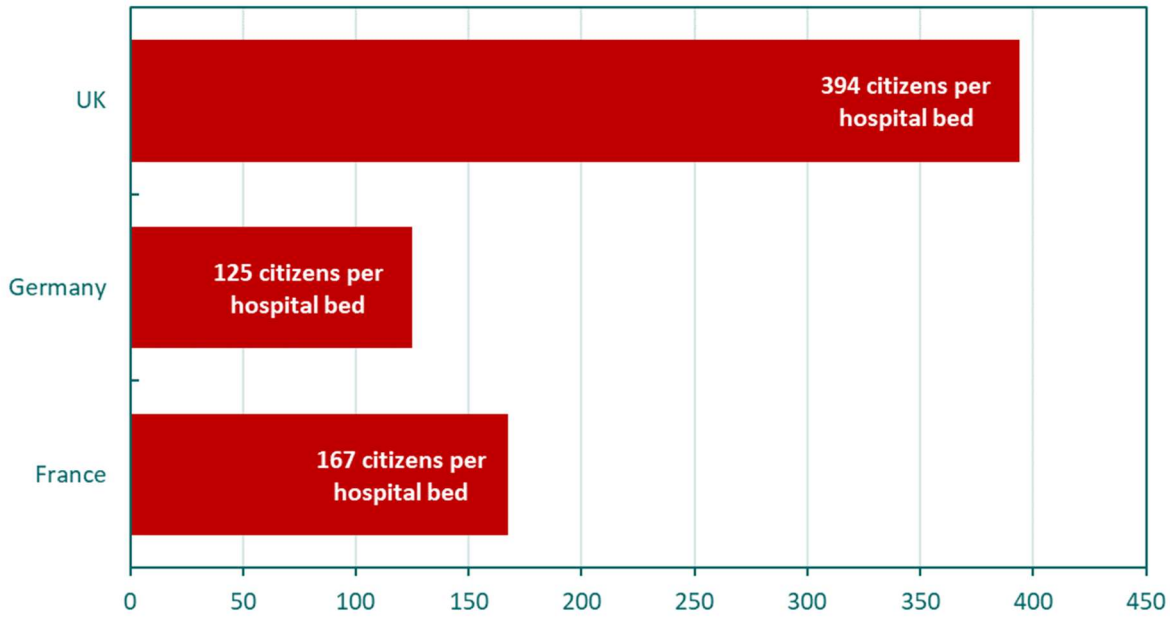
Exhibit 3: Number of people per nurse, 2018



Source: see appendix table 2 which also provides a time series

The availability of beds became a major issue in the Covid-19 crisis. But again, the UK has relatively fewer hospital beds than France or Germany. Acute bed numbers have fallen all over Europe in the past thirty years: long term care of those with psychiatric conditions or learning disabilities, and care for the old have been shifted out of the hospital system; while the technical advances of day surgery have made shorter acute stays possible. But the UK has gone further since the stock of acute beds has been more or less halved over that period and continues to decline gently. Using OECD methods of calculation, excluding maternity wards, the total number of (public and private) beds in the whole of the UK fell from 184,000 in 2010 to 168,000 in 2018. As exhibit 4 shows, the result is a huge disparity in available beds against France and Germany: on a comparable basis, France with almost the same population as the UK had 400,000 beds in 2018 while Germany with a population 50% larger had 661,000.

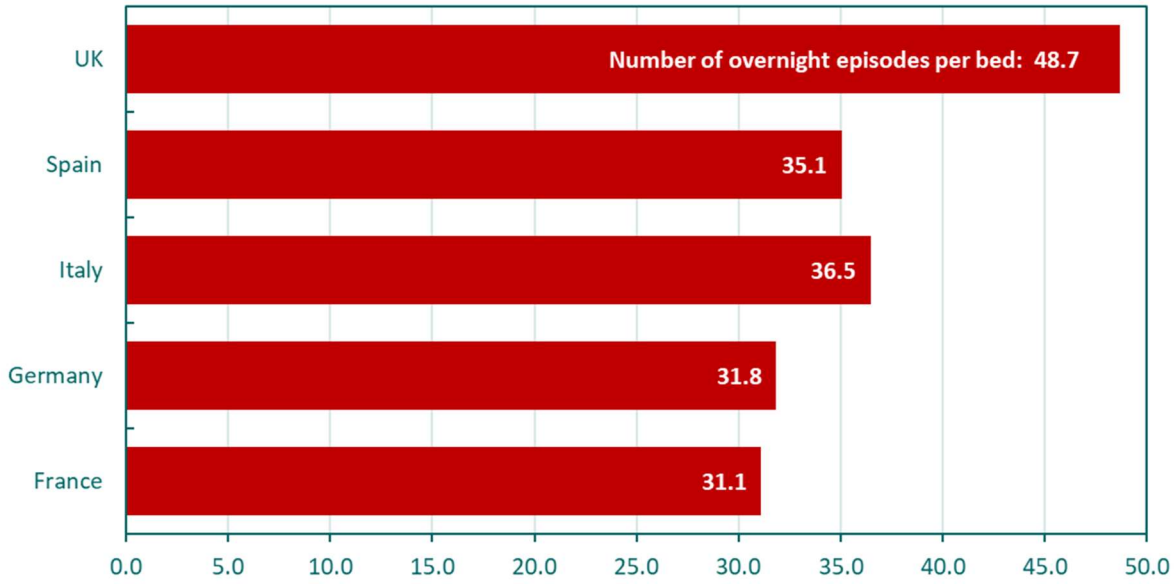
Exhibit 4: Hospital bed provision in relation to population, 2017



Source: see appendix table 3 which also provides a time series

These comparative figures strongly suggest that the UK hospital system has a stock deficit, and that the only way around that limit is to run UK hospitals as high flow systems which work through speed combined with continuity of patient throughput. The bottleneck scarce resource is the hospital bed, so (as we noted above) the system has been directed towards reducing the average length of stay and increasing the number of times each bed is used annually. This is quite a crude way of thinking about flow because the availability of specialist wards with appropriate beds, and thus the flow of patients between wards, is also relevant; at the same time, high flow becomes more difficult with an ageing population and an increasing number of elderly patients with comorbidity problems. But the UK hospital system has surmounted these difficulties to lead all others in Northern and Southern Europe on flow measures like the number of patients using each bed in the course of a year. We can proxy this from OECD data by division, taking the number and duration of overnight patient stay episodes per year as the numerator and the number of available beds as the denominator. On this basis, in 2017 the UK used each bed 49 times each year; in France and Germany each bed was used 31-32 times and in Italy and Spain 35-37 times

Exhibit 5: Overnight stay episodes per bed (acute and general care), 2017



Source: see appendix table 4 which also provides a time series

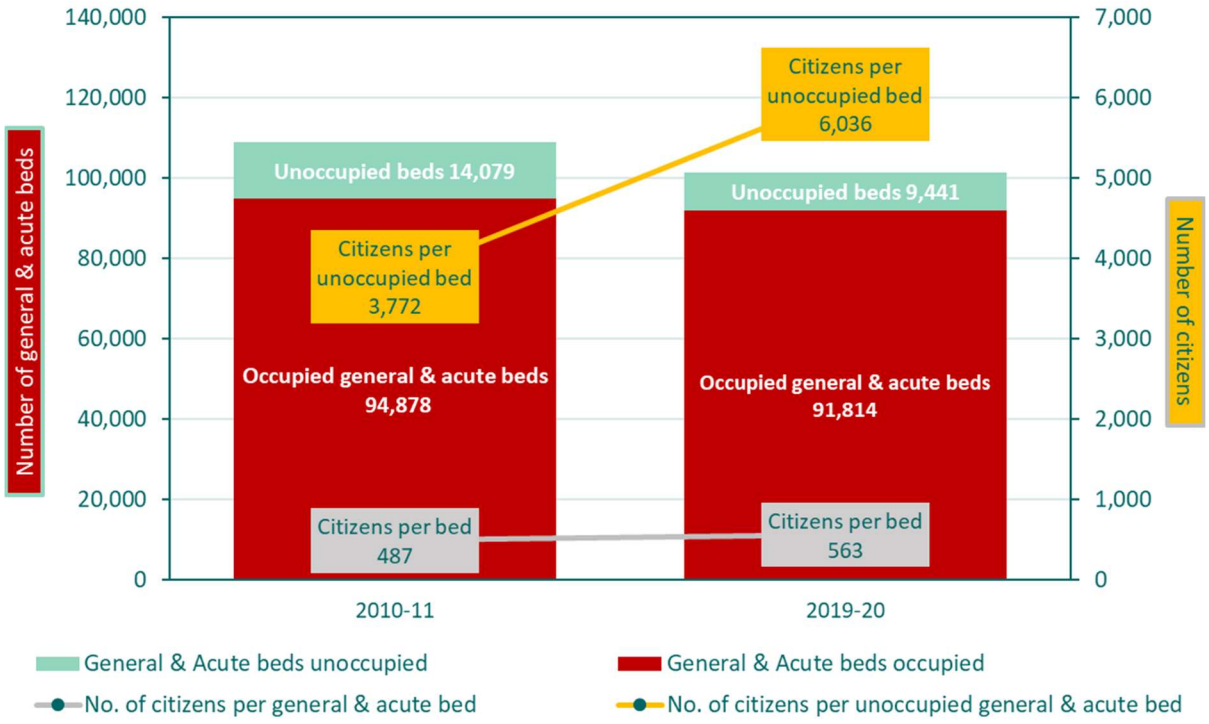
The further complication is increasing citizen demand for hospital services which logically required higher speed or more continuity from hospitals if beds and other resources are not increased to match; this was especially so in the austerity years after 2010 when, as we shall see in chapter 4, NHS funding was increasing much more slowly than in earlier years. The pressure of increasing demand was relentless across the whole hospital system through this period. In England between 2010-11 and 2018-19 the number of hospital admissions rose 15% to 46,900 per day; the number going to major A&E departments rose 13% to 43,000 per day. The number of emergency admissions to hospital via A&E rose by 35% to 12,850 per day and the number of citizens receiving a first treatment for cancer rose by 27% to 859 per day (House of Commons Library 2019). Our conclusion is that in England and the rest of the UK, the hospital system was being forced to behave rather like the speeded-up assembly line in Chaplin's *Modern Times*, putting pressure not just on the workforce but on every fixed resource.

A high flow system under demand pressure is inherently fragile because flow can be interrupted for all kinds of reasons inside and outside hospitals: demand surge, bottleneck processes, staff shortage, equipment failure, 'bed blocking' through inability to discharge patients. Any hospital system, or other health service, needs buffers or spare capacity which covers irregularities in demand and interruptions to flow. Spare capacity usually costs money and is often not easily stored: PPE equipment can indeed be warehoused, and wards can be mothballed but staff on stand-by are expensive and often need retraining for new tasks. So, how much capacity is appropriate and in what form is a matter of judgement within physical and financial limits. What is unquestionable is that from about 2015, with the pressure of increased demand on a limited stock of all kinds of resource, the English NHS hospital system was running with no spare capacity buffers. A normal accident could be expected.

The evidence on bed availability is the most straightforward indicator of a maxed-out system. Tables 6 and 7 in the appendix summarises the available evidence on annualised rates of

occupancy of general acute beds in NHS England which rose from 87% to 91% between 2010-11 and 2019-20. Bed occupancy rates vary over the year and are typically higher in winter; so, an annualised rate of 91% means something like full capacity in general and acute beds with the system struggling to cope every winter even without a major flu outbreak. When the system is close to capacity, an increase in annualised occupancy rates by 4% (as between 2010 and 2020) is enough to substantially increase system stress and the risk of normal accident; over the whole year in 2010-11 the English NHS had one general and acute unoccupied bed for every 3,772 people in the population and by 2018-19 that figure had increased to 6,036.

Exhibit 6: Number of general & acute beds in NHS England and the number of citizens per occupied and unoccupied bed



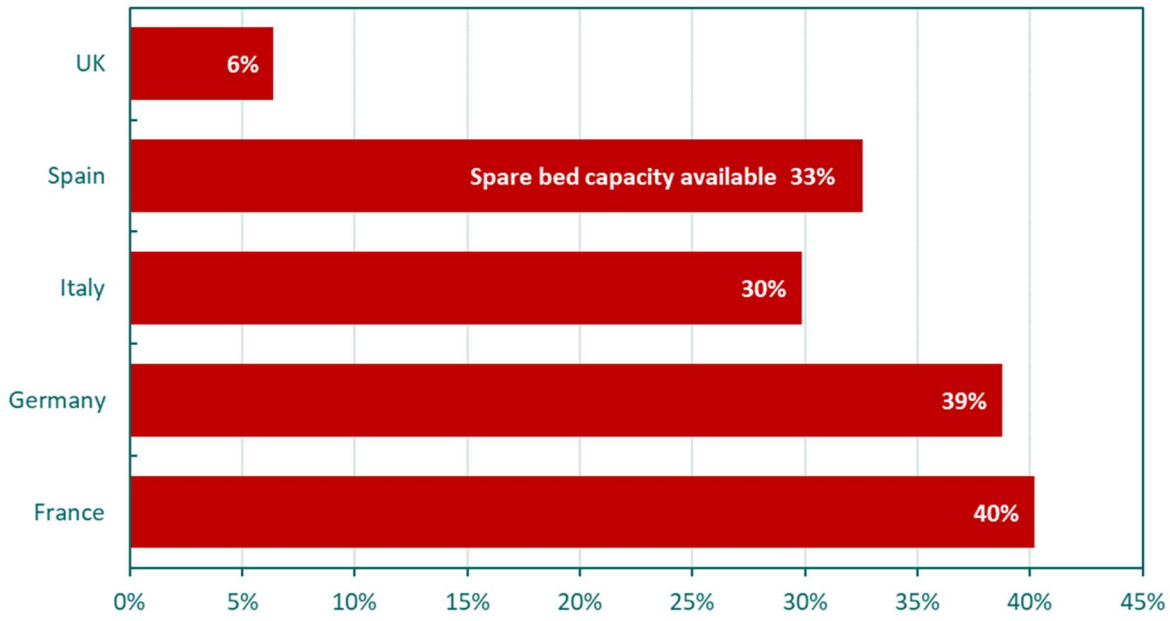
Source: Appendix table 5

When the Covid-19 accident happened, the immediate problem was not system-wide bed shortage but the availability of a particular kind of specialist bed in critical care. Here the problem was not relative but absolute shortage (as would be in the case of most health accidents which typically require specialist resources). When crisis hit, England had around 100,000 general and acute beds but only 5,000 critical care beds, In January 2020 just before Covid-19, NHS England reported a stock of 4,123 adult critical care beds, supplemented by 312 paediatric intensive care beds and 1,439 neo-natal critical care costs. At that point, by the standards of the whole system the mid-winter occupancy rate was relatively low at 83% with 3,423 beds occupied on the January 2020 census day. But the absolute number of English critical care beds was so small that the margin of safety for an English population of 56 million was just 700 beds each (probably) staffed by one critical care specialist nurse. (NHS England 2020a)

If safety margins are a matter of judgement, international comparisons bring out the point that the buffer decisions of NHS England and the devolved British nations were completely

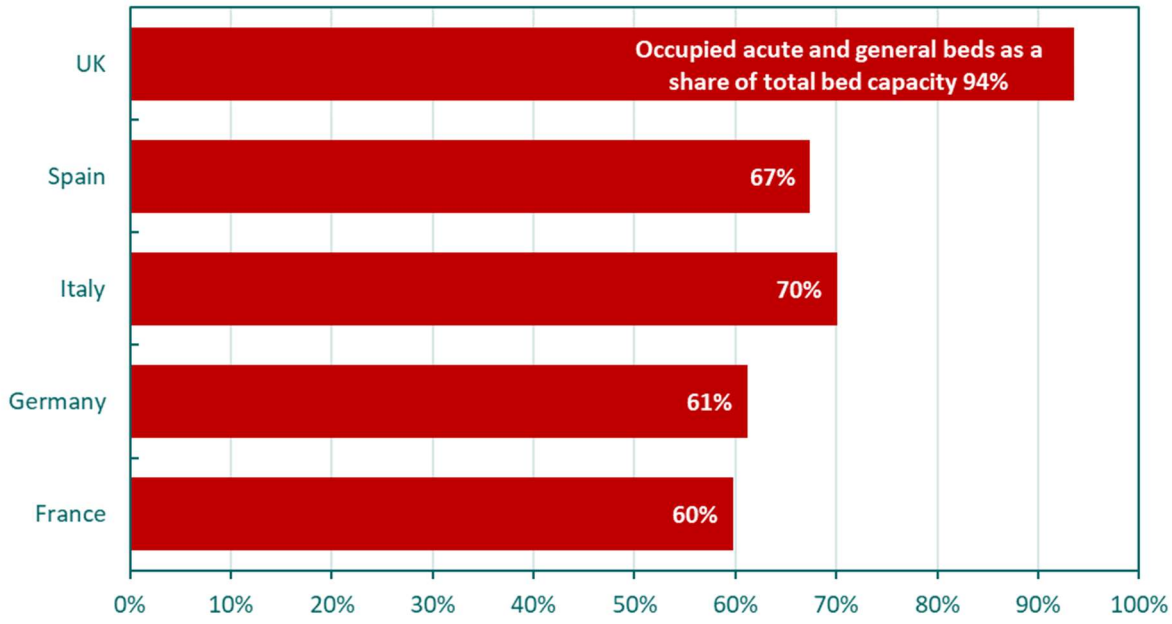
out of line with those taken in other European countries. It is not just that Germany had 25,000 intensive care beds against less than 5,000 in the UK. From the OECD data we calculate acute and general bed utilisation rates in the UK and in other European countries. On the OECD measure, the UK bed utilisation rate rose from 87% in 2010 to 94% in 2017; so bed utilisation in the UK as a whole on the OECD measure is broadly in line with the position in England on the NHS bed occupancy measure. The position is startlingly different in other European countries included in the table below. Bed occupancy rates are rising in three of the four countries, but all the European countries start and finish at dramatically lower rates. In 2017, the UK bed utilisation rate was 94% against a European norm of 60-70%; with France at 60%, Germany at 61% Italy at 70% and Spain at 67%. By European standards, the English default onto a low stock hospital system with no buffers looks like irresponsibility.

Exhibit 7: Acute and general care overnight stay beds average available spare capacity, 2017 (excludes maternity beds)



Source: see appendix table 6 which also provides a time series

Exhibit 8: Acute and general care overnight stay beds average occupation rates, 2017



Source: see appendix table 7 which also provides a time series.

All the comparisons so far have been physical, but the addition of financial information brings out another peculiarity of the English acute hospital system. Ordinarily, when flow systems are run close to capacity, the result is increased physical fragility combined with more financial robustness; thus, a car factory typically covers fixed costs at around 70% of capacity and the extra units of throughput at higher rates of utilisation are then typically highly profitable and factory utilisation above 70% increasingly generates large cash surpluses. We would expect something similar in NHS England hospitals because financial incentives for higher throughput are built into the system via waiting time key performance indicators and activity-based systems of payment per treatment: a national price for each standard procedure was originally introduced to cover a small proportion of elective hospital care, but by 2014-15 it accounted for two thirds of acute income.

But the price per treatment is set so that in order to break even many hospital trusts find that they need bed occupancy rates above 100% (see the Barts case below). In recent years nearly half of all provider trusts have incurred operating deficits and a smaller group of hospital trusts incur large deficits every year. Deficits. then become a source of additional system stress as they divert managers and clinical teams into cost reductions which do nothing for the quality of patient care. The Barts example shows the difficulty of operating under these conditions; and also shows how poor value for money PFI schemes add extra financial burdens. Hospitals could not be allowed to go out of business, so annual deficits were covered by subventions from the centre which congealed on hospital balance sheets as debt which realistically was never likely to be repaid. Indeed, as a deck-clearing exercise in the early stages of the Covid-19 crisis, £13.4bn of accumulated trust debt was written off (without, however, any commitment to revising the acute care pricing regime which caused the problem in the first place.)

Box 1: Barts NHS Hospital Trust

The results of the pressure to increase flows have been predictable. We illustrate this in Appendix tables 8, 9 and 10 for the Barts NHS Hospital Trust which combines prestige specialist provision at Barts and Royal London hospitals with three East London community hospitals. This shows that since 2012 Barts has operated at 95% or higher rates of bed occupancy. It has operated, that is, with no effective capacity buffer at all. It also shows that the price per treatment is set so low that Barts makes an operating loss every year because revenue from treatments does not cover the medical costs of providing those treatments even when running at full capacity. To put it differently, if Barts is to break even, bed utilisation needs to be more than 100%. Matters are then made worse by the handicap of a burdensome PFI contract which adds extra finance costs which have turned an operating deficit of £515 million over 8 years into an operating plus finance costs deficit of £817 million. This deficit is partly cancelled by balance sheet revaluation of assets upwards by £260 million between 2012/13 and 2018-19; this is the kind of opportunistic financial engineering which distressed corporates do to mitigate or postpone insolvency.

Some systems are intrinsically fragile. As we showed in Chapter 1, this is Perrow's argument about nuclear power generation with PWR reactors. The implication of his argument is that nation states should take political decisions not to build and operate such systems, as happened in Germany after the Fukushima catastrophe in 2011. Health care systems are different. This is because they are not *intrinsically* fragile, so the political implications are also different.[5] The implication is that nation states need to take decisions which maintain the robustness of their health care systems. From the evidence on physical provision and financial framework, this is what the Ministry of Health and NHS England have failed to do for English hospitals. When the Covid-19 crisis happened, the shortage of critical care beds, ventilators, staff and PPE was obvious to all. But behind this was a highly stressed and fragile acute and general hospital system which would have struggled to cope with any other significant disruption; and would most likely created further problems in the care home system. The UK acute hospital system was operating without buffers. It was an accident waiting to happen.

2.2 Efficiency discovered (and delivered?)

Nobody saw Covid-19 coming but, as the quote at the beginning of this chapter indicates, the hospital trusts had (through their NHS Providers organisation) repeatedly warned that a highly stressed system could not deliver more from their available resources. But, in the austerity years after 2011, the political decision was made that hospitals had to deliver more. The NHS high flow, bufferless system with no safety margin was partly the inevitable consequence of under-resourcing and treatment prices irresponsibly set below the level necessary for financial sustainability. But the irresponsible policy was also justified intellectually by a discourse about 'efficiency gains' and eliminating 'waste' regardless of system stress and the absence of buffers. This reflected the opportunistic political

[5] Perrow (2010) distinguishes between those accidents caused by the self-interested actions of key elite agents, and normal accidents intrinsic to certain kinds of systems.

appropriation of health economics as a way of thinking about health systems; and also the *ad hoc* interventions of consultants, including those who promoted 'lean thinking'.

The categories and calculations of economics came late to health; in the standard accounts, the discipline begins with an article by Kenneth J Arrow in the 1963 *American Economic Review* (Arrow). In the 1980s health care economics in the UK was a small and somewhat peripheral albeit proselytising discipline (Ashmore, Mulkay and Pinch 1989). But in 2020 the UK has 15 taught Masters' programmes in health economics or economic evaluation and health economics and the discourse has become a powerful influence on policy thinking. This is for the good insofar as it empowers evidence-based approaches. But health economics has also operated with a concept of efficiency that was politically appropriated in the 2010s to legitimate the pursuit of system-wide efficiency (while ignoring the need for buffers).

In mainstream economics technical efficiency is the ratio of output per unit of input; and this goes along with the expectation that outputs should be maximized for given inputs. This conceptualization in health economics opens up a world of productivity comparisons between different operating units and over time. These technical comparisons are easiest to understand at a single process level: in physical terms, does the medical team in hospital A perform as many hip replacement operations in a year as the team in hospital B? and has team A increased the number of hip replacements this year as compared with last year? This basic physical concept of efficiency can then be developed and used in a variety of ways as in the pricing of specific hospital treatments and/or for driving gains across the whole system.

In the pricing of treatments, economics fuses with management accounting. The input/output calculus can be expressed in financial terms because the labour inputs have a cost and the completed treatment has a price; so that low productivity means high cost. Hence in acute hospitals we have activity-based unit cost comparisons per patient treated or operations performed at different sites; and, using this information, it is possible to set standard prices paid for treatments, as in the DRG system first used in 1983 by Medicare in the United States (Chilingerian 2008). But we can then ask: why do the standard prices paid to Barts Hospital Trust not allow the hospitals to break even or generate an operating surplus? And the answer takes us to a political appropriation of the efficiency calculation by the Ministry of Health which was always and increasingly unjustifiable in the hospital system.

In mainstream thinking on national economies, as in Haldane's recent work (2018), the assumption is that efficiency/productivity gains could and should be made by firms through time; and that, at any moment in time, policy should aim to reduce the tail of laggard low physical productivity and high cost producers. This is a gross over-simplification. In classic work between the 1960s and the 1980s Baumol et al observed that many labour-intensive service activities did not achieve the same sustained productivity increases as manufacturing activities (Baumol, Blackman and Wolff 1991). That observation has subsequently led to a large literature discriminating different kinds of service activities which can or cannot achieve sustained productivity gains. In ICT-based services, for example, sustained productivity gains can be made (Maroto and Rubalcaba 2008). But, from this point of view, NHS hospital services are generally not activities where large, continuous efficiency gains have been or can be gained.

Historically, the NHS system as a whole has as has made very modest system wide efficiency gains which most authors estimate at less than 1% per annum in the long run (Keohane 2018); in this respect the NHS is apparently aligned with other personal service activities where neither exogenous technology improvements nor good management are transformative. There is erratic variation between NHS performance in sub-periods reflecting one-off technology changes like day surgery, and reductions in input costs like the move to generic prescription drugs. If the historic record is discouraging, critics could argue that this system wide performance simply shows that NHS managers and medical teams tolerate inefficiency; and that there is, for example, scope to do more in many hospitals through installing good management.

But this argument about tolerated slack and poor management encounters a major problem as soon as we look at the dispersal of productivity growth rates within and between UK hospitals. The crucial point here is that it is not possible to identify a group of efficient, high performing (and, by implication, well managed) acute hospitals in the UK. This is because in practice the data show no consistency in the productivity growth rates of individual hospitals from one year to the next, and individual hospitals have highly variable performance across departments (Aragón et al. 2017). By implication, idiosyncrasies of time, place and activity are very important as determinants of efficiency in ways that nobody understands; and this in turn suggests that efficiency returns to good unit management are very limited.

All this did not prevent the Health Ministry's political appropriation of increased efficiency as a system objective in the austerity years of the 2010s when, as we will show in chapter 4, the NHS obtained less generous financial settlements. 'Efficiency gains' then became the way in which the Ministry of Health and senior NHS managers sought to bridge a threatening gap between income and expenditure as they struggled to meet increasing demand. In practice productivity gains were extracted year by year from the whole hospital system by using an 'efficiency factor' to reduce the annual uplift in the national NHS prices paid for treatment: thus, in 2019-20 the system wide efficiency factor is 1.1% (NHS England and NHS Improvement 2019b). More was obtained in the 2010s, when NHS productivity increased by 2.1% per annum per year between 2010-11 and 2016-17. But this was cost cutting masquerading as efficiency gains because, the most significant gains were the result of wage restraint keeping input costs low (Maguire 2019).

Beyond this system-wide pressure for 'efficiency gains', by the end of the 2010s individual hospitals were being targeted in a campaign against 'unwarranted variation in costs.' This problem was framed using comparative productivity about the benefits of improving the performance of the long tail of high cost laggards. The difficulty here is that, as we have just seen, there is no consistently high productivity group of (well managed) hospitals and much of the cross-section variation in efficiency is simply unexplained. But this did not stand in the way of another political appropriation. So, for instance, the Carter Review (Lord Carter of Coles 2016) created an imaginary best practice 'model hospital' with metrics and benchmarks for measuring efficiency and productivity. On this basis, efficiency savings of £5 billion were promised, and the Health Minister accepted all Carter's recommendations so that productivity gains figured prominently in his subsequent mandate to the NHS.

If these productivity gains are magical thinking they still have to be delivered. Hence the importance of can-do hospital managers supported by consultants. Here economists have a limited role because within the discipline efficiency is a ratio of inputs to output with production as a black box. Economics does not engage with the sequence of operations necessary to produce complex goods or services; although managing this sequence is the key to improving the ratio of inputs to outputs. Hence the importance of consultancy firms for the health managers in acute hospitals who have to deal with these specifics; and hence also the importance of consultants bringing ideas borrowed from outside economics. We will show how this adds further confusion by considering the 2006 *Lean Academy Report* for the NHS Confederation whose approach was subsequently increasingly used in hospitals (Burgess and Radnor 2013) and was officially endorsed by NHS Improvement in 2018 (NHS Improvement Hub 2018).

The Lean Academy Report recommended the elimination of non-value adding, waste-creating activities through techniques pioneered in the Toyota Production System on the assumption that 'the principles on which lean is based are generic … (and) can be applied anywhere at home, in a bank, GP practice or hospital.' (Jones and Mitchell 2006). Like much consultancy literature, the Lean Report is constructed in a homiletic format where the efficacy of the principles is illustrated with vignettes of cases where the principles of lean have been applied and (always) produce dramatic savings; thus the report begins with an account of how the application of Lean in Bolton hospital pathology lab reduced process time and labour requirement to deliver 'improvements (which) can be replicated across the entire NHS' (Jones, 2006 #23, 4-5).

But this claim to efficacy is decisively disproved by a recent systematic literature review. This review finds that lean interventions have no statistically significant association with patient satisfaction or health outcomes; a negative association with financial costs and worker satisfaction; and inconsistent benefits on process throughput measures such as patient flow (Moraros, Lemstra and Nwankwo 2016). This disappointment is not surprising because health care can only be made to fit the Toyota template by making strong and unrealistic assumptions about the similarity between car factories and health systems while ignoring obvious differences. The *Lean Academy Report*, for instance, claims that most system volatility and unpredictability is not created by external demand but 'by the way the NHS itself is organised.' (Jones and Mitchell 2006,13). In this way of thinking about hospitals, pandemics do not count.

The further complication is that the high flow achieved by Toyota factories in the 1980s or Ford at the Highland Park plant before WW1[6] is a special case which is not representative of most manufacturing operations, let alone the NHS. In 1910s Ford or 1980s Toyota, the factories were already operating near capacity, with a virtually infinite demand for their products. With their fixed costs covered, building extra cars was hugely profitable and the factory manager's problem was only to get that extra car down the line. Most 1980s manufacturing plants in America or Europe, including the assembly plants of firms like GM or Renault, were differently placed because they had to manage fluctuating demand, were often working well below capacity and could handle occasional demand surges by extending

[6] On Ford and Toyota operations see Williams *et al*. (1994).

delivery waiting times. A UK hospital manager faces yet another different set of problems because she must manage high throughput near capacity (without financial reward) while maintaining buffers and surge capacity because a waiting list for urgent treatments is unacceptable

So here is the problem. The lean approach is doubtful because it extends techniques applicable to (some) manufacturing to health systems where they are not relevant. Physical and financial efficiency is indeed the key to competitivity in tradeable manufactures and lean can help some firms where the aim is to crank out more profitable output. Though, let us add, even here the advocates of lean exaggerate the scope for physical efficiency gains and downplay the importance of the financial leverage that comes from low wages or premium pricing. Low wages were the decisive advantage for Japanese manufacturers before the late 1980s (Williams et al. 1992) as they were for Chinese manufacturers through the 2000s and 2010s. There are few lessons here for an NHS which provides sheltered public services within a national wage settlement, with the premium price offer of queue jumping properly confined to a small private medicine sector.

None of this criticism of Lean and its false analogies should be understood as a general attack on the pursuit of value in the NHS which must in some sense usually involve the elimination of waste. Clinicians should not offer dangerous or useless medical procedures; and the costs and benefits of useful procedures should be publicly evaluated so that, for example, the efficacy claims and price demands of pharmaceutical companies can be challenged. Hospitals need National Institute for Health and Care Excellence guidelines on new and existing medicines and guidelines for appropriate treatment; and questions need to be raised about post code lotteries and regional variation in the availability of treatments. Our point is simply that a UK acute hospital in the 2020s is not a Toyota assembly plant in the 1980s and, if an acute hospital is understood and managed as though it was a car plant, the result will not be improvement but more probability of normal accident

But what of public health? What of the failure to ramp up the number of tests in the face of Covid-19? In the next section we explore the context of this for public health in England.

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3. Reorganising public health and laboratories

> *'The medical laboratory, also called the clinical laboratory or the pathology laboratory, provides diagnostic testing services…to help identify the cause of disease and changes in the body produced by disease conditions'* (definition of medical laboratory in encyclopaedia.com)

When the Covid-19 pandemic came the UK did not have enough clinical laboratories with PCR machines and suitably trained technicians for volume testing and this system bottleneck has been, and remains, a major constraint on policy. Before the lockdown, in mid-March limited test capacity forced the abandonment of a test, trace and isolate strategy; in the early stages of lifting lockdown at the beginning of June, inability to return the results of tests quickly was one of several constraints on the reinstatement of this strategy. The question of how and why England did not have enough test capacity is a complicated story which has to be reconstructed from many sources. In the first section we do this by providing a narrative history of the place of clinical laboratories in the UK health system which is illustrated by organograms which show how a system of distributed and embedded laboratory testing was undermined. A second section then argues this was the inadvertent consequence of health service reorganisation with other objectives so that the loss of distributed laboratory capacity was unintended collateral damage.

3.1 A narrative history of public health laboratory reorganisation

The laboratory was originally an adjunct to clinical medicine within the hospital where it provided analysis of body fluids and tissue or organ samples. Hospital laboratories in the form of ward side-rooms came into being at the end of the nineteenth century and in the first two decades of the twentieth century in England (Hughes 1993; Waddington 2010) to service ward needs for clinical pathology (an additional histopathology laboratory was usually located elsewhere in the hospital). Supplemented by a patchy network of pathology laboratories in and beyond the hospital in the interwar period, such side-ward facilities remained in place for routine tests in many hospitals until after the Second World War (Hughes 1993).

An Emergency Public Health Laboratory Service was established at the outset of war in 1939 to respond to possible wartime emergencies including bacteriological warfare, to back up local (and sometimes inadequate) microbiological services (Galbraith and Young 1980) and to detect national epidemiological patterns across different districts (Williams 1985). As part of the National Health Service Act this was placed on a permanent footing in 1946 with the creation of the Public Health Laboratory Service (PHLS) (Galbraith and Young 1980; Howie 1965). In the post-war period hospital laboratories grew in scope, while the role of the PHLS was to develop a network of laboratories to support GPs, local health authorities and Medical Officers of Health, and work with hospital laboratories (sometimes PHLS and hospital laboratories were combined) on a wide range of tasks which focused in particular on the spread of communicable diseases.

There were strong links between the PHLS and local practitioners. The PHLS offered advice and personal consultation for hospitals and practitioners such as the Medical Officers of

Health, the local government employees who were key figures in the fight against infectious diseases for one hundred years before 1974. The links were supported by a network of laboratories that spread across England and Wales and were increasingly differentiated in role. So, in 1965, and in addition to the hospital laboratories themselves, there were something like fifty-five Area Laboratories, eight Regional Laboratories, and a Central Public Health Laboratory in Colindale in North London (Howie 1965), plus a series of specialist laboratories mostly located in Colindale.

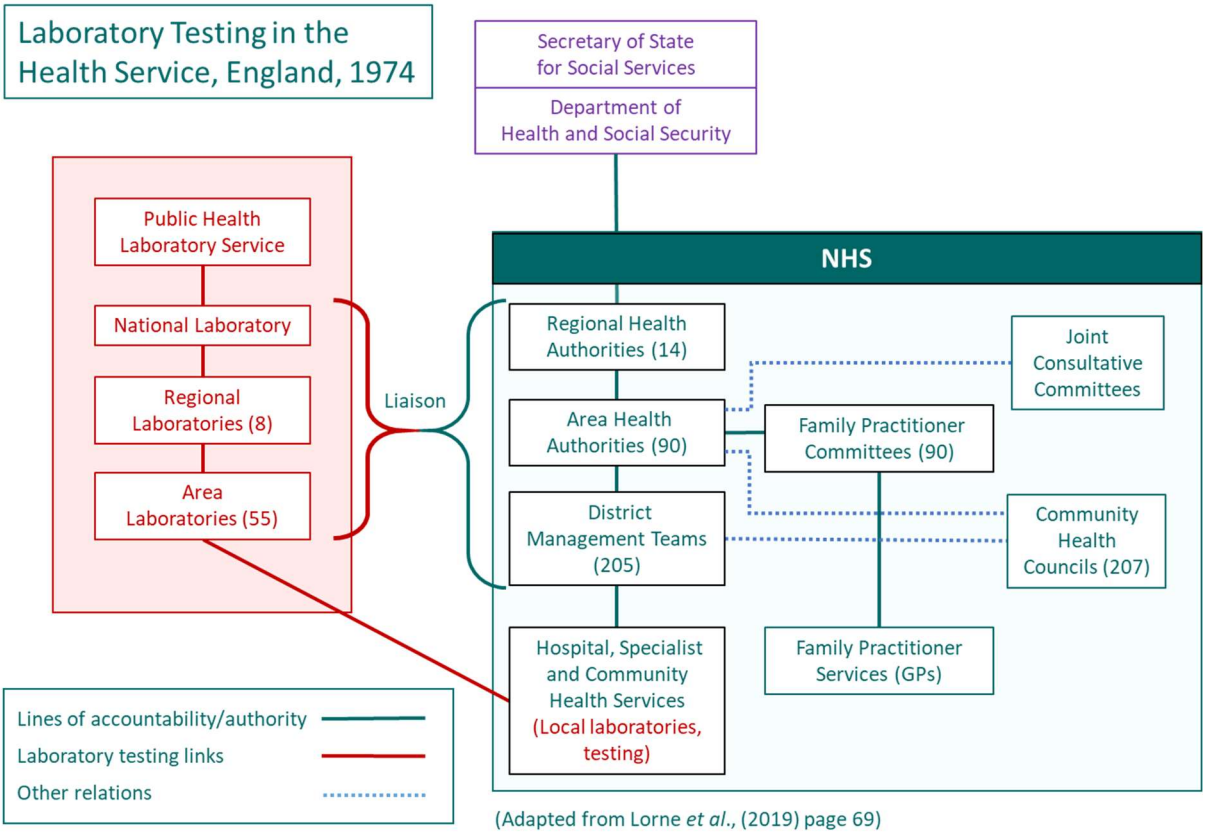
As part of a new division of labour between different kinds of laboratories, Colindale housed a series of *reference laboratories* which set standards. Colindale also undertook unusual tests that were not routinely required. At the same time, the PHLS also undertook and published research. So, for instance, the polio virus was isolated in one of its laboratories. As Howie commented in 1965, the PHLS was:

> 'not wholly a routine service, although it provides one for those whom it serves. Nor is it just another research body; but it cannot hope to do its work without the kind of people, methods, and resources made available for research.' (Howie 1965, 503).

Until 1961 the PHLS was part of the Medical Research Council, but at that point it was made independent (Howie 1965). There was more change in 1974 when the Medical Officers of Health were abolished, and public health doctors were moved into the NHS as community physicians at district and regional levels (Mold et al. 2019). So by the 1980s, at District Health Authority level, NHS community physicians liaised with local government environmental health officers to identify disease sources and trace contacts. Dividing responsibility, they used the PHLS area laboratories to deal with old challenges such as *salmonella* and passed tropical diseases and new challenges on to specialist centres or to Colindale (see figure Exhibit 9, adapted from Lorne et al. (2019) below)[7].

[7] This account of how the system worked is based on the recollections of Aneez Esmail, who worked in Manchester public health from 1987-92.

Exhibit 9: Laboratory testing in the Health Service, England, 1974



(Adapted from Lorne *et al.*, (2019) page 69)

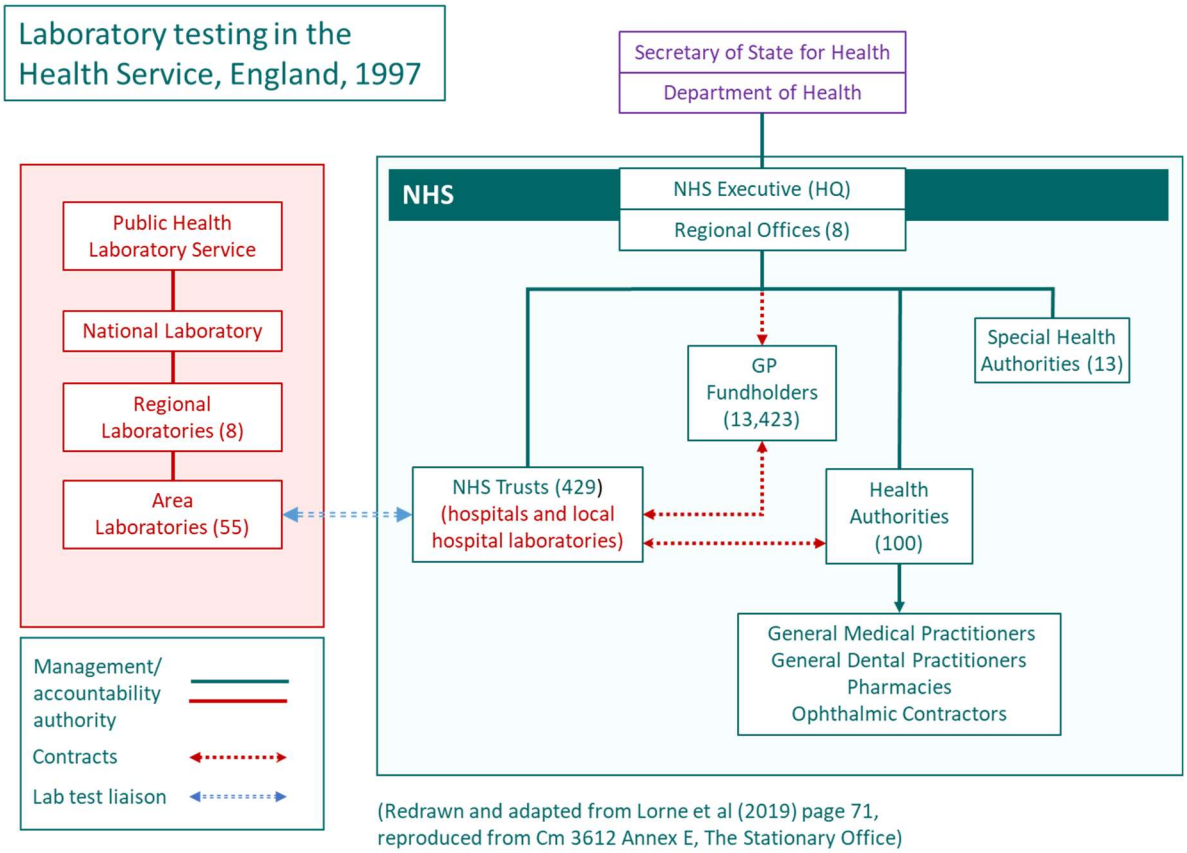
The organogram above describes the post 1974 system that lasted into the 1980s. It shows that there were two parallel, bureaucratic hierarchies for PHLS and the NHS each with a complicated and overlapping but vertically organised distribution of functions which, as we have described, were knitted together by tacit social knowledge and collaboration. Often the NHS hospital laboratories were, in effect, the bottom tier of the PHLS laboratory system at district, area and regional levels; those involved knew who to talk to about routine matters; or in an emergency where the skills were, and which connections and resources could be mobilised. In the 1980s the public health laboratory system was a working model of distributed capability. There is no guarantee that this kind of system will have the right kind of procedures, equipment, technicians and researchers for every eventuality; but it certainly has the organisational capacity to mobilise resources for new challenges.

But all this was disrupted by the NHS reforms which started in 1991 and then continued up to 2012. For these twenty years NHS reform was about installing a purchaser-provider split in a delayered and much flatter NHS organisation. Increasingly the crucial NHS relation was to be financialised and horizontal between primary and secondary care; that is, between GP purchasers who bought services from hospital providers. And the logic of this financialised relation was also about stripping out the layers of NHS bureaucracy at district, area and regional level. When GP doctors were contracting for hospital provider services, upper level NHS bureaucratic control and resource allocation became redundant because the 'internal market' would do the job. These changes were made to reform the NHS without any thought for clinical labs, but their consequences for the laboratory system were dramatic.

Where there had previously been two bureaucracies (NHS and PHLS), that were talking to each other at one level and across levels about public health issues, there now was a single bureaucracy in PHLS talking to itself. And PHLS was increasingly detached from the hospital laboratories which had provided the bottom tier of the public health laboratory system so that much of the routine volume testing capacity was actually inside the NHS. Now, the hospitals after 1991 were increasingly to become autonomous trust organisations charged with breaking even, and this logically implied the need for trusts to treat their laboratories as cost or profit centres which led to likely partial detachment from public health concerns. (Whitty and Jones 1992).

These changes were so radical and the NHS system was so complex that it took 20 years of continuous churning reorganisation, from Ken Clark's reforms of 1991 to those of Andrew Lansley in 2012 to complete the transition from bureaucratic coordination to an internally financialised NHS. But the direction of travel is clear from the organogram below, which describes the incomplete transition to the new order achieved by 1997. Here the majority of GPs in primary care are still subject to bureaucratic control via NHS regional offices and health authorities; but a minority have been cut loose as GP fundholders able to buy services from NHS hospital trusts which subsume their laboratories.

Exhibit 10: Laboratory testing in the Health Service, England, 1997



(Redrawn and adapted from Lorne et al (2019) page 71, reproduced from Cm 3612 Annex E, The Stationary Office)

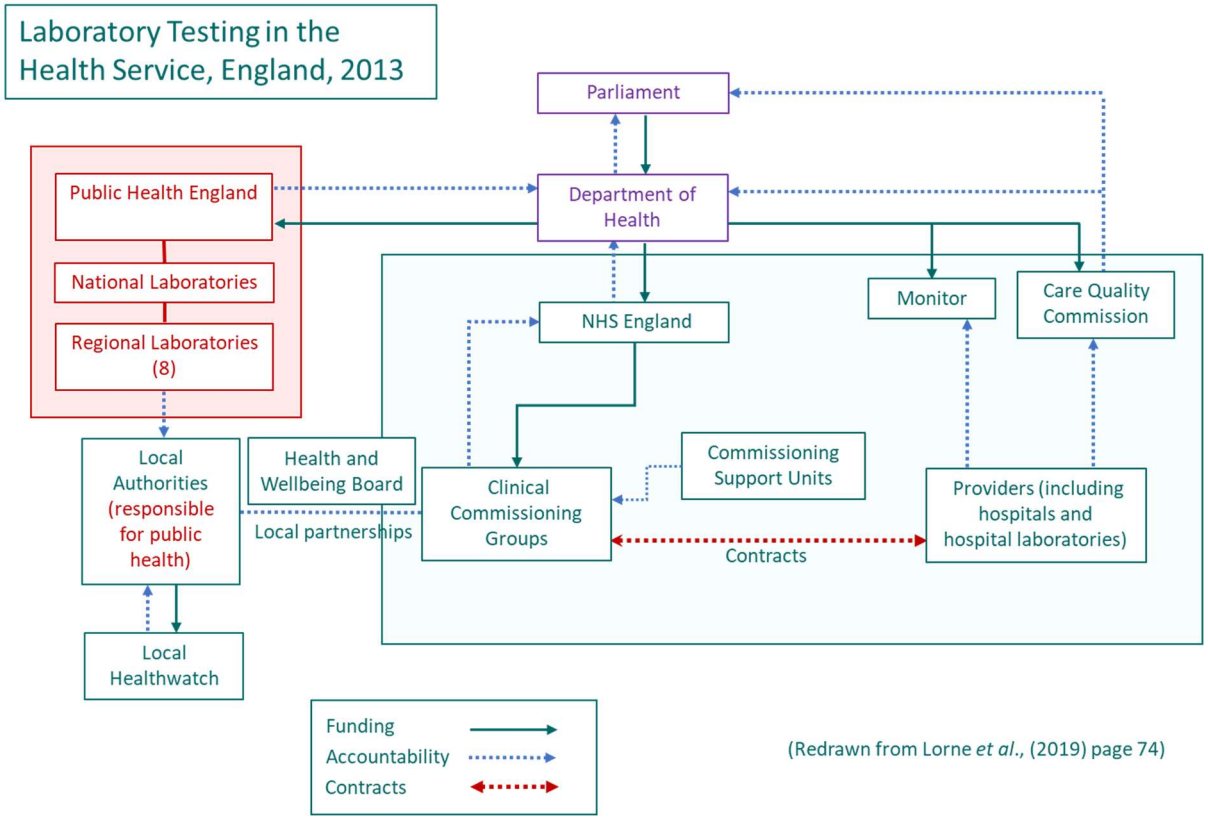
The realisation of financialised design required reorganisation of everything in the NHS and incidentally normalised continuous reorganisation of public health as the new norm. Within the NHS, financialised design was completed by Andrew Lansley's 2012 Health and Social Care Act. This pressed the horizontal relation, purchaser-provider logic already in place within the

NHS further by creating local Clinical Commissioning Groups. Meanwhile, public health was not financialised but repeatedly bureaucratically rearranged with new agencies created and dissolved as public health functions were redistributed in a 'pass the parcel' way.

An enlarged Health Protection Agency was set up in 2003. This absorbed the PHLS along with a series of other public sector laboratories responsible, *inter alia*, for environmental, chemical and microbiological threats. But more important, a decade later in 2012 the Health and Social Care Act reorganised public health quite radically. Under the 2012 Act, Local authorities (marginalised since 1974) were given back statutory responsibility for public health and took over community medicine services from the NHS. The Act also replaced the Health Protection Agency with Public Health England, an executive agency of the Health Department with the mission of improving public health and addressing health inequalities. Subsequently, Public Health England embarked on a process of centralisation. As a result, in 2020 the central PHE laboratory at Colindale is supplemented by eight regional laboratories, but PHE is in the process of 'bringing together all the public health laboratories onto a single integrated site' at Harlow outside London, where various laboratories plus PHE headquarters staff will be located by 2024 (Saunders 2017).

The organogram below shows the NHS and public health systems as they came to rest after the 2012 reforms. The old apparatus of bureaucratic control has shrunk and now survives as a small head office in NHS England. In specific circumstances this retains considerable power: witness the 17th March 2020 instruction from the NHS's Chief Executive and Chief Operating Officer to halt routine procedures and clear hospital beds for the anticipated surge in Covid-19 cases (Stevens 2020). Nevertheless, the primary driver within the NHS is the relation between all the GPs grouped into clinical commissioning groups and all the hospitals organised as trust providers. The dominant system relation is a horizontal financialised one from budget holders to hospital trust service providers. These trusts, as we saw in chapter 2, are financially beset by problems about operating deficits in ways which must reinforce the need to run their own laboratories according to cost and profit considerations. As for Public Health England, that is an appendage with no clear financial or bureaucratic relation to the dominant NHS purchaser and provider actors. The public health laboratory system is diminished because PHE's 8 regional laboratories survive but the 55 area laboratories visible in the 1974 and 1997 organogram have vanished. And to complicate matters further, neither Public Health England nor the NHS have responsibility for providing public health services, like sexual health. These have been handed to local authorities which are by 2013 distracted by their own financial problems following austerity cuts.

Exhibit 11: Laboratory testing in the Health Service, England, 2013



Perhaps the detail in our historical narrative is tedious but it provides the essential context in which it becomes possible to understand the testing bottleneck. The unintended consequence of financialization and organisational churn is a public laboratory system that has proved quite incapable of upscaling Covid-19 testing. The PHE facilities in Colindale are world class and, PHE was quickly able to develop a reliable RNA genetic signature Covid-19 test, using PCR technology. The requirement was then for volume testing which uses PCR machines and techniques which are widely used in research laboratories. A salmon laboratory in the Faroe Islands quickly repurposed itself in February with an output of 1,000 tests a day (Boffey 2020), and on some estimates there may be 10,000 PCR facilities in the UK. However, PHE was simply unable to organise the necessary volume of testing. (See box 4 below for detail).

PHE did not have the capacity in its central or regional laboratories. And it seemingly had only limited links with other NHS labs, university, or life science company laboratories. In the end the capacity to test has been (slowly) cranked up by bypassing PHE, partly by moving to life science and university facilities, and mainly by creating new 'superlabs' with much equipment borrowed from universities and other donors (Barker et al. 2020). This has increased capacity (Hodgson and Stanton 2020), though at the end of May it was clear that the relaxation of lock down requires a much larger testing operation able to return results to communities more rapidly (Barker et al. 2020). In short, testing has been, and at the end of May 2020 remained, a major bottleneck, and one with huge knock-on effects. This is a proliferating failure in a large scale 'normal accident'.

Box 2: Scaling up? from Colindale to the first super lab

- 7th February 2020: central PHE Colindale lab processing 100 tests a day; 11 labs to begin testing 'over the coming weeks' to bring total capacity to 1,000 a day (Public Health England 2020a)
- 11th March 2020: 12 labs processing 1500 tests a day. NHS laboratories and 'other labs' being brought on stream, enabling 8,000 more tests a day (NHS England 2020b)
- 16th March 2020: just 9 labs running testing (NHS England and NHS Improvement 2020, 18-19)
- 18th March 2020: 'hoped' to double to 10,000 tests 'next week'; subsequently to increase to 25,000 a day'. Subsequently the deadline for this was 'mid to late April' (Department of Health and Social Care 2020e)
- Late March 2020: The Crick Institute, Cancer Research UK units and research university laboratories participating to deliver 8,000 tests a day; the Guardian noted that 'these initiatives have happened locally, without government coordination, which until now has stuck to a centralised approach of testing' (Devlin 2020)
- 2nd April 2020: Health Department takes control and changes policy. Target of 100,000 tests a day by the end of April: John Newton (of PHE) to manage, enlisting life sciences companies and equipping large new test laboratories (bypassing PHE) (Syal 2020)
- 8th April 2020: Health Department encouraging major companies such as Astra and GSK to create 'new national business collaborations' to 'build a large-scale British diagnostics industry' (Department of Health and Social Care 2020c)
- 9th April 2020: Health Department issues first guidance for non-NHS organisations seeking to support the testing programme (Department of Health and Social Care 2020b)
- 9th April 2020: first of three new 'super labs' opened at Milton Keynes (labs at Alderley Edge and Glasgow to follow) built by Health Department with private or university organisations. (Department of Health and Social Care 2020d)

3.2 Consequences of reorganisation

The Covid-19 crisis reveals the fact that PHE Colindale was a small world class centre without the networks need to expand in a crisis: the failure to scale up testing tells us that Colindale and PHE regional labs had no effective working relations with outside labs in hospitals, universities and life science companies. Those who want a 'we name the guilty men' explanation of this public health laboratory testing bottleneck will be disappointed by the narrative in the previous section because there is no individual villain in this story. No health minister pressed a plan for public health laboratory closure. No committee or commission recommended restructuring and downsizing. The managers of Public Health England could even argue that, in the circumstances of the 2010s, they had successfully defended the research excellence of their central laboratories. And all this is true but, if nobody is directly to blame, this does not mean nothing is to blame: financialization, churning reorganisation and political noise undermined the laboratories.

What happened to the public laboratories was collateral damage in the strategized reform of the NHS over the whole period from 1991 to the 2012 Health and Social Care Act (Department of Health 2012). Over 20 years, ongoing reforms pressed the principle of a financialised relation between primary care purchasers and secondary care providers who should ideally complete; and, like all such principled reforms of complex organisations, it left activities which untidily did not fit the template and had many unintended consequences for these and other activities. Public health, which mostly cannot be re-created as a commodified service, manifestly did not fit; and as for the laboratories they were either subsumed into hospital trusts as cost or profit centres; or survived in the diminished and centralised form which PHE could sustain from its budget as a semi-detached adjunct to the NHS. As we will later see, in 2014 and 2019 plans the NHS rowed back from the principle of competition; but by then the damage had been done and there was no surviving network of laboratories and relations that might have made surge testing more feasible.

The problems were compounded by organisational churn through repeated reorganisation of NHS health care and public health. (For more detail see Box 3 in chapter 5). There was little reorganisation in the NHS between 1948 and 1974, but there were more than 50 major organisational changes between 1990 and 2009 (Edwards 2010,14-15). Indeed, less than 40% of the component organisations in the NHS survived more than ten years during that period (Edwards 2010,14-15). The consensus amongst economists is that most private sector corporate mergers and acquisitions are unsuccessful in that they do not create shareholder value. There is no reason to suppose that public sector mergers are any more successful in achieving their more diffuse public service objectives. Edwards concludes that mergers brought some benefits (Edwards 2010,4) but managers lost sight of patient safety, service developments were held up, the informal relations in smaller trusts were eroded, and distrust between colleagues from previously separate units made it difficult to transfer good practice. 'Other effects', he adds' 'seem to include the dislocation of key external relationships', and, in our view, this is crucial for the laboratories. Serial reorganisations dissipated social capital, disrupted personal relations and undermined technical and social tacit knowledge; and without these soft assets a system of distributed laboratory capacity could not work.

The effect of these two primary system-disabling mechanisms (financialization and reorganisation) were compounded by agenda change in public health which moved infectious disease control (and the laboratories required for that purpose) down the policy makers' list of priorities. Over the period of reorganisations from 1974 to 2012, there was a move from the 'big-state' public health collectivism needed to combat infectious diseases to a small state 'new public health' appropriate on the one hand to chronic disease and on the other hand to the growth of individualism. (We have, to be sure, collectively and rapidly relearned the merits of a big state in present circumstances.) But in the new public health frame, major public health issues became an effect of individual life-style choices, and it is therefore the role of the state to nudge behaviour rather than to legislate (Mold et al. 2019; Petersen and Lupton 1996). More recently – and especially following the Marmot Report (Marmot 2010) – there has also been considerable and welcome official focus on health inequalities; and indeed, the continuing importance of health inequalities is becoming clear in the Covid-19 epidemic (Kenway and Holden 2020; Wallis 2020). But, as we shall see in Chapter 5, the policy

corollaries of Marmot are unclear and health inequalities do not directly take us back to the public health laboratory system

The past 40 years has seen the emergence of a series of new infectious diseases such as SARS, MERS, Ebola and HIV/AIDS. Asian neighbours of China such as South Korea, Taiwan and Singapore drew their own conclusions about the potential need for rapid large-scale testing after watching the emergence of SARS in 2002 (Calvert, Arbuthnott and Leake 2020; Junga-a, Buseong and White 2019). But the changing UK public health agenda made the potential need for rapid large-scale testing appear less urgent and this effect was reinforced by the distraction of the political noise about austerity cuts after 2011 and Brexit after 2016.

It was perhaps never a great idea to hand public health services back to local authorities under the 2012 Act. Before 1974, Medical Officers of Health as local government employees had been key actors; but their status was low, and in the 1930s they were criticised, in some cases justly, for ignoring the significance of poverty and unemployment (Welshman 1997). A generation later local authorities were very poorly placed to become lead actors in rebuilding a public health system (with more laboratory capacity). By the 2010s, English local authorities increasingly lacked the personnel and expertise to organise or deliver services. They had been stripped of responsibility for social housing and education and in many other areas from adult care to refuse collection, they had become putters-out of contracts to outsourced providers. Furthermore, public health was returned to local authorities after 2012 in a period which coincided with unparalleled austerity cuts of 40% in local authority budgets (Buck 2020). After its transfer to local authorities, the public health grant was ring-fenced, but it was not protected from austerity cuts which cost more than one billion pounds (Buck 2020), with the biggest service cuts falling in the poorest areas (Evans 2020).

In addition, it is also clear that austerity generally distracted from pandemic preparedness in central government. Emergency stockpiles of equipment and medication, and training were all cut during the years of austerity (Calvert, Arbuthnott and Leake 2020). On one estimate, the value of stockpiled health supplies fell by £200 million between 2016 and 2019 (Davies, Pegg and Lawrence 2020). Participants describe how meetings for pandemic preparedness were '"bumped" off the diary' in the face of more urgent matters (Calvert, Arbuthnott and Leake 2020). The austerity years were not a period when a proposal for investment in the infrastructure for large-scale testing could easily have been formulated and approved.

And that was before the soap opera about Brexit sucked attention away from many functions of government, including pandemic preparedness. In 2016 a major exercise 'Cygnus' (whose results remain secret) tested the preparedness of the NHS for a pandemic The Cygnus exercise 'predicted the health service would collapse and highlighted a long list of shortcomings' (Calvert, Arbuthnott and Leake 2020). None of these seem to have been rectified; instead British politics descended into post Brexit childishness: thus, in the early stages of the Covid-19 crisis, the government failed to participate in a series of EU procurement schemes (for instance for ventilators) in February and March 2020 for ideological reasons (Boffey and Booth 2020). Whether the schemes included testing kits and materials is unclear (Hughes, Pooler and Brunsden 2020) but the decision not to participate is indicative of the ministerial state of mind.

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4. How much more money for robustness?

> *'the growth in [hospital] waiting lists and slippage in waiting times, and the existence of substantial deficits in some parts of the system, offset by surpluses elsewhere do not add up to a picture that we can describe as sustainable'* Seventh Annual Report on the Financial Sustainability of the NHS (National Audit Office 2019, 11)

'Financially unsustainable' was the verdict of the National Audit Office on the NHS system in 2017-8 before the May Government ended austerity annual settlements and promised £21.5 billion more revenue funding over 5 years. In this chapter we argue that this settlement was nowhere near enough to secure robust systems and avoid more normal accidents and proliferating failures interacting in unpredictable ways. Adding more funding is necessary but not sufficient when we have made such a comprehensive mess of the NHS and the public laboratory system The conditions of robustness are complex and need to be grounded in political context and intellectual analysis of many factors in addition to funding; hence in chapter 5 below we argue that renewal in health needs to be seen as part of a larger project of reskilling the state after a destructive period of hyper innovation. In the current chapter we demonstrate that any plausible remedy for the under-resourcing of the NHS requires very large amounts of extra funding which in turn raise questions about the limited revenue raising capacity of the UK tax system.

4.1 The current five-year funding settlement as 'reversion to mean'

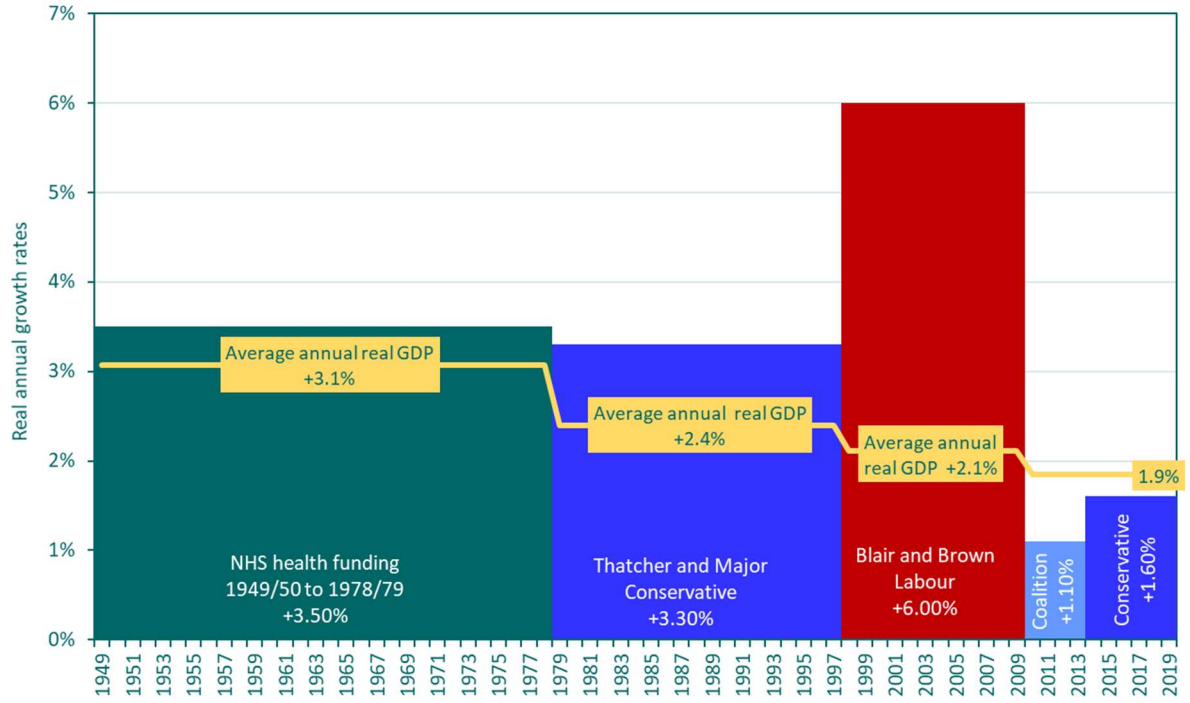
The argument so far has been about buffers because in acute hospitals and public health laboratories, the necessary margins of safety do not currently exist. The first thing to recognise is that the margin of safety is often two or three dimensional and will take different forms in various systems. Thus, in acute hospitals, the first prerequisite is increased funding for the hospital system, which then has to flow through appropriate payment systems and business models so that funding translates into physical resources like beds and trained nurses. In public health laboratories and more generally in public health, the first prerequisite is organisation: in the case of laboratories, the requirement is for a capillary network of relations which sustains distributed capacity both inside the NHS and outside in autonomous institutions such as universities.

When these qualifications have been entered, inadequate NHS funding settlements have inevitably eroded buffers and safety margin in all kinds of ways because extra beds and hospital staff or standby surge testing capacity cost money. And there is a reassuring Westminster political answer – from both government and opposition – to this question of how much more money is now required. The answer is that the NHS (including acute hospitals) can be kept going if it gets a real term revenue funding increase of somewhere between 3.5 and 4.5% per annum. In 2018 Prime Minister May committed to a 'sustainable long term plan' for NHS England which offered an increase of 3.4% per annum over the next five years which amounted to a cumulative £20.5 billion real increase (£33.9 billion in cash terms) over the period on a funding base line of £ 114.6 billion in 2018-9 (Department of Health and Social Care 2018). In 2019 the Labour opposition fought an unsuccessful election on the promise of an increase of 4.3% per annum plus a promise to 'return NHS England to

the international average level of capital investment' (The Labour Party 2019, 31). Our argument is that this kind of funding settlement will not bring sustainability (however defined) and certainly provides no margin for rebuilding buffers.

In perspective, the May settlement was about restoring NHS annual revenue funding increases to something like the historic norm in the pre-austerity years. In the whole period from its foundation in 1948 to the John Major years in the 1990s, real NHS funding across the UK increased by something like 3.4% per annum. Funding then increased more rapidly by 6% per annum under New Labour before falling away in the austerity years when the health budget was not cut but settlements were much less generous. In the years of austerity, the average annual real growth under the coalition government was 1.1% and then just 1.6% under Conservative government to 2018-19

Exhibit 12: Average annual real growth in NHS funding and UK GDP by time period (The Health Foundation 2019)



Source: see appendix table 11 which also provides a time series.

Westminster's 'reversion to historical mean' funding settlement is certainly less generous than it sounds for the hospitals because it is going into a run-down hospital system which is in a financial and operating mess. By 2017-18 43% of trusts were in deficit, key performance indicators such as A&E waiting times were (once again) deteriorating and 'NHS performance on key standards has steadily declined since 2012-13 in most areas' (National Audit Office 2019, 8-9 and 22). And the May settlement was predicated on magical thinking about how the NHS could sustain an 'efficiency gain' of 1.1% per annum. (NHS England 2019b, 103). By 2017-18 in a highly stressed hospital system NHS Quarterly Improvement Reports showed that 26% of provider 'efficiency gains' were delivered by one-off measures like deferring investment, freezing recruitment or making land sales. As NHS Providers commented drily:

'these are not typically actions that directly improve patient services.' (NHS Providers 2018b, section 3 on finance).

By the time NHS England was being offered 3.4% real extra revenue in 2018-19 in hospital and other services it was under-resourced, stressed to maximum flow and failing in slow motion through no fault of its staff. Against that dispiriting background, we can focus our concerns about funding by asking how much more would it cost to operate extra beds in NHS hospitals? Chapter 2 showed that high occupancy rates were a condition of acute hospital fragility and consequently that NHS England needs to consider adding beds to reduce occupancy rates (and we would suggest temper the fee for treatment/payment by results system which incentivises hospitals to max out any capacity they have). The private sector in the UK has only some 8,000 beds, so there is no large reserve of capacity outside the public hospitals which have around 100,000 acute and general beds.

Exhibit 13 below provides a simple, imprecise but instructive estimate of the operating costs incurred by adding extra hospital beds. The average cost per bed is proxied very crudely from the income returns of all hospital trusts. Three relevant sources of income are added together by summing income for (1) elective services, (2) non-elective services and (3) first out-patient appointment; other income sources such as A&E and out-patient follow-up are excluded. This income total from three sources (at the prevailing 92% occupancy rate) is then divided by the number of acute and general beds available in 2018-19. The estimated cost per bed is then £292k per annum; so that increasing the number of beds by 5% adds around 5,000 beds and increases the annual hospital system operating cost by approximately £1.5 billion; while, *pro rata*, increasing the number of beds by 10% adds 10,000 beds and increases the annual hospital system operating cost by approximately £ 2.9 billon (at current prices).

To put this into perspective, under May's year settlement, the whole of NHS England is being offered a revenue funding increase of about £ 5 billion per year in real terms and less than £7 billion in cash terms: if the number of acute beds was increased by 10%, that would absorb more than half the funding increase in the early years. The practical logic of these numbers is that the most likely outcome over the next five years is fewer beds (not more). That is because this is a practical way in which the managers of hospitals a running deficit can limit costs; and this would of course incidentally increase the fragility of the hospital system.

Exhibit 13: Estimated additional income required to increase acute and general bed availability in England (NHS Providers 2019)

	Baseline costing @ 92% bed occupation (actual rate)	5% increase in beds	10% increase in beds	15% increase in beds
Annual average cost of each acute and general care bed	£291,515	£291,515	£291,515	£291,515
Total number of beds acute and general beds available	100,950	105,998	111,045	116,093
Total cost (£m) (no. of beds x cost per bed)	£29,429m	£30,900m	£32,371m	£33,843m
Additional cost (£m) (compared with 2018/19 baseline 100,950 beds)	*0*	*£1,471m*	*£2,943m*	*£4,414m*

Sources: (NHS Providers 2019); average daily number of available and occupied beds open overnight by sector; average daily number of available and occupied beds open overnight by sector, (NHS England 2019a).
Notes: Average cost per bed in 2018-19 based on income received per trust for elective, non-elective treatment and first outpatient, divided by the number of beds available. Estimated increase in costs based on cost structure of 92% actual occupancy rate in 2018-19 in NHS England.
Additional cost calculated as the cost of extra beds, compared with 2018/19 baseline cost

It should be remembered that our estimated cost per bed is mainly operating cost which will exclude both the costs of making good neglected maintenance in existing hospitals and the costs of capital expenditure in new or expanded facilities. Over the past decade, hospital maintenance has been neglected and capital spend has not only been restricted but repeatedly raided to meet operating deficits. By 2018-9 there was a £6.5 billion maintenance back log of work which should already have taken place; more than half of this back log was classified as incurring 'high' or 'significant' risk (NHS Digital 2019). On the capital budget, a NAO report highlights the 'key fact' that, between 2014-15 and 2018-19, some £4.3 billion was transferred from capital to revenue budget by financially distressed trusts (National Audit Office 2019, 4). In an earlier period, privately financed rebuilding under PFI boosted new build, but these poor value schemes have now been effectively discontinued. Publicly financed capital spending in NHS trusts in consequence fell by 21% in real terms between 2010-11 and 2017-18. May's restorative five-year settlement only covered NHS revenue requirements and multi- year capital funding settlements have been promised but not delivered so that NHS capital spend going forward depends on whatever the Treasury allocates in annual spending reviews (Kraindler, Gershlick and Charlesworth 2019, 4 and 8).

The cost of redressing the fragilities of the acute hospital system is therefore increased by the need to make good the legacy effects of the austerity years when maintenance and

investment was cut in a way that is unsustainable. Our itemised listing of necessary expenditures in a stressed system makes the point that May's reversion to mean settlement on revenue funding will not finance the restoration of robustness in the hospital system. The practical issue is that extra beds are very expensive and just one non-recurrent item, such as the maintenance backlog, is large enough to absorb all of one year's real NHS funding increase under the May settlement.

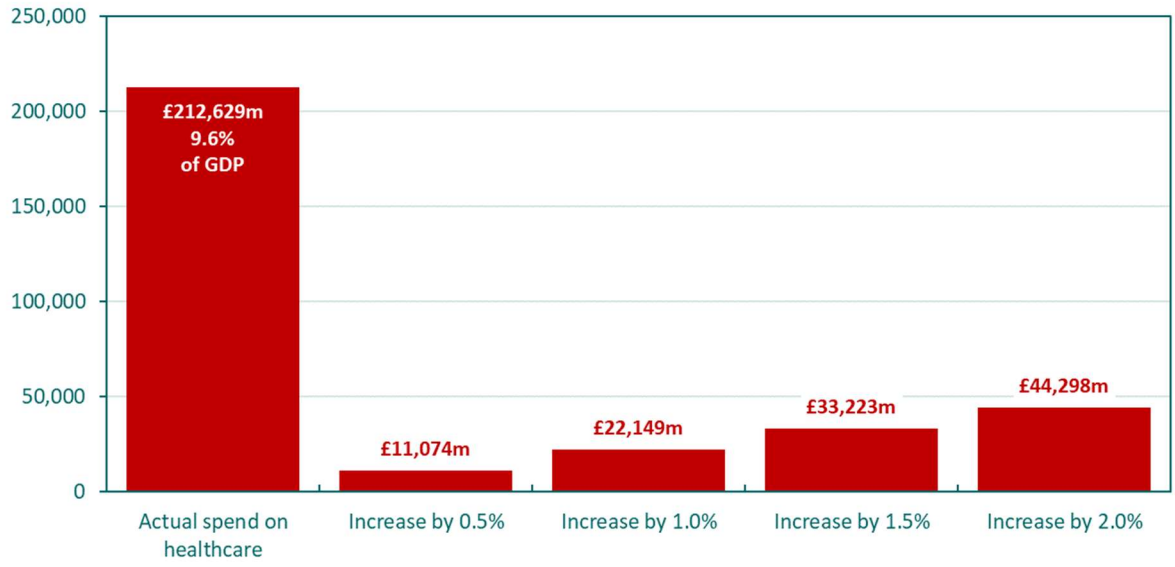
4.2 International comparisons

The listing of many items with separate costings can quickly become confusing and may look like special pleading. So, it is also useful to look at the financial underfunding issue in comparative international terms. Comparative international information usually covers the whole UK and often covers all of health and care, but it is certainly good enough to reinforce the arguments that a large increase in English NHS expenditure is necessary if robustness is to be achieved. Here we can ask two questions: first, what would it cost to raise major items like capital expenditure to North European standards?; and second, what would it cost to increase the NHS health budget overall towards the North European standard? Answers to these questions offer no direct read across to a specific sum required but do give some indication of the magnitude of the necessary adjustment in health spending – a sum which is well above the current reversion to mean funding settlement for NHS England. It shows directly that the UK spends less on health and care than the rest of Northern Europe which is a relevant reference point because it indicates the politically practical ceiling elsewhere.

The OECD produces comparative international data on capital investment in health and care which confirms the UK's position as the laggard of Northern Europe. If we consider one year like 2014-15 in the middle of the austerity years, the UK is at the lower end of the league table as 26th out of 34 OECD countries ranked for capital investment in health care as a proportion of GDP (OECD 2019b); and the Labour opposition's promise of returning capital expenditure to 'the international average' would have involved significant expenditure. More directly, against North European peers, the UK spends 0.3% of GDP on capital investment in health care; which is half as much as France which invests 0.6% of GDP or Germany which invests 0.7% of GDP in health care (OECD 2019b).

From OECD data it is straightforward to calculate what it would cost to raise overall UK spending on health and care as a percentage of GDP towards the North European norm. In the period 2013-2019 the UK each year spent an average of 9.6% of GDP on health and care, whereas France spent 11.4% of GDP and Germany spent 11.2%. Exhibit 14 below presents the results of a counterfactual calculation for the years 2013-19 and shows how UK health expenditure would increase if the percentage of GDP spent on health was raised successively in steps of 0.5%. With France and Germany as the reference point an increase of 1.5% is the relevant benchmark and in 2019 that would increase UK health and care expenditure by £33 billion every year. NHS England only covers the cost of health (without care) and does so in England with a budget of £114.6 billion in 2019; but the point remains that the May settlement of £21 billion cumulatively over 5 years in real terms will do nothing to close the gap against France and Germany.

Exhibit 14: Counterfactual increase in UK GDP expenditure on health (using OECD method)

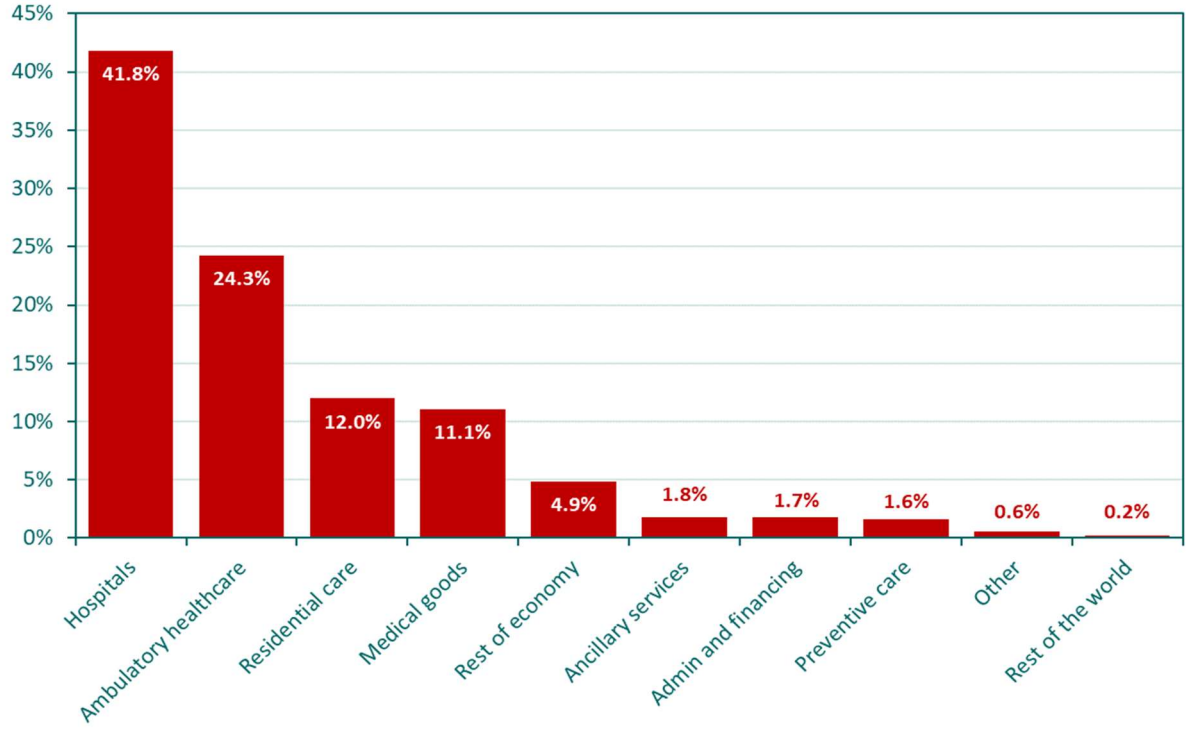


Source: see appendix table 12

The comparative international evidence describes UK health or UK health and care, whereas our focus has been more narrowly on English acute hospitals. From this narrower point of view, the important point is that these acute hospitals are an expensive part of a larger system which needs to balance spending on acute hospital treatment against the claims of primary care, community medicine and prevention of all kinds. As Exhibit 14 shows, acute hospitals currently absorb 41% of the total NHS budget and high-tech acute medicine can always bid for more when saving lives through acute intervention has a certain glamour: thus, we have tv soaps about emergency wards and casualty but not about stroke rehabilitation or social prescribing. The UK's high flow/few beds acute system could be thought of as the inept and fragile British way of attempting to balance acute claims on the total health budget without confronting the underlying issues.

The inescapable conclusion is that a substantial increase in the overall NHS England health budget is absolutely necessary. Because that is logically the only way of reconciling the key aim of hospital system resilience within a balanced NHS which must offer many other kinds of services. The first resilience aim is to run acute hospitals to break even at lower rates of capacity utilisation which will, as we have seen, cost more. The second and equally important balance aim is to limit the share of acute health in the overall NHS budget so that spending on hospitals does not crowd out other services such as primary care which would have to manage with less if the overall budget is not increased.

Exhibit 15: Allocation of the UK's £197 billion current healthcare spend by category, 2017

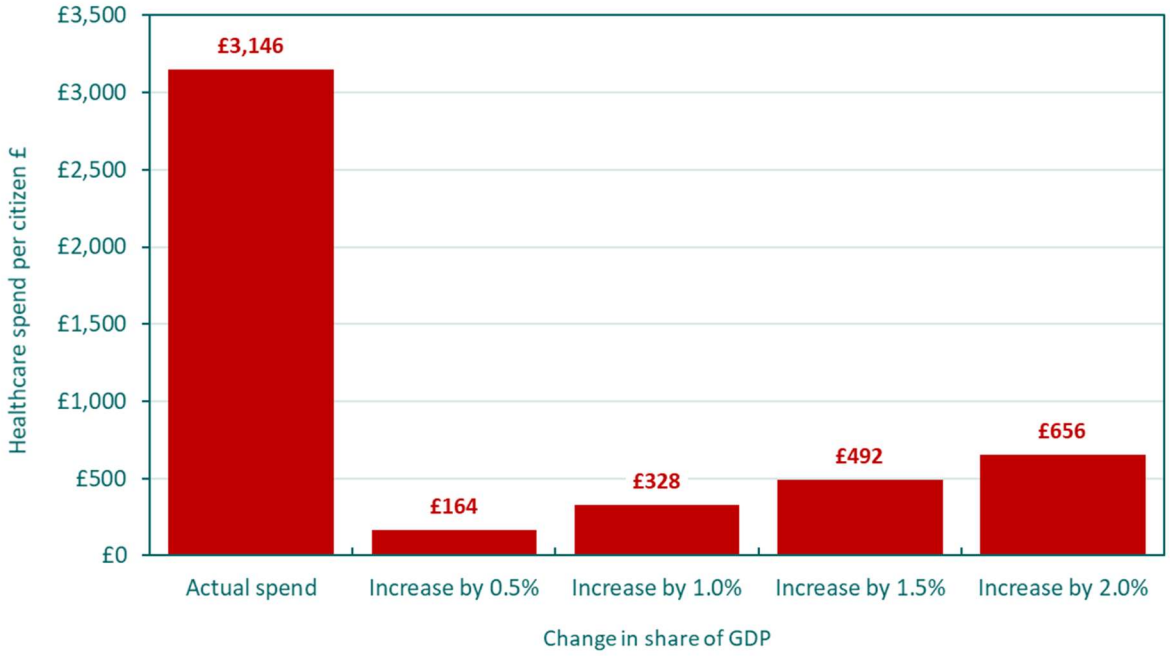


Source: see appendix table 13 which also provides a time series

It should also be remembered that the fragility of the acute hospital system also depends directly on its connection to the care system: a high flow acute hospital serving an elderly population depends on discharge into residential adult care. Obviously, the residential care system has a stand-alone value and should not be considered simply as a warehouse adjunct to a high flow hospital system. But, from any point of view, care in England is more grossly underfunded than health; and the reform of care is greatly complicated by the entrance of financialised chains whose extractive and debt-based business models are both predatory and unstable (Burns et al. 2016, 3-6). In turn, health and care are not the only claimants After 40 individualist years of dismantling the post war settlement and dodging the need for a new and different collective settlement, there will be legitimate demands after the crisis not only for better health and adult care but also for more social housing, better public transport and investment in grossly neglected social infrastructure like public parks.

If an increase in the health budget is to become possible, and if that increase is not to crowd out other objects of public expenditure, the general precondition is a comprehensive reform of UK taxation so that more tax revenue is raised more fairly. Something can be done through hypothecation, as with an extension of pay as you go social insurance to finance care, but a comprehensive reform of indirect and direct tax on income and wealth is required if all the just claims are to be met. The dimensions of the problem can be illustrated by some simple arithmetic about how any substantial increase in NHS expenditure requires higher tax receipts. As we have seen a 1.5% increase in health and care expenditure as a percentage of GDP is required to raise UK spending nearly to the level of France and Germany; if UK health expenditure alone were to increase by 0.5% of GDP that would require 1.8% higher UK tax receipts and an increase by 1% of GDP would require 3.6% higher UK tax receipts.

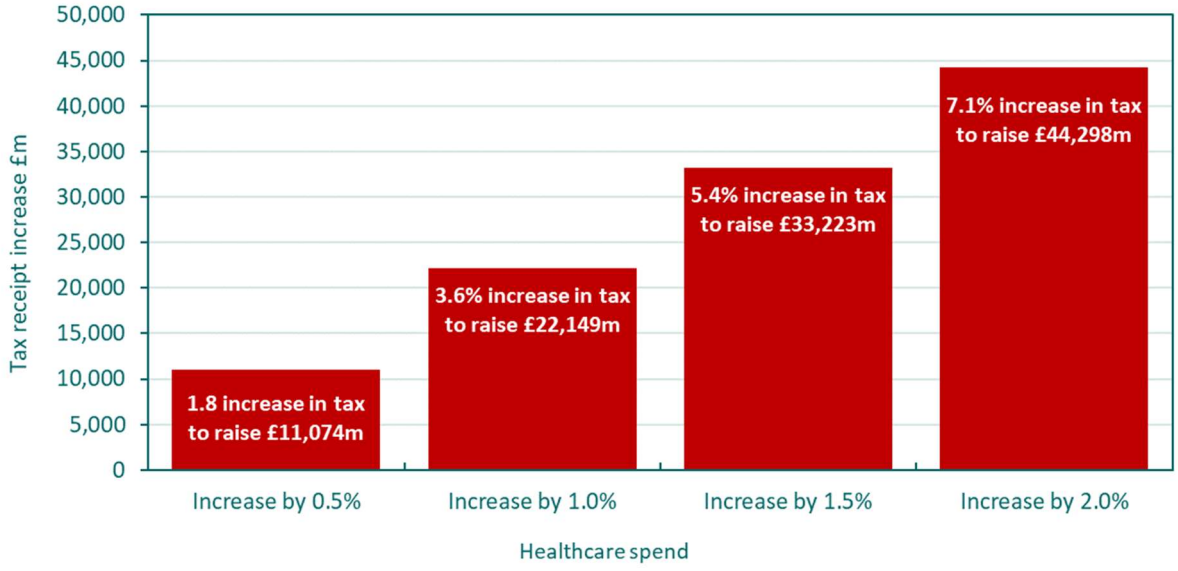
Exhibit 16: Counterfactual increase in expenditure on health per head, 2019



Source: see appendix table 14

After the Covid-19 crisis there will be an extra burden of debt to be serviced if not repaid. During the crisis, government has acted as paymaster and lender of last resort for much of the economy. And, after the crisis, there will be demands for more expenditure on a variety of social objectives as well as health and, at the very least, social resistance to austerity cuts in public spending. The reform of taxation is then urgently necessary because the circle can only be squared by higher taxes and a substantial increase in government spending as a percent of GDP.

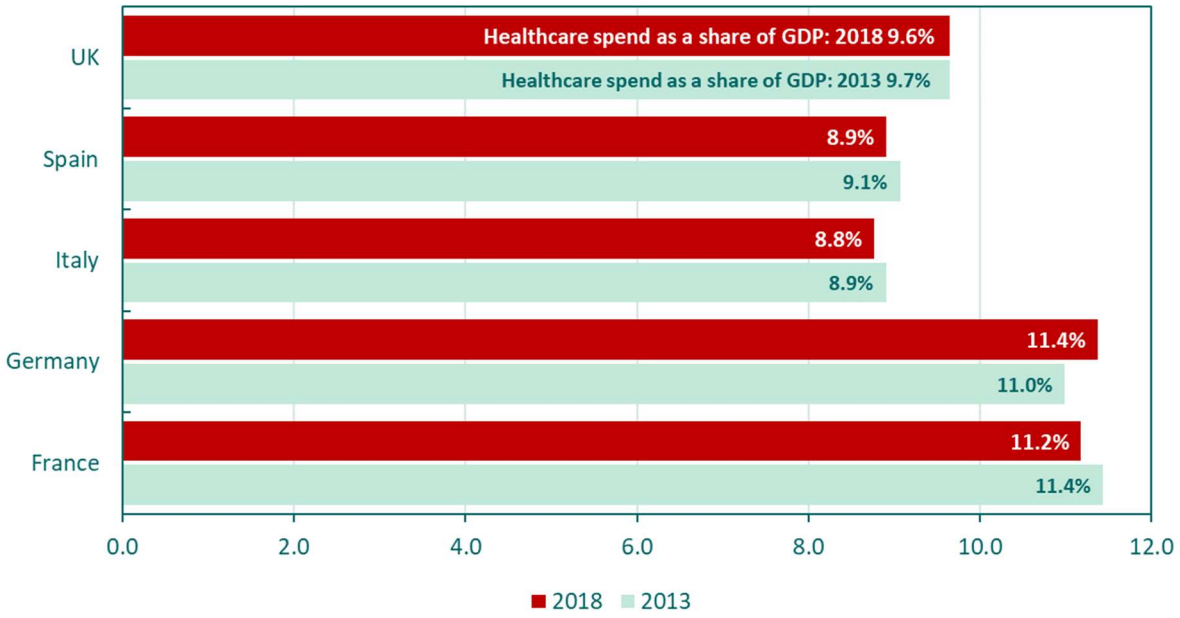
Exhibit 17: Counterfactual increase in tax receipts required to fund increase in health expenditure, 2019



Source: see appendix table 15 which also provides a time series

In terms of Government spending as a percent of GDP, the UK is in the bottom half of the EU league table: in 2015 UK public spending accounted for 42.3% of GDP with Germany and the Netherlands not much higher; but all the Nordic countries, Belgium, France and Italy are (for different reasons) at or above 50%. The sky would not fall in if UK government expenditure was running above 50% of GDP; if the UK wants more resilient reliance systems, in hospitals and elsewhere, the UK will need tax reform which would raise public expenditure to Nordic levels.

Exhibit 18: Total health expenditure as a share of Gross Domestic Product (GDP)



Source: see appendix table 16

The argument about more resilience in the acute hospital system has so far been entirely cast in terms of system funding because substantially increased funding is the basic precondition. But the hospital system only obtains the benefits of increased funding if a variety of corollaries are fixed at the same time. It is clearly necessary to address training bottlenecks and staff retention problems when the NHS has for several years been running with 100,000 full time vacancies and a shortage of around 40,000 nurses whose recruitment is not helped by the withdrawal of the nurse's training bursary which led to an 18% drop in applicants in 2017 (The Health Foundation, The King's Fund and Trust 2018, 7). The number of medical school places is also capped, and the promise is to raise the annual medical school intake from 6,000 to 7,500 starting in autumn 2018 (Roberts and Bolton 2017, 4). Against this background there is a strong suspicion that NHS costs have been managed partly by Treasury-inspired policies which culpably choke off the UK supply of trained nurses and doctors.

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5. After hyper-innovation: the need for care-ful policy practice

> '*the congruence of a governing ideology that puts immense faith in achievement with a history of policy disaster is, to put it mildly, inconvenient*' (Mick Moran (2003), The British Regulatory State)

The current mess is the accumulated result of multiple well-intentioned designs for reform which promised better health care and undermined public health laboratory capacity and a robust acute hospital system. The challenge here is to renew and repair in ways which reduce the likelihood of future normal accidents. Some of the vulnerabilities are quite specific. As we have argued above, the Covid-19 crisis has revealed particular points of failure in the laboratory and hospital systems, and these need to be fixed. And, as we showed in Chapter 4, if this is to be done this will take substantial additional resources. But this is only half of the story. This is because, as we have also argued, the inevitability of further normal accidents is also embedded in the organisation of the NHS and the English public health system. More precisely, it is inscribed in what we might think of as a politics of mis/organisation. How, then, to think about this 'misorganisation'? What are its sources? And how might they be remedied? These are the topics we address in this final Chapter. For, or so we want to suggest, the inevitability of accident is inscribed in a political ecology of the NHS that has been created by this politics of mis/organisation.

To make this argument we draw on a range of further resources. Borrowing from political science, in the first and second sections below we show how the outcome of reform by re-design has deskilled the state and degraded its administrative capability. It is this process of churning hyper-innovation that has led to system mis/organisation. But why has this come about? In Section four we argue that this politics of mis/organisation – and therefore the underlying obstacle to reform – reflects a specific politics of health services provision which we call the control paradigm. Successive redesigns (up to and including the current NHS ten-year plan) have been initiated by Westminster politicians and NHS senior management who mistakenly believe that it is possible to discipline NHS professionals and especially doctors by creating a two-tier system of government. In this way of thinking doctors can be kept in line by autonomous unit managers, while those managers are in turn controlled from the centre financially and administratively. Our argument is that in the medium-term health services can only be made safe if we break with this failing control paradigm and its disciplinary divide-and-rule tension between health professionals and managers. This is because what has happened in practice has not led to effective control let alone resilience, but rather counts as a deadly instance of Mick Moran's 'inconvenient' gap between an ideology of achievement and a history of policy disaster.

This said, we need to proceed with caution as we try to come back from the current state of administrative incapability and service mis/organisation, conditioned as this is by a control paradigm that has been destabilising health care for more than three decades. But how? In the third section of this chapter we draw on feminist sociology and STS (science and technology studies) to articulate an alternative *care-ful approach to policy practice*. This different kind of policy process would work in the first instance not by imposing particular top

down redesigns, but instead by *posing questions*. So, in section five of the Chapter we explore what this care-ful approach to policy might imply, both with respect to the *points* of system failure revealed by the Covid-19 crisis, and for the *relational* sources of system vulnerability which predispose to further normal accidents. In the sixth and final section we conclude by arguing that these relational points of vulnerability can only be addressed through a fundamental shift from the control paradigm approach to health service policy.

5.1 The post-administrative state

Colin Crouch described the loss of effective participation in what he called the *post-democratic state* (Crouch 2000, 1-30). In this state the formal apparatus of representative democracy (elections, competing parties of government, free media) is sustained, but political choices are framed and decided by business and political elites with little input from groups and organisations of ordinary people. The post-democratic state is thus one that holds on to democratic forms, whilst simultaneously hollowing these out. By analogy, we suggest that the loss of bureaucratic and organisational capacity that led to failures in testing and PPE supply can be characterised as the product of a *post-administrative state*.

In this post-administrative state, the formal apparatus of modern management (strategies, mission statements, initiatives, business plans, policies, key performance indicators and forms of audit) are all in place. Indeed, they proliferate in new forms such as risk registers. All of these are to be found in government departments and agencies such as the NHS or Public Health England. But (this is the hollowing out) the capacity of these organisations to make and operationalise administrative judgements which safeguard the systems on which we depend has been eroded for the reasons we have discussed. The years of austerity together with successive reorganisations have removed civil servants with specialist technical and administrative expertise and destroyed the organisational relations that go with these. In short, the competences that include the organisational, local and task-specific forms of expertise necessary for effective administration have disappeared.

The idea of a pre-administrative state will be familiar to those who know the work of historical institutionalists. In his classic work, *Building an American State*. Stephen Skowronek (1983) showed that, until the late nineteenth century, the USA operated without a strong, centralized state apparatus; and that this central apparatus with its administrative capability was only built slowly in response to crises such as the Spanish American War and complexities like sectional conflicts between industry and finance capital. Until recently most have assumed that the achievement of a strong state was consolidated and permanent. We are now arguing simply that the administrative capacity of central and local states can be and has been undone by atrophy and ill-judged reform even while its outer form is maintained.

These problems are not confined to the UK. For instance, in Germany employers and trade unions agree on the need for a massive increase in spending on infrastructure, but local authorities have been unable to spend the modest sums allocated for infrastructure renewal partly because they lack technical and planning staff (Chazan 2019). But it is likely that post-administrative incapability is a particular problem in the UK for two reasons:

1. **Centralisation in London**: One distinctive British problem is a polity that is by international standards highly centralised and incapable of the delegation necessary to manage heterogeneity. The problems about centralisation of public health laboratory testing are symptomatic of broader problems. (For recent comment in the context of Covid-19, see Bounds (2020) and Vize (2020).) London-based politicians and civil servants have been reluctant to operate multi-level governance structures which (for better or worse) allow local discretion and distribute capability. Some degree of Scottish and Welsh devolution with very limited tax-varying powers was agreed by the Blair government in 1998. But earlier in 1986 Margaret Thatcher had abolished the Greater London Council and the Metropolitan Counties because they had resisted central policies, and it was only in the 2010s that central government belatedly realised that the absence of a city region level of government in England posed a major problem. Significantly, the central policy response was then to create elected city mayors with very limited powers, and to offer them 'city deals' with no choice but to accept the Treasury's superordinate policy objectives of economic growth and jobs (Cabinet Office and Deputy Prime Minister's Office 2013).
2. **Privatisation, outsourcing and deregulation** (with an emphasis on delivering grandly conceived top down policy designs and objectives regardless of specifics) was centrally important to both Conservative and New Labour governments for many years between 1979 and 2010. Indeed, this led not just to policy fiascos but also to human tragedies. The Grenfell Tower fire was caused by the undermining of building regulation and inspection, which resulted in sub-contracted, poorly fitted and highly combustible cladding panels on many high-rise blocks. The Windrush scandal about the victimisation of undocumented Afro-Caribbean migrants was part of a hostile environment policy after 2012 which created 'foreseeable and avoidable' injustices (Williams 2020) in contexts where there were no documents and the relevant landing cards had actually been destroyed by UK government.

The British problems of over-centralisation are long-standing and help to explain why there was never a golden age for the NHS before the reforms which began in the 1970s. The power of the Treasury as an over-mighty finance ministry long predates the austerity years when it became a public issue. Towards the end of austerity, the Kerslake review of the Treasury concluded that Treasury control over spending departments such as health or housing worked 'to both disempower departments and stretch the Treasury beyond its underlying capabilities' (Kerslake 2017, 5). At the same time, we should recognise that ongoing, multi-year administrative horrors such as Windrush are a relatively recent development, and that the UK's highly centralised polity has new and worsening problems with degraded and lost administrative capability.

This was illustrated by the NHS PPE procurement problems in the Covid-19 crisis. The strategic stockpile of PPE equipment and NHS procurement is centrally managed by NHS Supply Chain Co-ordination Ltd which is directly owned by the Department of Health. But in January 2020, 45% of the items in this stockpile were out of date and could only be distributed with delay after they had been retested for efficacy. At the same time, the warehouse operation had

been outsourced to an American firm, Movianto, which struggled to cope with demand (Davies 2020a). Meanwhile, efforts to procure new stock were hampered because NHS Supply Chain had limited reach into, or understanding of, the supply chain: the *Financial Times* reported that NHS Supply Chain 'had no experience of directly sourcing PPE and was accustomed to securing it through UK-based intermediaries' (Foster and Neville 2020). Hence the multiple problems in securing supplies, and the purchase of products whose quality made them unusable, as with the Turkish gowns flown in with maximum publicity by the RAF (Hughes and Pitel 2020).

When in-house capability is limited, government departments have no choice in a crisis but to default to distress outsourcing without any of the controls necessary for sensible results. At every point in the Covid-19 crisis, when the British government has needed something done quickly and at scale it has turned to outsourcing companies. Deloitte was recruited to assist with procuring PPE (Asgari 2020), and, along with other firms such as Serco, Sodexho and Boots, to increase the number of regional testing sites to 50. NHS England hired a team of about 60 consultants at KPMG to build seven temporary Nightingale hospitals (Kinder 2020). By early May private call centre operators including Serco were being asked to provide more than 15,000 call centre staff for contact tracing (Smythe 2020).

We have elsewhere explained how outsourcing conglomerates often suffer profit collapse when they move into unrelated activities which they do not understand (Bowman et al. 2015). But in this kind of distress outsourcing the risk lies with the taxpayer and the service user rather than the outsourcing company. Value for money is unlikely because in the emergency the outsourcing firms were granted Covid-19 contracts without competition, and cost-plus contracts were unavoidable. Lines of accountability were blurred, as in the case of Deloitte which was officially only 'supporting' the Health Department in running test centres. Results were at best mixed when outsourcing firms often had no specialist expertise in the areas where they were racking up chargeable hours; in one case, dissatisfied local hospitals sought unsuccessfully to take over an underperforming Deloitte testing centre (Evans et al. 2020).

5.2 Hyper innovation

If the damage caused by outsourcing was localised in areas such as procurement, the larger problems of incapability in the NHS and Public Health England were caused by forty years of churning reorganisation in what political scientist Mick Moran called the '*hyper innovation state*'. Moran's argument was primarily about the British regulatory state and the shift from elite club government to formal audit by metrics within the framework of systems of governance, and he focussed in particular on the Thatcher and Blair projects of reconstructing institutions and economic practices for economic competitiveness (Moran 2003, 154-6). His argument thus applies directly to hospitals, where the power of medical consultants was to be displaced or at least challenged by unit management and governance through boards. However, Moran's argument can also be applied more generally to understand the consequences of health reorganisation.

The modernization which Moran analyses was greeted positively in the early 1990s. This was the 'new public management' (Hood 1991) which Osborne and Gaebler describe as a shift to serving citizen-consumers in which public sector managers were encouraged to 'steer, not

row' (Osborne and Gaebler 1992). A decade later, however, Moran drew on the work of James C. Scott (Scott) to draw a much darker picture (Moran and Williams 2016). Scott had analysed the 'great leaps forward' of authoritarian high modernism such as the collectivization of Soviet agriculture. These imposed top-down grand designs conceived and monitored through simplified and distant forms of knowledge that ignored local conditions and practical knowledges. But Moran saw that modernizing liberal democracies also had more than their share of fiascos, such as rail privatization and BSE, so that Scott's argument could be extended.

Looking at the state in the UK, Moran argued that modernizing reforms used the language of policy competence and effectiveness to justify the imposition of grand designs. At the same time, the outcomes were frequently underachievement and disappointment punctuated by fiascos. But here is the twist, these disappointments in turn often became the rationale for further reforming top-down redesigns. This was the process he called hyper-innovation. '[F]iasco,' he wrote, 'is …both a reflection of hyper-innovation and a force driving the state into ever greater frenzies of hyper-innovation.' (Moran 2003, 173) And we would add that churning reorganisations also routinely and cumulatively undermined institutional memory, distributed expertise and the capacity to act effectively. The recent history of public health and the NHS count as salutary examples of the pathological consequences of hyper-innovation.

The 'purchaser-provider' split introduced in 1991 is a classic example of grand modernist re-design. The idea that the UK's NHS needed an 'internal market' came from US academic Alain Enthoven (1991) after a one-month visit to the UK; and the idea that GPs should be 'fund holders' was added by the British health economist Alan Maynard (Tuohy 1999). At this point an earlier medley of sometimes more, and sometimes less, effective administrative and funding relations was increasingly abandoned and this was justified by ambitious but thin simplifications about the self-evident benefits of competition within markets. In the New Labour period, the No 10 adviser Julian le Grand (2003) reinforced this belief by arguing that market choice would empower purchasers and discipline providers. Unfortunately, this design failed to register the reality that public health concerns fit poorly within a framework of commoditised rewards for specific measurable outcomes.

But worse than this, what happened was not a single grand reorganisation, but a series of successive and wrenching changes in which the overall health system never stabilised but was instead subject to continuous reorganisation. The Medical Officers of Health abolished in 1974 had a long and continuous history which went back 100 years; but, as we have seen, between 1990 and 2009 NHS reorganisation ensured that less than 40% of its constituent organizations survived for ten years. Talk of 'internal markets' disappeared after the 1990s, but the purchaser-provider split and the principle of competition between providers survived and was reinforced to the point that it became absolutely central to the 2012 reorganisation discussed above (Timmins 2017).

Box 3: CHURN: testing in the context of NHS reorganisation

- 1870s **Notification of Infectious diseases** (Barnett and Sorensen 2011, 172)
- 1939 **Emergency Public Health Laboratory Service** created (Barnett and Sorensen 2011) (Galbraith and Young 1980) (Howie 1965)
- 1946 **Public Health Laboratory Service** established (Galbraith and Young 1980) (Howie 1965)
- 1961 **Public Health Laboratory Service** separated from Medical Research Council (Howie 1965)
- 1974: **Medical Officers of Health** replaced by Community Physicians within NHS (Galbraith and Young 1980) public health
- 1977**: Communicable Disease Surveillance Centre** set up at the Public Health Laboratory Service (Galbraith and Young 1980) to provide a national epidemiological service (Galbraith and Young 1980); a service unit (Galbraith and Young 1980)
- 1982: **Area Health Authorities** (90) abolished (Lorne et al. 2019) 192 **District Health Authorities** created (Lorne et al. 2019)
- 1996: **District Health Authorities** abolished (Lorne et al. 2019) 192; **Regional Offices** (part of NHS Executive) created (Lorne et al. 2019, 50)
- 1999 Public Health responsibilities moved to 303 **Primary Care Groups/Trusts/ Organisations** (PCOs) (Abbott et al. 2005); with strategic responsibility to **Health Authorities** (Abbott et al. 2005)
- 2002 **Health Authorities** abolished; amalgamated into 28 **Strategic Health Authorities** for strategic delivery; most staff went to PCOs (Abbott et al. 2005): some to Health Protection Agency
- 2002 **PCTs** reduced in number from 303 to 158
- 2003 PHLS reconstituted into **Health Protection Agency**, for communicable disease control and emergency planning (Barnett and Sorensen 2011) (Abbott et al. 2005)
- 2004 (Second) Wanless report recommends a 'strategic' plan needed for PH workers (Abbott et al. 2005)
- 2006 **Strategic Health Authorities amalgamated**: 10 instead of 28 (Lorne et al. 2019) because of loss of financial control?
- 2012 **Strategic Health Authorities** and **Primary Care Trusts** abolished (Lorne et al. 2019)
- 2012 **Clinical Commissioning Groups** (210) created: numbers somewhat reduced to date (Lorne et al. 2019)
- 2013 **Public Health England** set up to unite PH specialists in 70 organisations (Public Health England 2019b) **National Infection Service (NIS)**: a directorate of PHE, with a set of Units and Laboratories (Public Health England 2019b).

Wearied by this churning and its unintended consequences, there has been no attempt at large-scale NHS structural reorganisation since 2012. But the hyper-innovation story continues because, another modernist grand design was articulated when a new relational principle was inserted into the existing structure. And this new principle – collaboration – was

the antithesis of the old principle of competition around which the whole system had been redesigned over a twenty-year period since 1991.

This new principle of collaboration (not competition) appeared in 2014 in the NHS Five Year Forward View (NHS England 2014) and was consolidated in the 2019 NHS Long Term Plan (NHS England 2019c). The talk now was of 'sustainability and transformation partnerships' which would develop into 'integrated care systems' bringing together GPs, hospitals and local authorities. Our point is not about the merits or otherwise of this re-design (obviously the collaboration principle is in many ways attractive), but rather about the confusing consequences and uncertain results of introducing new principles of collaboration into an already stressed system that had been dogmatically constructed around quite different principles of single unit action by financialised players.

For twenty years between the 1991 and 2012 reforms, health policy had been about creating quasi autonomous institutions (finally in the form of clinical commissioning groups and hospital trusts) connected by horizontal financial relations which policy makers believed would provide self-acting motivation and discipline shaped by single unit economic calculations. Now these units were also being asked to collaborate both with one another, and with local government authorities which were statutorily responsible for social care and coping with budget cuts of around 40%. While some hoped the new plans would end purchaser-provider relations (Iacobucci 2017), in practice the new collaborative partnerships and population-based payments were laid on top of the existing commoditised fee-for-treatment relations between Clinical Commissioning Groups in primary care and provider hospital trusts.

Hyper-innovation also sucked the oxygen out of public health provision. As with the NHS, there were rationales for each reorganisation, but the most recent reform and the 2012 creation of Public Health England is a perfect example of strategized policy by grand design and the imposition of yet another modernist top-down vision. This is because PHE was a new kind of agency charged with an extended public health mission.

Thus, PHE was created as an 'executive agency', a novel form of organisation intended to implement policy (or deliver a service) under ministerial direction (Cabinet Office 2018) with more responsibility than a division within a Whitehall Ministry, but less autonomy than a quango. On its web site PHE says that its mission is 'to protect and improve the nation's health and wellbeing, and reduce health inequalities' (Public Health England 2020b) and this emphasis on health inequalities reflects a general shift in the public health agenda consolidated by the influential 2010 Marmot Review mentioned in Chapter 3 above. Thus, in the PHE's 2020 -2025 strategy the CEO notes there is a 19-year difference in the number of years of healthy life between the poorest and most affluent communities, and the strategy document itself insists that PHE is 'integrating the reduction of health inequalities in everything we do.' (Public Health England 2019a,12)

The difficulty was that the title 'executive agency' encouraged expectations of effective action that could never be delivered by PHE. The problems were inherent in the (otherwise admirable) Marmot Review itself which accepted the siloed division between public health policy on the one hand, and economic policy on the other, a divide which meant that the latter was effectively outside the domain of public health. Thus, one of Marmot's six key

objectives for reducing health inequality was to 'create fair employment and good work for all'; but there were no recommendations for achieving this through economic policy interventions which would hinder the UK's financialised employers hiring in deregulated labour markets (Marmot 2010).

PHE was further limited when, on key public health issues such as the reduction of salt and sugar in processed foods, the Health Department was unable to resist corporate lobbying for weakly permissive or voluntary regulation which fitted with the larger governmental ambition of being business-friendly. On sugar, the industry target in 2016 was a 20% reduction in sugar content by 2020 in key food categories; in 2019 the amount of sugar in products had been reduced by just 2.9% while per capita sugar consumption had actually increased by 0.5% because retailers and manufacturers had been marketing high sugar products (House of Commons 2019, questions 13-15). And repeated failures have led to no change in the approach of PHE: in February 2020 a consultation with the food industry on a fifth round of voluntary salt reductions was announced. (Dinkovski 2020)

5.3. The care-ful practice of policy

How do we recover robust health systems and avoid creating new fragilities when the hyper-innovation of policy by design has created a hollowed out post-administrative state and its consequent mis/organisations? The starting point has to be the observation that health reform has been partly motivated by the top-down control paradigm search for power over medical professionals by creating financial levers wielded by autonomous unit managers who are themselves subject to financial incentives and administrative sanctions. It is clear that if we want to think differently and more constructively about policy we need to set off from a different place. Our starting point for doing this is with clinical practice for managing chronic conditions as this is described by feminist and STS sociologists, because this suggests an alternative approach – the *care-ful practice of polic*y.[8]

As we noted above, for thirty years or more health reform has been about redesigns intended to control medical professionals through the budget holding managers of individual NHS units. In Le Grand's (2003) influential account, competition and markets are rationalised as a mechanism that can impose disciplinary power on the players. In his chess board metaphors, health providers should not be assumed to be self-interested 'knaves' or altruistic 'knights', but they can be disciplined into virtuous behaviour if they are obliged to compete for the custom of purchasers who thereby are empowered as the 'queens' of the system. This cartoon rationalisation overlays the implicit search for sovereign managerial power which animated reforming health ministers from Ken Clark in 1991 to Andrew Lansley in 2012, confronted by what they saw as the interests of medical and paramedical professionals. The result is animus between managers and medics within the health system where each side is easily able to justify its own position: managers find evidence of costly, bad clinical practice

[8] Natalie Gill, Vicky Singleton and Claire Waterton talk of 'care-full' policy. See, for instance, Singleton and Mee (2017) and Gill, Singleton and Waterton (2017); and in the context of foot and mouth disease control, Law and Singleton (2014).

while doctors complain that managers only create paperwork and multiply the number of unproductive jobs.

If we are to change the frame for thinking about effectiveness, then we need to shift away from the design-based idea that this is all about imposing power on agents, or capturing power from special interests. When the problem is administrative incapacity and fragility in health systems, any dispute over power within those systems is likely to be of secondary importance. And our move here is to *rethink effectiveness as appropriate practice*. To do this we stand the logic of using policy to control medical professionals on its head and ask *what policy might learn by looking at the logic of clinical care as a practice for intervening and managing chronic conditions.* This is apposite because, as readers who have followed our argument thus far will appreciate, our NHS hospital and laboratory systems are similar in certain ways to elderly patients suffering from chronic conditions with many co-morbidities – co-morbidities which may indeed be the result of a long history of ill-judged acute interventions.

This analogy makes it clear that we are not suggesting that all clinical practice works well, and neither are we trying to prop up the privilege of medical professionals. Rather, we want to draw lessons from what feminists have called the 'logic of care' (Mol 2008) that underpins this approach to medicine. In managing chronic conditions this logic is modest, nuanced, consultative and iterative. It involves patients, relatives, nurses, support staff and clinicians who all try to work together. It works by trying to find the best way forward in sub-optimal circumstances. It looks carefully at the disadvantages as well as the advantages of any course of action. And it is flexible because circumstances keep on changing. (For a clinical example see Box 4).[9]

This logic of care therefore works on the assumption that the world is imperfect and that this is a chronic condition rather than something that can remedied once and for all. Its skill is in recognising and retuning the tensions between different and more or less incompatible concerns. Looking at the drawbacks to any course of action as well as its benefits, skill in care is therefore the art of getting messy circumstances to fit together more or less well in a practice which involves difficult decisions and trade-offs around incommensurability. It works when it incorporates a diversity of skills including the medical, the social and the administrative, all of which have to be mobilised and dovetailed as best as possible.

[9] See also Mol, Moser and Pols (2010).

Box 4: The logic of care: managing Type 1 diabetes

GPs, specialist nurses, and patients with chronic diabetes talk about 'managing' insulin-dependent Type 1 diabetes. So, for instance, blood sugar levels are best held low because there is the risk of severe long-term complications such as peripheral neuropathy if blood sugar levels creep up. On the other hand, this is a balancing act, because hypoglycaemia (low blood sugar levels with confusion and loss of consciousness) is also dangerous. Insulin doses therefore need to be carefully calibrated. But blood sugar levels change for a whole series of reasons. Diet. Exercise. Other forms of illness. Emotional state. Hormonal variations. And (here's the kind of trade off nurses and patients discuss) a social treat in the form of (say) an after-work visit to the pub with friends, or a slice of cake with afternoon tea, is in tension with the aspiration of keeping blood sugar levels low. But which is more important? Strictly controlled blood sugar levels, or the kinds of rewards that go with a social life? There is no single good answer to this question. It depends on the patient, her state of health, the character of her family relations, her friendships, her state of mind, and what she values most in her particular social circumstances. So, at the diabetes clinic, the patient and the nurse and the doctor together tinker their way towards (this month's revisable) plan for managing blood sugar levels, insulin, exercise, diet and social activities. These are (to put it in philosopher's language) different and not necessarily compatible 'goods.' And how to balance these off in the least worst way changes day by day and month by month. There is no perfection. There can be no grand design. But, done well, the care of a chronic condition such as diabetes is exceedingly skilful. (Mol 2009)

As we noted above, the logic of chronic care also recognises that what is appropriate is contingent on local circumstances; unlike true love, it alters when it alteration finds. In short, it is the unheroic antithesis of strategized policy by design. It is the opposite to a control paradigm which rests on the assumption that the application of simple principles reliably leads to improvement everywhere, regardless of local circumstances or differences in activity. And the practice also comes with self-knowledge of its own disadvantages and limitations. The obvious disadvantage is that deliberation may lead to muddle and at worst to paralysis. The limitation is that by the time the patient is in A&E deliberation becomes irrelevant because there is no time: the medical team either already has rehearsed the skills it needs, or it has not. And, if the medical team has those necessary skills (as with the pilots flying a plane with engine failure) few words are needed as the team makes rapid and complex judgements about possibilities and trade-offs.

However, in circumstances in which care-ful policy is appropriate but is not practised, the results are always bad. We see this in the first steps towards lifting the UK national lockdown. Imposing the lockdown was a difficult but straightforward matter of emergency action with one clear objective, to reduce the R number, and one clear public rule to stay at home. This did not require much enforcement because most households willingly obeyed. But, when it came to lifting the lockdown in steps, this required a much more iterative, experimental, variegated and consultative way of creating policy. It needed an approach that looked hard at the tensions between various pros and cons not simply from the centre, but also from around the country. What was needed was therefore the care-ful elaboration of a policy – or more likely a set of different policies – after consultation with (for instance) national teaching

unions, regional politicians and local experts about the (regionally variable) down-sides as well as the obvious advantages of such measures as reopening schools. (Bounds et al. 2020; Cookson, Hughes and Hodgson 2020).

Without a care-ful approach to policy, the UK government therefore stumbled into all kinds of difficulties and had first to row back on its plan to reopen all primary schools before then changing its mind about reopening primary schools to all years before the summer break (Parker 2020; Stanton and Pickard 2020). The 'right decision' about when and how to reopen schools was unclear since there were different arguments – economic, educational, social and epidemiological – pulling in different directions. But, rather than consulting, the core of government decided on a top-down, one size fits all policy. When the Prime Minister announced the single national opening date of June 1st, the devolved administrations in the Celtic nations first learned about the policy as it was being announced (Parker 2020). The problem, then, was that one size manifestly did not fit all. The devolved administrations and a series of local authorities outside the south east of England announced different policies, in part because their R values were higher than the overall UK figure (Cookson, Hughes and Bounds 2020). And the government had not thought through how it needed to carry local authorities, academy chains, teachers and parents if the policy was to be implemented. (At the time opinion polls suggested that around half the parents were uncertain about sending their children back to school (Jack, Stanton and Tighe 2020).)

In politics, the care-ful practice of policy is not about knowing what to do. It is not about particular policies at all. Instead it is about creating a process that can arrive at policies that make it possible to build robust systems. It recognises that 'front of house' promises in manifestoes or announcements in press conferences or 'save the NHS' injunctions from lecterns need to be supported by the 'back stage' work that produces manifesto promises that can be kept and policy announcements that can be implemented. Overall, the centralised British system of policymaking and its control paradigms do not seem to understand this. And if, as seems probable, the present administration under Boris Johnson is even more tightly centralised than its predecessors, it is it is likely that there will be many additional and unnecessary failures in the difficult process of lifting lockdown.

5.4 Articulating questions and policies for health

But how do we make the practice of care-ful policy work and what does this mean concretely for acute hospitals and public health laboratory capacity? It is completely beyond a group of report writing academics to make care-ful policy from their desks. It would also be hypocritical to end with a series of policy recommendations which in effect propose our own alternative design for NHS structure and strategy. But we can contribute to the discussion, and what follows should be read as an attempt to start a care-ful process of policy making with respect to health system vulnerabilities. Our aim is therefore to find a way of turning general matters of concern that are not necessarily very well specified into focused problems. We do this by starting from our analysis of the evidence and then by asking questions about our health systems – much as a medical specialist would when a patient presents at a clinic for chronic disease.[10] Artful questions can turn concerns into problems so that the vague and malleable

[10] On matters of concern, see Latour (2004).

is crystallised into more definite issues that can become input for the political process whose output is manifesto promises and ministerial announcements. As we noted above, our questions are about two sources of system fragility: first, about the *points of failure* directly revealed by the Covid-19 crisis; and, second, about the relations between health and other systems which create *vulnerabilities* that predispose to further normal accidents. Our list of points of failure and relational vulnerabilities is simply a starting point and there are many other concerns that need to be articulated.

The relational vulnerabilities in health can only be understood in the context of the mis/organisation of health services and the post-administrative loss of capacity generated by hyper-innovation through redesign. As we have seen above, since the early 1990s health has been organised around a control paradigm motivated by a distinctive ideal of effectiveness, and Westminster politicians and an inner group of senior NHS managers have sought to turn the managers of formally autonomous NHS units into the agents of central policy. Using power relations and financial self-interest as the drivers, their sanction has been dismissal for those unit managers who failed to deliver. This kind of centralised and controlling NHS reflects a much more general theory of leadership, and the responsibility for successes and failures that go with leadership. Inter alia, this means that 'failure of leadership' becomes a convenient alibi when things start to go wrong, as, inevitably they do.

As we argued in the last section, real effectiveness is not about taking control but about encouraging appropriate practice. This insight into care-ful practice involves breaking with the control paradigm idea that solutions to NHS problems can be found at the top and then imposing a single agenda and set of priorities on the whole system. Instead care-ful practice involves mobilising those involved in new forms of organization that include citizens, clinical teams and managers who together engage in defining problems and agendas for change along with the claims for resources that these imply.

There is much to be thought through here. This is because the issues are not simply medical and budgetary, but are also technical, organisational, economic and social. And, just as important, all of these different concerns are entangled and potentially in need of definition and redefinition. Even what counts as a 'medical problem' may need discussion (see box 5 below[11]). This tells us that it is not just the usual interest groups who need have a role in the care-ful practice of policy. Yes, the medical professionals and the patients need to be a crucial part of the conversation along with those such as the managers who have been produced by the control paradigm that has bred the financialization and competition between the healthcare units that we have described above. But others need to participate too, including researchers, trades unions, voices from the care sector, other providers, local and regional voices, and those of ethnic minorities if we are to care-fully articulate a way out of a single focus on efficiency towards a health service that is resilient rather than a system that is simply a normal accident waiting to happen.

[11] The malleability of 'the technical' and its entanglement with the social, the political and the economic is carefully explored in the context of science policy in Callon, Lascoumes and Barthe (2009). For a small-scale exploratory study see Waterton and Tsouvalis (2015).

Box 5: How medical, technical, organisational, social and economic problems get redefined together

Health problems are complex because they are simultaneously medical, technical, organisational, social and economic. All of these factors weigh in to explain, for instance, why there is more or less effective immunisation against influenzas, but not for so-called 'neglected tropical diseases' such as schistosomiasis (bilharzia). Or why life expectancy varies so much between the privileged and the underprivileged in the UK. However, this heterogeneity is particularly visible for Covid-19 because all these different dimensions have been changing so rapidly. So, for instance, for the first month after the condition was recognised it was thought to be non-transmissible between humans. Obviously, this particular hypothesis did not survive for very long, but estimates for its R_0 value continue to change as they are recalculated and new statistics become available (Calvert, Arbuthnott and Leake 2020; Sanche et al. 2020).

Five months on in June 2020 as we complete this report some basic facts about Covid-19 have become clear. But the list of unknowns remains long and impressive. These include: why it is mild or asymptomatic for many; why it manifests itself in so many different ways for those who exhibit serious clinical symptoms; why it is differentially more serious for certain groups (men, the elderly, people of BAME origins) than others; why mortality rates vary, for instance between Japan (low) and the UK (high); why some patients suffer from cytokine storm syndrome whilst most do not; how long immunity lasts for those who have recovered from the disease; the most effective clinical interventions available to control the disease (fewer patients are being put on ventilators than was expected in March); the extent to which any drugs have potential as effective interventions; or convalescent plasma likewise; why some patients continue to suffer from debilitating symptoms long after contracting the condition, and what their prognosis is; whether an effective vaccine can be created to immunise against the disease; if such a vaccine can be created, how it can and should be distributed; whether wearing masks will make it possible to safely reduce social distancing, for instance on public transport, or in shops or restaurants; and whether it will be necessary to shield vulnerable people for the foreseeable future.

Our point is that questions about the disease, its treatment and its epidemiology are entangled with questions that only indirectly have to do with the disease. Here are just a few. How to organise hospitals to minimise infection. How to protect care home residents or organise workplaces safely. How to organise secure supply chains. The future or otherwise of cheap, large scale international travel and the jobs that go with mass tourism. The prognosis for the high street (again, the question about jobs). The future of the office (likewise). In short, we are back to systems thinking, and systems vulnerabilities. And we need to find ways of thinking about these in the round.

The technical failure of hospital systems with too many patients or of laboratory systems with too little testing capacity, needs to be set in the context of this broader NHS wide ecology. The control paradigm and the forces released through the mis/organisations of top down redesign have disconnected health from environment and territory, therapy from prevention, health care from care, and health care from wider participation. The legacy of thirty years of

redesign is the primacy of the hospital as the factory of health care operations; and most of the surviving public laboratories as departments of the hospital factory. From this point of view, Lean (or the hospital as Toyota factory) is entirely logical. At the same time, if we are interested in resilience it makes no sense at all.

5.5 Fixing Points of failure

This reform of the structure of health services is of course radical, difficult to think through, even more difficult to perform and enact. It is therefore encouraging to find that we can begin to fix some of the points of failure within the hospital and laboratory systems without immediately embarking on a structural reform of the NHS. Our analysis of the Covid-19 crisis in earlier chapters identifies four points of failure which directly caused fragilities which predisposed to accident and made it more difficult to deal with proliferating consequences of the crisis. These four points are:

1. Insufficient capacity in the acute hospital system. There are not enough beds or staff in the NHS to support surge capacity. It is simply irresponsible to run the acute system at 92% occupancy, or to run critical care with a mid- winter margin of only 700 beds.
2. Insufficient laboratory test capacity. More distributed public health laboratory surge capacity in NHS hospitals is needed because the Covid-19 crises has shown that non-NHS labs and new testing facilities cannot be quickly added on a large scale.
3. Inadequate in-house procurement capability for service-critical consumables in an emergency, because global supply chains do not reliably deliver when every international customer wants the same product.
4. Inadequate domestic manufacturing capacity to buffer imported supplies of many kinds of medical equipment such as consumables or ventilators. While autarchy is unnecessary, long-chain procurement clearly has its limits in a world of uncertainty and growing hostility to globalisation

If our analysis (like that of many other commentators) highlights these points of vulnerability, the nearly inevitable and apparently simple questions that follow are: how much extra capacity in acute hospitals? how much extra laboratory test capacity? and how to rebuild procurement capability and supply chains? We explored the first of these in Chapter 4, but such questions are necessarily matters of art. Because ‘how much is enough’ questions raise complicated issues about sufficiency which cannot be brushed aside with the ‘more is better’ assumptions of efficiency discourse. With efficiency, more is better because the achievement of ever higher levels of productivity merits unqualified praise for continuous processes that have no fixed upper limit. By contrast, with sufficiency, we always have the idea of an upper limit set by resource consumption, and that growth beyond that point is irresponsible. For example, those who use the concept of sufficiency in ecological thinking work with upper and lower limits. As they define this, a sustainable economic system is one that operates between a floor of resource consumption to meet basic human needs and a ceiling of resource consumption set by the environment’s ability to satisfy present and future needs (Potočnik et al. 2018).

The problem with health systems is that there is no one simple justifiable target for how many more beds or PCR machines, or doctors and nurses; nor any simple template for rebuilding procurement capability. The point was well made more than 60 years ago in the Guillebaud Report whose official brief was to consider whether the NHS could provide an 'adequate service' within a limited budget. The report's conclusion was that adequacy was a moving target because 'no objective and attainable standard of adequacy exists' for health services (Guillebaud et al. 1956). Against this background, we would suggest the prerequisite is a kind of *planning by iteration* which moves through a questioning process of inquiry and discussion to arrive at proposals which reflect the multi-dimensional complexities of NHS choices. The aim here is to avoid getting diverted into the style of policy making adopted by politicians under pressure who pluck bold sounding targets from the air, as the UK's Health Minister did under pressure with the target of 100,000 Covid-19 tests a day (Calvert, Arbuthnott and Leake 2020), or the ultimate aspiration of 250,000 (Parker and Hodgson 2020). And it also means not assuming it is job done if NHS Supply Chain is renamed and given a few extra staff without a clear, executable brief on purchasing criteria.

So what does this mean in practice?

1. On acute hospital capacity, we need consideration of bed and staff numbers which factors in the concerns of different specialisms and regional contexts and looks at staff retention as well as training. The costings for capacity need to consider not just the expense of extra capacity but also the expense of making good the legacy of underinvestment and neglected maintenance that we have described above. Investment appraisal techniques need to factor in the costs of vulnerability and the near certainty that a UK acute hospital system running at full capacity, as in the late 2010s, is vulnerable to further normal accidents. The UK's acute provision might sensibly be benchmarked against North European peers as a point of reference for British policy makers; a target half-way between current British and the average North European levels of provision would be a good starting point for public discussion.
2. On laboratory capacity, decisions can only be taken after reviewing (a) possible demands for different testing technologies in a range of pandemic scenarios and changing global circumstances; and (b) available UK laboratory capacity in hospitals, universities and life science companies. Margin-of-safety calculations will need to recognise the inherent uncertainty of risk assessments; remembering that one reason for Covid-19 vulnerability was that pandemic preparedness assumed a flu-type virus. Once the level of reserve capacity is determined, this will need to be supported by a funding stream that secures retention and renewal of equipment, consumables and trained technicians. Regular reviews of distributed capacity by an independent agency such as the National Audit Office would help to embed this in the face of efficiency thinking so that surge capacity does not atrophy.
3. On procurement, the initial starting point for NHS England might usefully be an inquiry into how other organisations do it better. Here it would be worthwhile exploring what the NHS might learn from supermarket procurement and how a firm such as Tesco had prepared for some kind of crisis disruption of its just-in-time supply chains and consequently retained the in-house capability to get grocery perishables to its stores

throughout the crisis (Butler 2020). It would also be worthwhile examining how devolved government, as in Wales, had retained elements of the necessary in-house procurement capability. The likely and (relatively cheap) outcome would be the establishment of an internal NHS England procurement team of middle ranking buyers recruited from the relevant sectors; and they would need an explicit brief about how security of supply should be balanced against low cost.

4. On manufacturing the starting point surely has to be a survey of onshore domestic capacity in key sectors to identify existing capacity dedicated to NHS production and potential surge capacity ordinarily serving other buyers. This would identify supply chain gaps and allow discussion of how parts of existing industrial policy could usefully be refocused. This would imply a partial shift away from high tech innovation and glamourous sectors such as aerospace and towards building supply chain capacity for mundane consumables with direct supply arrangements to reduce the price penalty of domestic production. Again, this would cost money but given the unreliability of long-distance logistical chains, social value is not the same as least cost.

5.6 Relational vulnerability

In addition to the points of failure within the NHS, there are broader issues about the relations of vulnerability that arise from the way in which the NHS interacts with other systems. These relations of vulnerability matter because they have the capacity to cause further normal accidents and/or to undermine our capacity to build an effective NHS able to address 21st century challenges. These interactive problems are highlighted both by our analysis of the Covid-19 crisis and by the recent history of the NHS which includes local crises revealing grossly inadequate clinical care as, for instance, at the Mid Staffs hospital trust in the late 2000s (Francis 2013). In this section we identify and discuss three sources of relational vulnerability: first, the relations between the health and care systems which currently subordinate care; second, the democratic deficit which weakens effective policymaking and erodes the case for more funding; and third, the separation of health from other kinds of economic and social policy which limits the response to health inequalities. As with the 'point failures', our discussion of these 'relational vulnerabilities' should be read as an initial attempt to open up a care-ful process of policy debate rather than a definitive policy statement in its own right.

1. *Healthcare relations with Social Care*. The underlying problem in the relation between health and care systems is that care is not a partner whose concerns and problems have equal status, and the subordinate status of care has been tragically demonstrated in the current crisis. The 'Save our NHS' slogan focused political attention on the danger that NHS acute hospitals would be overwhelmed; consequently, in the early stages of the pandemic, care homes received infected people who had been discharged to free up beds in NHS hospitals[12]. The relation is concealed in current NHS policy language about the 'integration' of health and social care. This is treated as a technical process of bringing

[12] This is effectively admitted by the Department of Health and Social Care guidance published on 16 April 2020 promising to begin testing of hospital discharges. The implication was that testing had not been taking place up to this point. (Department of Health and Social Care 2020a, Section 1).

together the budgets of NHS health services and local authority adult care (for the elderly) and encouraging coordinated provision within new structures. But we suggest that the two systems cannot be meaningfully unified as long as social care has a different funding source and is means tested while it is delivered mainly through small private operators paying wages close to the legal minimum.

This kind of subordination has huge potential to create or compound proliferating consequences in future accidents. In default NHS efficiency think, the role of the social care system is not to obstruct patient flow through a hospital system which lacks buffers. Social care then becomes an adjunct activity whose role is to limit hospital admissions and delayed hospital discharges. This dodges the big questions about adult care which need to be answered before health can integrate with a more robust care sector (Burns et al. 2016). How can more funding for adult care be raised? Can this be done either by tapping house equity or extending social insurance? How can this funding be distributed to private operators so that the care sector pays decent wages? How to ensure wages are not eroded by the incursion of private equity-financed chains seeking double digit returns on capital employed? How can existing systems of care, especially adult home care, be focused less on biomedical and more on social needs? And, relatedly, how to manage the interface between paid and unpaid care when it is neither possible nor desirable to commodify all the growing demand for elderly care over the next couple of generations?

2. *Crystallising concerns through participation*. The democratic deficit is another serious problem that stands in the way of care-ful healthcare policymaking. Thus, both ordinary citizens and most of those who work in the sector are excluded from NHS decision making and priority setting. The NHS is connected at the top to representative democracy via a responsible Minister of Health, but it has never been connected at the bottom to any system of deliberative democracy. This perhaps made sense in 1948 when the task was primarily administrative, and the object of policy was to roll out hospital provision. But it is now a serious point of vulnerability. This is partly because if, as we have argued, health and care need additional tax funding, this will be more easily secured with citizen endorsement of that priority. Even more important, however, is the need to include a wide range of voices in order to articulate the widespread concerns about healthcare evinced by the Covid-19 crisis. Commitment to a care-ful process of policymaking suggests that ways need to be found which make it possible to crystallise such concerns into more specific policy-relevant problems, and then, in a second move, into possible responses to those problems. How this might be done is itself a topic for inquiry and experiment, though there are a range of possibilities. These include deliberative mechanisms such as citizens assemblies and juries which would allow interaction between experts and professionals of all kinds on the one hand, and patients, families of NHS users and other interested participants on the other. In a report such as this it makes no sense to stipulate how this should be done, but it is clear that such fora would need to hear evidence and have the ability to input informed endorsements of, and challenges to, NHS priorities and resource allocation.

   This would be quite unlike the present situation. Currently the representation of the public interest in policy thinking is little better than tokenism, for instance in the form of the recently created advisory NHS Assembly where the carefully selected nominees meet

a few times a year (NHS England and NHS Improvement 2019a); and also by over-reliance on board governance of single institutions such as hospital trusts which evidence suggests is no protection against future accidents. This board governance in the public sector imitates the systems for controlling management and monitoring performance introduced in for-profit public companies after the Cadbury Report of 1992 (Cadbury 1992). In the private sector, corporate governance has systematised the escalation of senior management pay, while non-executive directors (along with auditors) have failed to control fraud and risk taking, as we see from a succession of corporate scandals from Enron to Carillion. In NHS hospitals, oversight by non-executive boards has therefore been sensibly reinforced by the reports of multiple regulatory agencies. But this has not prevented a new kind of service failure, as at the Mid Staffordshire NHS Foundation Trust in the late 2000s, which mixed old style clinical malpractice and new style executive mismanagement under financial pressure. At the Mid Staffs, the final Francis Report of 2013 concluded that, amidst multiple failures, the board 'failed to appreciate the enormity of what was happening (and) reacted too slowly' to high mortality rates (Francis 2013, 43). Officially, the default answer to governance failure is more governance, including (this appeared in the year of the Francis Inquiry itself), an extended statement of NHS 'principles for good governance' (NHS Leadership Academy 2013). It may be that the governance revolution disappoints because it is incomplete. But there must also be a suspicion that governance is a modernist device for control of executive management that is easily prone to management capture.

3. *Healthcare relations with other forms of policy*. The third source of vulnerability is siloed thinking about how the solution to health problems lies within the domain of health policy, rather than a matter of embedding of public health priorities in other aspects of economic and social policy. As we have seen, both public health and NHS policy thinking have been decisively influenced (and greatly for the better) by what might be called a new social challenges narrative about health inequalities. And this is embedded in a larger NHS narrative about a shift from episodic interventions to the new challenge of preventive activity and the management of chronic conditions. As the current NHS 10-year plan puts it 'we cannot treat our way out of health inequalities' (NHS England 2019b, 13). In 1948 the newly founded NHS was designed to handle individual episodes of ill health or affliction. By 2020 in an ageing society, with rising incomes for a minority and the existence of sharp inequalities, the new challenge is to remedy or manage better the negative impacts of chronic ailments and illnesses including diabetes, obesity and cardiovascular disease as well as mental health; and all of these bear down hardest on the disadvantaged and poor.

   If that is the new challenge, a huge literature on the social determinants of health, including the Marmot Report (2010) touched on above, shows that economic and social conditions – especially the distribution of income and wealth – determine health outcomes. And this raises fundamental questions about the boundaries and domain of health policy. It is not just that, as we have already seen, PHE is overloaded with undeliverable objectives and the Department of Health and Social Care needs to assert itself against corporate lobbyists and business interests. It also suggests that health inequalities and chronic illness can only be managed constructively by embedding public health priorities in the policy of a wide range of central government departments. And

this has not happened when, for example, since the 2008 financial crisis the Treasury has targeted job creation without recognising that a succession of low-quality jobs and irregular income are bad for public health. The question here is how we can recover the broad view of the connections between health and environment that was obvious one hundred years ago; when infectious diseases were controlled not just by medicine narrowly defined but by the provision of the material infrastructure of piped water, sanitation and decent housing.

Attention to points of failure and relational vulnerabilities will depend on the creation of a care-ful process of policymaking. But this will only be possible if we can find ways of moving on from the control paradigm for making policy that has dominated the NHS for the last thirty years. And this in turn will only be possible if policy is no longer about the central control of doctors through financialised management that we have described above. That much is clear. But what might a care-ful process of policymaking look like? As we indicated above, the key to this is a two-step process. First it is to find contextually sensitive ways of crystallising general concerns into better-specified problems. And then it is to find good ways of seeking out workable responses to those problems. And doing this as it were in the round, for as we know realities are different in different places, one size does not fit all, and the full range of important concerns and exigencies are never visible from a single location. In short, it needs be motivated by the recognition that wisdom is distributed rather than located in a single centre.

There are many ways of imagining this. For instance, as we have noted above there are citizens' juries and citizens' assemblies. These have been explored in a wide range of contexts. Callon, Lascoumes and Barthe (2009, 18ff) writing about what they call technical democracy have described 'hybrid forums' which they conceive of as open and experimental spaces of learning in which groups can discuss options that are simultaneously technical, social and economic. As a part of this, they have argued that calculable 'risks' need to be reconceptualised as uncalculable 'uncertainties', and that health planning is beset with such uncertainties that need to be articulated, explored and set in relation to one another. And it also tells us that these are best assessed if we draw widely from the full range of available competences, professional and otherwise, rather than limiting policymaking to a small elite. Our argument, then, is that in health care policy we need to experiment collectively if we are successfully to explore what is most likely to work well and what will not. As, for instance, was done in New South Wales with the creation of Clinical Service Networks (see box 6).

This Australian experiment is quite unlike anything envisaged in the current NHS Ten Year Plan and much closer to a care-ful and resilient process of policymaking. First, it is a serious attempt to explore a new model of governance and accountability for innovative provision; a search which recognises that top-down control (with or without market mechanisms and board governance by non-executives) has helped to produce the current unresilient mess, and that clinician-initiated processes should be given a chance. Second, it aims for a delegation of responsibility much more radical than anything envisaged by the controllers of the NHS who are reluctant to accept that the current control paradigm for policymaking is ineffective or to consider letting go of resource allocation.

Box 6: An experiment with Clinical Service Networks

The Clinical Service Network (CSN) model of reform trialled (with mixed results) in New South Wales has taken the form of clinician-initiated interventions designed around solving a health/social challenge. It is an example of the care-ful practice of policy which recognises that effective change requires the insight of deep expertise, but that this expertise is often fragmented by strict divisions of labour. Australian attempts to break down this fragmentation (for instance by getting nurses to do more work commonly done by doctors) triggered effective resistance. The solution to change trialled in New South Wales involved the movement to CSNs in particular domains, for instance creating a stroke network and a frail aged support network (Braithwaite and Goulston 2004). Appropriately adapted, this practice might be explored and used to activate the NHS 'sustainability and transformation partnerships'.

In essence the CSN model starts with a general matter of concern, such as the health problems of an aging population in the greater Sydney area, and gives clinicians an initiating role in implementing change to solve problems that get articulated in a process of iterative deliberation. Everyone with a relevant concern (not just the doctors) is gathered together to deliberate on the character of the problem that needs to be solved. This might begin by considering the demographic projections of an aging population in a defined geographical area and exploring what this would mean for predictable health problems such as dementia. It has been the experience of such events that often those with highly specialised skills such as gerontologists rapidly acknowledge that they will not be able to meet future demand. This creates the space for a discussion amongst clinicians themselves about how they can change the division of clinical labour on their own initiative and reach out beyond the health system. A strategy for reconfiguring services and education arrangements based on new divisions and integrations of labour can then be mapped out by a newly formed clinical services network.

There are several preconditions of success. Senior management needs to be prepared to make large scale delegations and create the spaces where these kinds of discussion can take place. Deliberation requires resources, including a neutral facilitator or chair to ensure discussion is well briefed, managed and followed-up. The newly formed CSNs need to be able to act on their recommendations. They need, that is, to take control of resources and manage them through the CSN. Given these preconditions, the outcomes experienced in New South Wales have been mixed. Often the initial ideas have generated considerable enthusiasm before stalling. Government agencies such as Health New South Wales have been keen on the ideas, but have been less willing to relinquish control, especially of resource allocation. Conservatives within the professions (especially doctors) have then locked onto this in order to defend their patches in the labour market[13]. Thus, the CSN is often not a solution (let alone *the* solution), but rather a way of turning matters of concern into problems, and then identifying the resistances to possible solutions.

[13] The discussion of preconditions and outcomes in this paragraph is based on notes prepared in May 2020 by John Buchanan of the University of Sydney who is a member of the Health Reform Group which continues to promote changes coherent with the earlier experiments.

Does this seem to be an unsatisfactory solution? It may seem so to some. Certainly, we leave our readers with more questions than answers. And we recommend not policies but the creation of care-ful processes of policy making which come with no guarantee of successful outcomes, and all the more so when the existing NHS central controllers are likely to resist broader participation and delegation to experts, professional and lay, across the regions and the nations of the UK. But we none the less hope and believe that the questions we have articulated in this report suggest a good place to start. We also trust that the particular policy suggestions we have explored indicate a sensible direction of travel for citizens, clinicians and anyone in politics who is honest enough to recognise that we live in a hollowed-out post-administrative state and that further modernist innovation by design may unintentionally increase the fragilities of the systems on which we all rely. Targets plucked from the air or redesigns imposed from the top without iterative participation or delegation will not solve the chronic ailments of the NHS and public health. Until we undo the political focus on top-down domination and its control paradigm, the outcome will only be more of the same politically toxic mix of underachievement combined with broken promises, unfixed points of failure, systematic vulnerabilities and more normal accidents with proliferating consequences. If not now, when would you propose adopting a care-ful practice of policy?

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Conclusion

> *'We are making progress in this national battle because the British public formed a human shield around this country's greatest national asset – our National Health Service. We understood and we decided that if together we could keep our NHS safe, if we could stop our NHS from being overwhelmed, then we could not be beaten, and this country would rise together and overcome this challenge, as we have overcome so many challenges in the past' (Boris Johnson on being discharged from hospital)*

After his brush with death perhaps we may forgive the Prime Minister his rhetoric. Certainly, the NHS is a great British asset because of its practical role in British everyday life. But the NHS is much more than an asset, because it also plays a symbolic role in our national politics. At general elections, parties must compete to insist that the NHS is 'safe in our hands' and include funding promises in their manifestoes. The duplicitous slogan on the side of the Vote Leave campaign bus was 'We send the EU £350 million a week. Let's fund our NHS instead.' *Inevitably, then, the NHS is also a site of political conflict.* Nigel Lawson, Conservative Chancellor of the 1980s observed that the NHS is 'the closest thing that English have to a religion' (Lawson 1992, 613); and this was part of his complaint about how that religion's professional priesthood resisted every attempt at reform. From the other side of politics, privatisation becomes an ongoing threat. The 2012 reforms were resisted by a 'keep our NHS public' grassroots organisation; and, in the run up to the 2019 election, Labour protested that the 'NHS was up for sale' in a post-Brexit trade deal with the US (Perraudin 2020).

Practically, the NHS is our greatest asset because it offers medical treatment according to need, free at the point of use and does so through a universally available service used by nearly every citizen. It employs 1.5 million (1.1 million FTEs) which puts it in the world's top ten employers along with Walmart, Indian Railways and the People's Liberation Army. This means that it is also central to the foundational economy, that part of the economy which safeguards well-being by providing essential daily services to every household. And the social importance of all this was reinforced by Covid-19. Citizens in some ethnic and socio-economic groups are far more vulnerable than others but, in principle, anyone can catch this disease and the pandemic has reminded rich and poor alike that everyone is vulnerable. This has given new life to the collectivist public health reality that no-one is safe unless everyone is safe.

Hence the justified fear of policy makers (and the public) that the NHS would be overwhelmed in the first wave of community transmitted infection. The slogan at the beginning of the Covid-19 lockdown was: 'Stay home, protect the NHS, save lives.' And, confronted by the initial crisis, there was huge relief that acute hospital sector was more or less able to rise to the challenge thanks to the skilled efforts of all those working in it. Happily, then, despite the many excess deaths, the UK avoided the fate of North Italy where the TV news showed beds in corridors and army trucks carrying the dead to overflowing mortuaries. The qualification is that, at this stage in the pandemic, caution is needed. As we write in June 2020 there is still large scale and continuing community transmission of the disease. R values are hovering just below, and in some parts of the country just above, one. Many epidemiologists are critical of lockdown relaxations (Hodgson et al. 2020), and think that these are premature. And many,

probably most, think that it is very likely that there will be a second spike of infections in the early winter. How well the NHS manages at that point will be tested if and when that happens.

But, if the acute hospital system has (so far) not been overwhelmed, the argument of this report is that the overall healthcare system in the UK has failed despite the best efforts of its staff. The Covid-19 crisis is a normal accident because the acute hospitals had no buffers, and the public health laboratories had no surge capacity. Hospital beds were found in April by decanting frail and untested patients into care homes where the resulting spread of the disease became a national scandal. Hospital beds were also freed by discontinuing other treatments, and NHS managers are now warning that there will be almost ten million patients waiting for routine operations by the end of 2020 (Campbell 2020). In addition, PPE procurement was quite inadequate even into the core NHS, while supplies were yet more limited in the care sector. And overwhelmed by relatively small numbers, community testing and tracing was discontinued in March; while as we write the attempt to restart this on 27th May (as a part of the move from lockdown) is stuttering (Neville, Warrell and Hughes 2020; Warrell and Hughes 2020) All of these are failures, and all of them have contributed to the severity of the crisis.

So what is to be done? How might the British healthcare system be made more resilient? How might it avoid future normal accidents? The first prerequisite is to broaden the frame of public political debate which has for decades been more or less exclusively concerned with the issue of NHS funding and questions about the role of private service providers within a publicly funded service. The political concern with funding goes back all the way to 1951 when Nye Bevan resigned from the Labour Government after refusing to accept the levying of prescription charges; the issue about private providers goes back at least to the late 1980s when free marketeers increasingly had to accept that the full privatisation of the health service was not practical politics. These issues are indeed hugely important, but in this report we have set them in context by arguing that sensible decisions in these areas are necessary but not sufficient to create a robust NHS.

On both the issues of funding and private providers, we have taken clear, strong positions and indicated the limits of such positions. We have argued that the hospital system needs more funding, indeed much more funding than the two major parties envisage, if we are to have a more robust hospital system with buffers. But, this will not by itself solve the problems of acute hospitals and the rest of the NHS which is not only underfunded but also enmeshed in the 'control paradigm' and the consequences of churning reorganisation. It would be highly undesirable to admit private providers into free public services. Economically, in work on financialised chains in residential adult care we have elsewhere shown that private providers aiming for a 10%-plus return on capital will add a significant extra cost if the activity is capital-intensive (Burns et al. 2016); politically, privatisation embeds rent seeking players which lobby against any change that threatens their business model. But, privatisation or threat of privatisation is not the only cause of fragile NHS public services for, as we have seen, the absence of surge capacity in NHS public health laboratories has been an unintended consequence of top down redesign.

The problem at present is that a fixation on the issue of funding and the role of private providers is crowding out discussion of other issues that are equally important to health and

to other public services. The most important of these issues is the problem of a central state apparatus which combines an appetite for control with very limited administrative capability. The effect of this is ongoing serial shambles. The post-administrative state has a bias towards outsourcing, and in crisis has no alternative but to engage in distress outsourcing in the vain hope that consultancies, outsourcing conglomerates and corporates with spare capacity will solve its problems. The results in the present crisis in health include the faltering procurement of PPE, lost Covid-19 test results, and the faltering attempt to rebuild a 'world beating' test and trace system. In an earlier crisis about Brexit preparations the results included a contract for the ferry company with no ferries (Pickard 2019). Before citizens can get the public services that they deserve, the state will have to be re-skilled so that it develops new administrative capability. This is a very large issue which (as Grenfell and Windrush show) applies to the Ministry of Housing, Communities and Local Government and the Home Office as much as to the Department of Health and Social Care.

But as this report has shown, the NHS and public health have sector-specific problems. The 'control paradigm' in its relentless search for an efficient and disciplined healthcare system has imposed a series of different one-size-fits-all reorganisations in a destructive process of hyper-innovation which has undermined the robustness of both the NHS and public health organisations. These mis/organisations have ignored the distributed knowledge and wisdom of those directly involved in healthcare, and have never seriously entertained the thought that patients and members of the public might also be able to contribute to an intelligent conversation about healthcare policy. From this point of view, readers will understand why our report does not – and could not – end with a detailed list of policy recommendations for changes in NHS structure and strategy. We are agnostic on structures; and on strategy would only observe that, if we want a health system that is not a set of accidents waiting to happen, then the pursuit of efficiency needs to be supplemented or replaced by a logic of sufficiency.

Fundamentally, what this report criticises is not specific policies but a health policy process where it is assumed that effectiveness can be achieved through control and top-down redesign which specifies structures and mechanisms; a process in which each redesign fails, and in turn requires further redesign. This is a process which leads to the mis/organisation of hyper-innovation. The implication, then, is that what we need is an alternative model for thinking about how policy is made, and this is what we sketched in chapter 5. This alternative is a care-ful process of policymaking that is modest, experimental, iterative, revisable and consultative as it crystallises concerns, specifies these as problems, and seeks possible solutions to those problems. What might care-ful policymaking look like in practice? We touched on one such initiative from New South Wales which added the deliberative and participative elements that we consider essential. The new forms are themselves a topic for discussion and experiment, and need to be worked out in practice; along with a change in policymaking style and tone in an over -centralised country whose London-based elites have never been more than grudgingly willing to concede that the nations and the regions and the professions and lay people across our country might be also be able and willing to participate in policymaking

So we are not stipulating particular policies. Instead we are recommending decentralised experiment, delegation of responsibility, loosening of control and the creation of new fora for deliberation. Perhaps some readers will find this frustrating. To this our reply is that the

national NHS of 1947 was built on a foundation of local experiments in the 1930s. The 1947 NHS offered health insurance for the whole population with free hospitalisation and access to professional surgeons. But this was pioneered in the 1920s and 1930s in in two small Welsh towns, Llanelli and Tredegar, where trade unions led a local Medical Aid Society; an 18-month dispute with Llanelli doctors in 1934-6 prefigured the NHS conflicts of 1947 about the salaried status of doctors (Hart 2010). There were parallel rural experiments In the Highlands and Islands Services and the Gloucestershire Medical Services Scheme (Political and Economic Planning 1937, 28). All we are saying is that it is time to revive this tradition of local initiatives as a way of reanimating a mis/organised NHS.

And Covid-19 gives us the motive and the opportunity to rethink the health system – and much else besides. The virus has brought new realities: Zoom meetings, wearing masks, living in bubbles, and football matches without spectators. It has created a host of new problems about lost jobs and educational opportunities, deepening economic and health inequalities, additional domestic violence, greater loneliness and increasing rates of cancer mortality. Will this 'new normal' disappear as the novel possibilities and many of the problems fade away? Or are we at a moment of disruption when we can aspire collectively to make a new normal that is better than what it was that came before? Perhaps we can imagine a new normal that is fairer, more open, more generous. Perhaps, the focus of this report, we can imagine a healthcare new normal that is robust rather than an accident waiting to happen. Perhaps, too, we can imagine new ways of making policy that move on from the failed old paradigm of centralised control. Perhaps we can imagine a new normal in which responsive and productive policies are care-fully created. Policies that work better for all.

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17th March - 26th June 2020

Table 1: Number of citizens per physician, 2010-2018

	France Citizens per physician	Germany Citizens per physician	UK Citizens per physician
2010	329	269	378
2011	326	258	372
2012	324	253	371
2013	322	248	368
2014	321	243	364
2015	320	242	361
2016	319	239	360
2017	316	235	356
2018	315	n/a	352

Source: OECD Health Statistics 2019, Health Care Resources: Physicians, OECD.Stat. https://stats.oecd.org/# (OECD 2019b)
Notes: Data refers to practising physicians. Doctors are either generalists providing community care to individuals and families, or specialists such as paediatricians, obstetricians/gynaecologists, psychiatrists.

Table 2: Number of citizens per nurse, 2010-2018

	France Citizens per nurse	Germany Citizens per nurse	UK Citizens per nurse	UK (excluding associate nurses) Citizens per nurse
2010	118	84	119	150
2011	115	82	122	152
2012	110	82	126	156
2013	107	79	126	155
2014	104	78	126	155
2015	101	77	126	155
2016	98	76	127	155
2017	95	75	128	156
2018	93	n/a	128	157

Source: OECD Health Statistics 2019, Health Care Resources: Nurses, OECD.Stat. https://stats.oecd.org/# (OECD 2019b)
Note: French and German data refers to professionally active nurses; Italian and Spanish data refers to nurses licensed to practice; UK data refers to practising nurses and includes associate nurses.

Table 3: Number of citizens per hospital bed, 2010-2017

	France No. of citizens	Germany No. of citizens	Italy No. of citizens	Spain No. of citizens	UK No. of citizens
2010	155	121	274	321	341
2011	157	119	284	328	348
2012	158	120	292	334	356
2013	159	121	302	337	363
2014	161	122	311	337	366
2015	163	123	313	335	383
2016	165	124	315	337	389
2017	167	125	314	336	394
2018	n/a	n/a	n/a	n/a	n/a

Source: OECD Health Statistics 2019, Health Care Resources: Hospital beds and Historical population, OECD.Stat https://stats.oecd.org/# (OECD 2019b)
Notes: Data includes all beds in the public and private sectors; psychiatric care beds are excluded from the count.

Table 4: Number of overnight stay episodes annually per bed (Acute and general care), 2010-2017

	France Per year	Germany Per year	Italy Per year	Spain Per year	UK Per year
2010	26.2	29.1	37.9	32.5	45.1
2011	26.5	29.5	37.6	32.7	45.4
2012	26.5	30.1	37.6	33.1	46.3
2013	26.4	30.5	37.4	33.5	46.8
2014	26.6	31.1	37.4	34.2	47.3
2015	26.7	31.4	37.1	34.3	49.2
2016	31.0	31.9	36.8	35.1	49.6
2017	31.1	31.8	36.5	35.1	48.7
2018	n/a	n/a	n/a	n/a	n/a

Source: Health Care Resources: Hospital beds, OECD.Stat, https://stats.oecd.org/# (OECD 2019b) and Hospital discharge rates (indicator), OECD, doi: 10.1787/5880c955-en, (OECD 2019a) (Accessed on 10 April 2020)
Notes: Data includes all beds in the public and private sectors; psychiatric care beds are excluded. Number of overnight stay episodes is calculated from hospital discharge rates which measure the number of patients released after staying at least one night in hospital. Discharge includes deaths in hospital following inpatient care. Same-day discharges are usually excluded.

Table 5: Annualised average overnight bed availability and occupation in England (total and general and acute beds)

	Available		Occupied		Occupation rate		General & Acute beds	
	Total	General & Acute	Total	General & Acute	Total	General & Acute	share of total beds	Unoccupied
	No.	No.	No.	No.	%	%	%	No.
2010-11	142,470	108,958	121,656	94,878	85.4%	87.1%	76.5%	14,079
2011-12	138,574	105,703	118,159	91,845	85.3%	86.9%	76.3%	13,858
2012-13	136,767	104,737	117,969	92,231	86.3%	88.1%	76.6%	12,506
2013-14	135,949	104,581	117,338	92,072	86.3%	88.0%	76.9%	12,509
2014-15	135,506	104,653	118,210	93,128	87.2%	89.0%	77.2%	11,525
2015-16	131,072	102,941	114,328	91,566	87.2%	89.0%	78.5%	11,374
2016-17	130,457	102,690	115,156	92,754	88.3%	90.3%	78.7%	9,935
2017-18	129,230	102,100	113,945	92,256	88.2%	90.4%	79.0%	9,844
2018-19	128,383	101,352	112,994	91,373	88.0%	90.2%	78.9%	9,979
2019-20	128,058	101,255	113,293	91,814	88.5%	90.7%	79.1%	9,441

Sources: KH03 number of available and occupied beds open overnight that are under the care of consultants, NHS England https://www.england.nhs.uk/statistics/statistical-work-areas/bed-availability-and-occupancy/bed-data-overnight/ (NHS England 2019a)
Population estimates, ONS (accessed via Nomis 06-04-2020)
2018/19 and 2019/2020, Principal projection - England summary , ONS https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/tablea14principalprojectionenglandsummary (Office for National Statistics 2019d)
Note: 2019/20 is annualised using three quarters data .

Table 6: Acute and general care overnight stay beds average availability rates, 2010-2017

	France %	Germany %	Italy %	Spain %	UK %
2010	50%	44%	27%	38%	13%
2011	49%	43%	28%	37%	13%
2012	49%	42%	28%	36%	11%
2013	49%	41%	28%	35%	10%
2014	49%	40%	28%	34%	9%
2015	49%	40%	29%	34%	5%
2016	40%	39%	29%	32%	5%
2017	40%	39%	30%	33%	6%
2018	n/a	n/a	n/a	n/a	n/a

Source: Health Care Resources: Hospital beds, OECD.Stat, https://stats.oecd.org/# (OECD 2019b) and Hospital discharge rates (indicator), OECD, doi: 10.1787/5880c955-en, https://data.oecd.org/healthcare/hospital-discharge-rates.htm#indicator-chart, (Accessed on 10 April 2020) (OECD 2019a)

Notes: Data includes all beds in the public and private sectors; psychiatric care beds are excluded. Hospital discharge rates measure the number of patients who leave a hospital after receiving care. Hospital discharge is defined as the release of a patient who has stayed at least one night in hospital. It includes deaths in hospital following inpatient care. Same-day discharges are usually excluded. We derive the total number of episodes from the discharge data which provides the numerator for the calculation. The denominator is the number of beds multiplied by 365 to give the number of bed days.

Table 7: Acute and general care overnight stay beds average occupation rates, 2010-2017

`	France %	Germany %	Italy %	Spain %	UK %
2010	50%	56%	73%	62%	87%
2011	51%	57%	72%	63%	87%
2012	51%	58%	72%	64%	89%
2013	51%	59%	72%	65%	90%
2014	51%	60%	72%	66%	91%
2015	51%	60%	71%	66%	95%
2016	60%	61%	71%	68%	95%
2017	60%	61%	70%	67%	94%
2018	n/a	n/a	n/a	n/a	n/a

Source: Health Care Resources: Hospital beds, OECD.Stat, https://stats.oecd.org/# (OECD 2019b) and Hospital discharge rates (indicator), OECD, doi: 10.1787/5880c955-en, https://data.oecd.org/healthcare/hospital-discharge-rates.htm#indicator-chart, (Accessed on 10 April 2020) (OECD 2019a)
Notes: Data includes all beds in the public and private sectors; psychiatric care beds are excluded. Hospital discharge rates measure the number of patients who leave a hospital after receiving care. Hospital discharge is defined as the release of a patient who has stayed at least one night in hospital. It includes deaths in hospital following inpatient care. Same-day discharges are usually excluded. We derive the total number of episodes from the discharge data which provides the numerator for the calculation. The denominator is the number of beds multiplied by 365 to give the number of bed days.

Table 8: Barts Health Trust operating characteristics

	Total income £m	Operating expenditure £m	Net operating surplus or deficit £m	Surplus or deficit as a share of income %	Acute and General hospital bed occupation rates %
2012-13	1,324	1,330	-5	-0.4%	95.2%
2013-14	1,288	1,355	-67	-5.2%	94.5%
2014-15	1,320	1,394	-74	-5.6%	99.1%
2015-16	1,343	1,538	-195	-14.5%	97.8%
2016-17	1,489	1,541	-52	-3.5%	96.1%
2017-18	1,513	1,551	-38	-2.5%	94.3%
2018-19	1,527	1,603	-77	-5.0%	97.9%
Total/ average	9,803	10,311	-508	-5.2%	96.4%

Source: Annual report and accounts, Barts Health Trust.
https://www.bartshealth.nhs.uk/annual-reports (Barts Health NHS Trust 2018)

Table 9: Counterfactual analysis -Barts Health Trust operating characteristics at 100% bed utilisation

	Total income £m	Operating expenditure £m	Net operating surplus or deficit £m	Surplus or deficit as a share of income %	Acute and General hospital bed occupation rates %
2012-13	1,391	1,330	62	4.4%	100.0%
2013-14	1,363	1,355	8	0.6%	100.0%
2014-15	1,332	1,394	-62	-4.7%	100.0%
2015-16	1,373	1,538	-165	-12.0%	100.0%
2016-17	1,549	1,541	9	0.6%	100.0%
2017-18	1,604	1,551	53	3.3%	100.0%
2018-19	1,559	1,603	-44	-2.8%	100.0%
Total/ average	10,172	10,311	-139	-1.4%	100.0%

Source: Annual report and accounts, Barts Health Trust.
https://www.bartshealth.nhs.uk/annual-reports (Barts Health NHS Trust 2018)

Table 10: Barts Health Trust surplus or deficit from operating level to balance sheet

	Net operating surplus or deficit £m	Surplus of deficit after finance and other costs £m	Surplus or deficit after revaluations and impairments £m	Net surplus or deficit after all accounting adjustments £m	Acute and General Hospital Bed Utilisation rates %
2012-13	-5	-49	-23	0	95.2%
2013-14	-67	-112	20	-38	94.5%
2014-15	-74	-128	-65	-80	99.1%
2015-16	-195	-224	-271	-135	97.8%
2016-17	-52	-109	-127	-69	96.1%
2017-18	-38	-108	2	-109	94.3%
2018-19	-77	-87	-94	-84	97.9%
Total/ average	-508	-817	-557	-515	96.4%

Source: Annual report and accounts, Barts Health Trust.
https://www.bartshealth.nhs.uk/annual-reports (Barts Health NHS Trust 2018)

Table 11: Average annual real growth in NHS funding and UK GDP by time period

Period	Financial years	Real average annual change in NHS funding	Real average GDP growth rate
Pre-1979	1949/50 to 1978/79	+3.5%	+3.1%
Thatcher and Major Conservative Governments	1978/79 to 1996/97	+3.3%	+2.4%
Blair and Brown Labour Governments	1996/97 to 2009/10	+6.0%	+2.1%
Conservative-Liberal Democrat Coalition Government	2009/10 to 2014/15	+1.1%	+1.9%
Cameron and May Conservative Governments	2014/15 to 2018/19	+1.6%	+1.9%

Source: The Health Foundation (2019), 'Labour pledges a step-change in NHS funding after almost a decade of austerity' (The Health Foundation 2019); GDP growth rate from https://www.ons.gov.uk/economy/grossdomesticproductgdp/timeseries/ihyp/pn2 (Office for National Statistics 2019b)

Table 12: Counterfactual increase in UK health care spending as per cent of GDP

	UK GDP	Actual healthcare spend	Increase in healthcare spend if increased by			
			0.5% of GDP	1.0% of GDP	1.5% of GDP	2.0% of GDP
	£m	£m	£m	£m	£m	£m
2013	1,782,109	172,009	8,911	17,821	26,732	35,642
2014	1,861,965	179,942	9,310	18,620	27,929	37,239
2015	1,916,896	183,647	9,584	19,169	28,753	38,338
2016	1,995,478	191,025	9,977	19,955	29,932	39,910
2017	2,071,667	197,414	10,358	20,717	31,075	41,433
2018	2,144,304	206,862	10,722	21,443	32,165	42,886
2019	2,214,888	212,629	11,074	22,149	33,223	44,298

Source: GDP data tables, ONS, https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/uksecondestimateofgdpdatatables (Office for National Statistics 2019a), and Health Care Resources: Health expenditure and financing, OECD.Stat (For share of Health expenditure as a share of GDP) https://stats.oecd.org/# (OECD 2019b)
Notes: Data includes all public, private and out of pocket spend; UK Gross domestic product at market prices and 2019 shares are estimated.

Table 13: Breakdown of the UK's current healthcare spend by category, 2013-2017

	2013 £m	2014 £m	2015 £m	2016 £m	2017 £m
All providers	183,266	188,514	191,630	195,227	197,414
Hospitals	74,861	76,909	80,313	81,526	82,602
Residential long-term care facilities	22,843	22,586	22,859	23,355	23,633
Providers of ambulatory healthcare	43,208	43,846	46,145	47,384	47,913
of which: Offices of general medical practitioners	13,381	13,258	13,935	14,518	15,451
of which: Dental practices	6,930	6,943	7,164	7,300	7,355
of which: Providers of home healthcare services	9,221	9,514	10,031	10,278	10,323
of which: Other ambulatory providers	13,677	14,132	15,015	15,289	14,784
Providers of ancillary services	3,139	3,322	3,374	3,494	3,567
Providers of medical goods	21,031	21,376	22,161	21,848	21,862
Providers of preventive care	2,963	3,353	3,426	3,351	3,196
Providers of healthcare system administration and financing	4,368	4,301	3,973	3,080	3,446
Rest of economy	7,676	8,206	8,088	9,016	9,615
of which: Households as providers of home healthcare	2,317	2,505	2,738	2,849	2,939
of which: All other industries as secondary providers of healthcare	5,359	5,700	5,350	6,167	6,676
Rest of the world	391	351	355	368	467
Not elsewhere classified	2,786	4,264	936	1,805	1,113

Source: Healthcare expenditure, UK Health Accounts: 2017, ONS, https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthcaresystem/bulletins/ukhealthaccounts/2017 (Office for National Statistics 2019c)
Notes: Totals exclude capital expenditure on capital but include allowance for consumption of capital. Totals include all government spending by the NHS, local authorities and other government bodies involved in the provision of healthcare. Expenditure is reported net of client contributions and grants to charities.

Table 14: Counterfactual increase In per capita UK health care spending as per cent of GDP

	Actual UK healthcare spend per citizen	Extra cost per citizen if healthcare spend increased by			
		0.5% of GDP	1.0% of GDP	1.5% of GDP	2.0% of GDP
	£	£	£	£	£
2013	2,683	139	278	417	556
2014	2,786	144	288	432	576
2015	2,821	147	294	442	589
2016	2,910	152	304	456	608
2017	2,989	157	314	471	627
2018	3,114	161	323	484	646
2019	3,146	164	328	492	656

Source: GDP – data tables, ONS (UK GDP data), https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets/uksecondestimateofgdpdatatables (Office for National Statistics 2019a); Health Care Resources: Health expenditure and financing; GDP OECD.Stat (For share of Health expenditure as a share of GDP) https://stats.oecd.org/# (OECD 2019b) and Nomis, ONS (for population data) https://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?opt=3&theme=&subgrp= (NOMIS: Official Labour Market Statistics 2020)
Notes: Data includes all public, private and out of pocket spend; UK Gross domestic product at market prices and 2019 shares are estimated.

Table 15: Increase in UK tax receipts required to fund increase in health expenditure

	Total Tax receipts	Tax increase to fund healthcare spend increased by			
		0.5% of GDP	1.0% of GDP	1.5% of GDP	2.0% of GDP
	£m	%	%	%	%
2013	473,625	1.9%	3.8%	5.6%	7.5%
2014	492,800	1.9%	3.8%	5.7%	7.6%
2015	514,054	1.9%	3.7%	5.6%	7.5%
2016	532,859	1.9%	3.7%	5.6%	7.5%
2017	567,868	1.8%	3.6%	5.5%	7.3%
2018	592,083	1.8%	3.6%	5.4%	7.2%
2019	620,094	1.8%	3.6%	5.4%	7.1%

Source: HMRC Tax and National Insurance Receipts, HMRC https://www.gov.uk/government/statistics/hmrc-tax-and-nics-receipts-for-the-uk (Office for National Statistics 2020)
Note: Data relates to all receipts collected by HMC and includes tax, VAT and duties.

Table 16: Total health expenditure as a share of Gross Domestic Product (GDP)

	France %	Germany %	Italy %	Spain %	UK %
2010	11.2	11.1	8.9	9.1	8.4
2011	11.2	10.8	8.8	9.1	8.3
2012	11.3	10.8	8.9	9.1	8.2
2013	11.4	11.0	8.9	9.1	9.7
2014	11.6	11.0	9.0	9.1	9.7
2015	11.5	11.2	9.0	9.1	9.6
2016	11.5	11.2	8.8	9.0	9.6
2017	11.3	11.4	8.8	8.9	9.5
2018	11.2	11.4	8.8	8.9	9.6

Source: Health Care Resources: Health expenditure and financing, and GDP OECD.Stat https://stats.oecd.org/# (OECD 2019b)
Notes: Data includes all public, private and out of pocket spend. There is a break in the UK series between 2012 and 2013

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