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Vaccine Sovereignty as a Strategy for the UK's Future Health, Wealth and National Security

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Foreword

The Covid-19 pandemic was one of the most significant global events of our time. It exposed how deeply health security, economic stability and national security are intertwined – and how vulnerable the UK becomes when it cannot reliably access critical medical countermeasures at speed.

The response to Covid demonstrated what the UK can achieve when government, the NHS, industry and communities act together. The rapid development and deployment of vaccines, led by the Vaccine Taskforce, was a defining success. Backing multiple vaccine platforms (each with a different mechanism of action against Covid-19), taking early financial risks and partnering closely with industry ensured that the UK was not dependent on a single scientific or commercial pathway. That approach saved lives and shortened a period of profound social and economic disruption.

But the pandemic also revealed a harder truth: scientific excellence alone is not enough. The UK lacked the domestic manufacturing capacity and end-to-end capability needed to translate innovation into doses at scale under intense global pressure. Supply chains for raw materials, specialist equipment and finished vaccines proved fragile and highly concentrated overseas. In a new world of rising geopolitical tension, export restrictions and competition for scarce resources, those vulnerabilities are not hypothetical: they are real and structural.

The lesson is clear: vaccine sovereignty is not about isolation or self-sufficiency, but strategic resilience. The UK must be able to act quickly and independently in a crisis, while remaining a reliable partner to allies. That requires sustained investment in domestic capability, alongside deepened international collaboration with trusted partners.

This matters because the risk has not receded. A future pandemic is not a question of if but when. As human activity increasingly intersects with previously undisturbed ecosystems, the probability of novel pathogens is rising. Future threats might not be best addressed by mRNA vaccines alone, but potentially by other platforms such as viral vectors, protein subunits,

virus-like particles or technologies yet to be developed. Relying on a single platform, or just-in-time contract manufacturing, introduces avoidable risks. In addition, global markets are unlikely to function perfectly in a major public-health emergency.

As this paper shows, the cost of complacency is severe. Disinvestment in pandemic preparedness would result in significantly higher deaths, hospitalisations and economic damage in a future Covid-scale event, which would drive higher public borrowing and deeper, longer-lasting disruption. By contrast, targeted investment in preparedness, vaccine development and manufacturing capacity materially reduces both human and economic costs, while strengthening the UK's life-sciences sector and anchoring high-skilled jobs.

This report argues that vaccine sovereignty must be treated as a core component of national security. It calls for a hybrid approach: marshalling existing domestic capabilities into a coherent sovereign manufacturing core; building allied surge capacity through international partnerships; and targeting investment to remove critical bottlenecks across the vaccine pipeline.

These are not abstract policy choices. They are practical decisions about whether the UK chooses to insure itself against future shocks or rely on luck.

The premium for preparedness must be paid in advance. Manufacturing capacity, regulatory readiness and skilled workforces cannot be built once a crisis has already begun. In an increasingly volatile world, sustained and predictable investment in vaccine preparedness is essential to protect lives, safeguard the economy and ensure that the UK can respond quickly, decisively and with confidence when the next crisis comes.

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Executive Summary

If there was any lingering doubt among world leaders, the opening weeks of 2026 should have dispelled it: the international rules-based order is fracturing, countries previously considered allies cannot always be relied upon to act as such, and global economic interdependence is being used as leverage rather than an opportunity for shared prosperity. In this more volatile and contested environment, resilience has become a priority.

For governments facing such uncertainty, national security is about much more than defence: it also encompasses energy security, food security and, critically, health security. The ability of a state to withstand shocks, maintain public trust and continue functioning under pressure is now central to its sovereignty.

Vaccines sit squarely within this expanded understanding of national security. Timely access to effective vaccines is not only a public-health imperative: it determines how quickly a country can reopen its economy, protect its health-care system and preserve social stability. It also determines whether a government retains agency in a crisis or depends on the decisions of others.

However, vaccines are among the most globalised products in existence, reliant on complex international supply chains for ingredients, manufacturing and distribution. Previously that structure made sense because it was efficient; today the global provenance of vaccines makes them a strategic vulnerability.

This is especially pertinent given that the likelihood of a biological threat is rising. The annual risk of another event on the scale of Covid-19 is estimated at 2.5 per cent to 3.3 per cent per year, implying a cumulative probability of between 47 per cent and 57 per cent over the next 25 years.[1,2,3,4] And while influenza remains the most likely cause of the next pandemic, other drivers are becoming increasingly salient.

Climate change is reshaping disease ecology, accelerating the spread of vector-borne diseases such as dengue and chikungunya across Europe, with credible projections suggesting that both could become endemic within the next decade.[5] There is also growing concern that diseases such as malaria, previously eliminated from most of Europe, could re-emerge as environmental conditions become more favourable.

At the same time, antimicrobial resistance is on the rise, increasing the likelihood of bacterial outbreaks that are harder – and in some cases impossible – to treat, placing greater emphasis on vaccines as a preventative tool.[6] These risks are exacerbated by the growing plausibility of deliberate biological attacks, which would likely accelerate vaccine nationalism and place severe strain on alliance-based supply arrangements.

The pursuit of greater vaccine sovereignty does not have to mean complete self-sufficiency; it would be neither feasible nor efficient for every country to produce every vaccine from end to end themselves. Instead, greater sovereignty can be achieved by reducing exposure to catastrophic dependence: ensuring access to critical inputs; being able to pivot manufacturing across different vaccine platforms; and building trusted alliances that share insight, collaborate on preparation and guarantee priority access in a crisis.

This paper examines what vaccine sovereignty should mean in practice for the United Kingdom. In 2020, the UK demonstrated what was possible in terms of vaccine development and deployment. Against all odds it progressed the Oxford-AstraZeneca vaccine from "lab to jab" in under a year – a process that normally takes a decade. It was an achievement that saved thousands of lives in the UK and millions more globally. It wasn't perfect – very high rates of use revealed very rare side effects that would have been less acceptable in normal times – but it was the first. And in a pandemic, when every day without a vaccine compounds the human and economic toll, speed counts.

It would be a mistake to assume that the conditions that enabled this success still exist today. At almost every point along the lab-to-jab pathway, the UK has since lost either capability or capacity. Research funding has

weakened and clinical-trials activity has declined, for example. And while the UK has gained manufacturing capacity for the mRNA vaccine platform, it has lost capabilities for other critical vaccine platforms, like protein subunit vaccines, for example. Without action, the UK risks becoming dependent on a single platform at a single site, which would create an avoidable single point of failure.

Another consideration is that returning to 2020 levels of preparedness would not be sufficient to mitigate today's risks. Part of the UK's success during Covid-19 was down to good fortune: spare manufacturing capacity was available, global supply chains had not yet fractured and the pandemic, while devastating, was not at the most severe end of historical experience. These circumstances cannot be relied upon in future. The next pandemic could be more lethal or more disruptive to global trade, or coincide with other shocks such as conflict, energy disruption or climate-related crises.

Research commissioned by the Tony Blair Institute for Global Change and conducted by Public First shows just how exposed the UK is to this global supply-chain risk. According to our research (for which Public First's full methodology is available as a downloadable PDF), the UK pharmaceutical sector is more than three times as dependent on global imports as the economy overall, with 50 per cent of basic products and preparations arriving from abroad. For machinery and petrochemicals, the UK relies heavily on the European Union; for agricultural inputs, on Latin America and China; and for critical components of mRNA vaccines, almost exclusively on China. These dependencies not only create strategic vulnerabilities during a pandemic, but also for routine vaccines during non-pandemic times.

To quantify what is at stake, this paper examines the health and economic impacts of different levels of investment in vaccine preparedness under a range of geopolitical scenarios. The results are stark. The worst-case outcome for the UK would be a combination of government disinvestment in vaccine preparedness and heightened protectionism, particularly from the EU. Under this scenario, a Covid-like pandemic in ten years' time would result in 12 per cent more cases, 18 per cent more hospital admissions and 28 per cent more deaths than in 2020. This would be alongside almost 75

per cent more public-sector net borrowing and a nearly 90 per cent greater loss of gross value added (GVA), leaving the UK tens of billions of pounds worse off.

By contrast, a 25 per cent increase in investment would see the UK experience 2 per cent fewer cases, 4 per cent fewer hospital admissions and 5 per cent fewer deaths than in 2020. Regarding the economy, the UK could expect to spend about 10 per cent less on public-sector net borrowing, and lose about 8 per cent less in GVA.

At first sight this rather shallow "payoff" might seem a poor return on investment for the government, but such payoffs (small upside if you invest, large downside if you don't) are typical of insurance policies – and that is how an investment in vaccine preparedness should be considered. The cost of this insurance might seem like a luxury at a time of tight fiscal constraints, but it is important to bear in mind exactly what is being insured here: the entire UK economy.

What this modelling cannot fully capture is the intrinsic value of sovereignty: the ability to act independently, retain agency and secure access when markets and goodwill fail. Accepting a sovereignty premium is therefore not an example of inefficiency, but a strategic investment in national resilience.

While investment at any point along the lab-to-jab pathway strengthens vaccine security, manufacturing represents the most binding constraint. Vaccine R&D is inherently uncertain: even in 2020, with unprecedented focus and funding, the probability of finding a success vaccine for Covid-19 was estimated by senior officials at only 15 per cent.[7] Manufacturing capacity, by contrast, provides strategic leverage irrespective of where scientific discovery occurs. Countries with credible, GMP-compliant production facilities are better positioned to negotiate technology transfer, attract partnerships and secure supply once an effective vaccine exists. The Covid-19 experience demonstrated this clearly: the Oxford-AstraZeneca vaccine was licensed to manufacturers with established production capacity, including the Serum Institute of India, enabling rapid scale-up.[8]

For this reason, countries across the world are acting decisively to secure domestic manufacturing capacity. The United States, for example, has institutionalised preparedness through the Biomedical Advanced Research and Development Authority, investing in "ever-warm" manufacturing sites and onshoring critical inputs such as fill-and-finish and adjuvants; while the EU is investing in capacity and preparedness through its EU FAB programme,[9] a network of pre-contracted, "ever-warm" manufacturing facilities across multiple member states.

Importantly, if the UK were to implement such a programme itself (a UK FAB-type arrangement), it would not be starting from zero. Significant latent manufacturing capacity exists within domestic contract manufacturing organisations. This capacity was successfully mobilised during the Covid-19 response. However, this capacity is currently exposed to commercial market forces and underutilisation. Without strategic engagement, it risks being lost, repurposed, or relocated. Securing this latent capability would be one of the fastest and most cost-effective routes to rebuilding sovereign resilience.

Core Recommendations

Drawing on international best practice and detailed appraisal, this paper concludes that the most effective and affordable route to vaccine sovereignty for the UK is a hybrid strategy, built around three primary pillars: domestic capacity, allied capacity and targeted new investment. It should also be underpinned by enabling reforms.

PILLAR 1: SECURE AND INSTITUTIONALISE DOMESTIC SOVEREIGN CAPACITY

The UK should establish a UK FAB model as the core of its sovereign manufacturing capability. This would not necessitate building entirely new state-owned factories. Instead it would coordinate and contract with existing UK-based manufacturers through competitively selected consortia, each combining a vaccine developer, a manufacturing facility that meets the necessary standards and a fill-and-finish provider. These consortiums would

enter into multi-year "warm-lighting" agreements, under which facilities are kept in a state of operational readiness during non-pandemic times. In return for an annual retainer, the government would secure first rights to surge production (including sufficient doses for the UK population) in a crisis.

This approach preserves and stabilises latent domestic manufacturing capacity, avoids reliance on a single platform or site, reduces the cost and delay of rebuilding capacity from scratch, and anchors skills and supply chains within the UK. Routine NHS procurement, where clinically appropriate, should be used to provide predictable baseline demand to sustain these facilities commercially in non-pandemic times.

PILLAR 2: PARTNER WITH TRUSTED ALLIES FOR ADDITIONAL SURGE CAPACITY

Domestic capability should be complemented by structured international cooperation. The UK should undertake a formal appraisal of participation in EU FAB versus establishing or joining a broader Global FAB arrangement with trusted country partners.

The objective is strategic interdependence rather than full self-sufficiency: cooperating on preparedness (for example, through pathogen surveillance and tiered vaccine-prototype response) and securing guaranteed surge access to allied manufacturing capacity through pre-negotiated agreements, regulatory alignment and activation protocols.

Whichever route is pursued, allied surge capacity must be fully embedded within the UK's biosecurity planning with clear activation triggers, pre-agreed regulatory reliance mechanisms and defined allocation and logistics arrangements. This provides a credible second line of defence while preserving sovereign decision-making authority.

PILLAR 3: BUILD TARGETED NEW CAPACITY WHERE GAPS PERSIST

Where structural bottlenecks exist, the UK should deploy targeted public-private partnerships to close them. Priority areas include fill-and-finish capability, lipid nanoparticle production, quality-control and release analytics, and other critical supply-chain inputs. Government should use resilience contracts, advance purchase agreements and selective co-investment to crowd in private capital where national-security value is clear. This pillar means the UK would be able to deliver full end-to-end readiness across a range of diverse vaccine platforms.

UNDERPINNING ENABLERS

These three pillars must be supported by structural reforms and sustained investment.

Governance: Establish a permanent Vaccine Sovereignty Oversight Board (VSOB) within the Office for Life Sciences, supported by a Vaccine Sovereignty Delivery Unit (VSDU) located in the UKHSA. Together, these bodies would embed vaccine preparedness as a standing national function rather than a crisis response mechanism. The VSOB would set strategic direction across the lab-to-jab pathway, while the VSDU would coordinate operational delivery and readiness. Both should draw on public- and private-sector expertise to ensure alignment between health security, industrial strategy and fiscal planning.

Regulatory and planning reform: Streamline planning for vaccine facilities, pre-authorise emergency regulatory pathways with the MHRA and clarify indemnity and intellectual-property frameworks to enable rapid mobilisation.

Supply-chain resilience and skills: Secure access to critical inputs through onshoring or stockpiling, invest in specialist workforce programmes and conduct regular system-wide stress tests.

Sustainable fiscal framework: Move from episodic crisis spending to multi-year preparedness investment. Align the National Wealth Fund and Life Sciences Innovative Manufacturing Fund, with vaccine manufacturing acting as the strategic infrastructure, and adopt phased capital investment to maximise long-term value while limiting fiscal shock.

Strategic R&D investment: Embed mission-oriented vaccine R&D within domestic manufacturing arrangements, focusing on antimicrobial resistance and climate-sensitive infectious diseases.

The above approach strikes the optimal balance between cost, control, speed and flexibility. It avoids the high capital expenditure of fully state-owned models, while materially reducing the strategic risks of reliance on a single platform or international goodwill during a crisis.

As the world endures a more volatile and insecure era, resilience is no longer optional. Vaccine access sits at the intersection of public health, economic security and geopolitics, meaning the UK's ability to produce vaccines should be treated as a core priority of national security. Countries that fail to act will find themselves at the back of the queue when the next crisis hits. Those that prepare will protect their populations, their economies and their sovereignty. For the UK, the choice is clear – and the time to act is now.

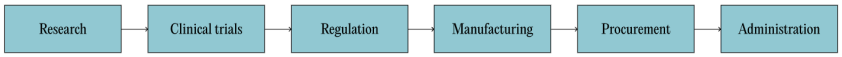
01

How Prepared Is the UK to Mount a Vaccine Response Today?

Not everything about the UK's handling of Covid-19 was a resounding success, but the speed with which vaccines were developed, procured and deployed was truly world class. Vaccine development is notoriously hard; there are many hurdles on the journey from "lab to jab" that new candidates can stumble over, as the following graphic shows.

FIGURE 1

The lab-to-jab process of vaccine development



Source: TBI

However, despite the fact that Covid-19 was a novel pathogen, and even though vaccines typically take up to ten years to develop, the UK managed to invent, test, license, manufacture and administer the Oxford-AstraZeneca vaccine within just one year. It also secured access to other effective vaccines – namely Pfizer and Moderna – as they emerged.

That home-grown Oxford-AstraZeneca vaccine undoubtedly saved many thousands of lives in the UK and millions more worldwide. It wasn't perfect – high rates of use revealed rare side effects that would have been less acceptable in normal times – but it was the first. And in a pandemic, when every day without a vaccine compounds the human and economic toll, speed counts.

However, it would be unwise to assume that just because the UK was able to mount such a swift response in 2020, it could do so again now. At almost every point along the lab-to-jab pathway, the UK has lost either capacity or capability. Research funding has fallen, clinical-trials activity has reduced, the Vaccine Taskforce (VTF) has been retired and the NHS is under more pressure than ever.

It is also important to be clear-eyed about the extent to which the UK relied on either luck or favourable domestic circumstances that no longer exist. In 2020 the country had a manufacturing base with enough spare capacity to produce extra vaccines, an NHS with enough capacity to deliver them, a population with enough trust in vaccines to take them and a government solvent enough to fund them. These conditions cannot be relied upon in the future.

Similarly, it would be unwise to assume that simply getting back to pre-pandemic levels of preparedness would be sufficient to mitigate today's risks. Not only is there an increased risk of a biological threat emerging, but the geopolitical context has changed too. Conflict, tariffs and rising global recidivism all impact the ability of governments to counter new threats, dependent as they are on global supply chains. This isn't just a problem when it comes to accessing vaccines in a pandemic: it could also be a risk to accessing business-as-usual vaccinations in non-pandemic times.

In this chapter we examine the UK's vaccine resilience, describing the ways in which the global and domestic landscape has changed since 2020 and the impact this has had on current levels of vaccine resilience.

In Chapter 2 we make the case for greater vaccine sovereignty, highlighting the expected risk to the UK's health, economy and national security if it doesn't invest in this critical infrastructure. In Chapter 3 we consider how other countries are approaching this challenge, achieving a greater degree of vaccine sovereignty through different means (including domestic-manufacturing investment and strategic international collaboration). Then, in Chapter 4, we set out clear, actionable recommendations for the government to achieve a greater degree of vaccine sovereignty and resilience in the UK.

A Changing Global Landscape

The global landscape has changed markedly since 2020. Back then it was comparatively stable: long-standing trade arrangements were largely intact, multilateral institutions were functioning and geopolitical tensions, while present, had not yet fractured global cooperation to the degree seen today. Today both the risk of a biological threat and the conditions under which governments would have to respond are very different.

According to the UK's National Risk Register, the likelihood of another event on the scale of Covid-19 is estimated at between 2.5 and 3.3 per cent per year, implying a cumulative probability of between 47 per cent and 57 per cent over the next 25 years.[10,11,12,13] Meanwhile, the nature of the risk is changing: influenza remains the most likely cause of the next pandemic, but other drivers are becoming increasingly salient.

Climate change, for instance, is reshaping disease ecology, accelerating the spread of vector-borne diseases such as dengue and chikungunya across Europe; credible projections suggest both could become endemic within the next decade.[14] There is also growing concern that diseases such as malaria, previously eliminated from most of Europe, could re-emerge as environmental conditions become more favourable. At the same time, antimicrobial resistance is on the rise. This increases the likelihood of bacterial outbreaks that are harder (and in some cases impossible) to treat, placing greater emphasis on vaccines as a preventative tool.[15]

In addition, the UK Health Security Agency (UKHSA) has identified a number of currently rare but high-risk pathogens – including MERS-CoV, poxviruses such as mpox and filoviruses such as Ebola – that could drive future epidemics or pandemics.[16] Getting set up for a swift response to these novel pathogens would involve continuous surveillance, as well as early development of vaccine prototypes across a range of different platforms. This reinforces the need for flexibility and diversity in vaccine capability.

Advances in technology are further altering the risk profile. As set out in our publication *A New National Purpose: Biosecurity as the Foundation for Growth and Global Leadership*, the convergence of synthetic biology and

artificial intelligence is lowering the technical barriers to designing, modifying and scaling pathogens, while simultaneously making attribution more difficult. This raises the strategic attractiveness of biological attacks for state and non-state actors alike.

These risks should not be understood as remote or theoretical. Public reporting has highlighted renewed investment by several states in high-containment biological facilities and biodefence infrastructure, prompting concern within the international security community. While the probability of a deliberate biological attack remains uncertain, its potential consequences would be severe.

Whatever the source of a biological threat, the UK must be able to respond rapidly and proportionately. The Covid-19 pandemic showed just how vulnerable countries are to disruption in their global vaccine supply chains: access to finished vaccines was affected, as were critical manufacturing inputs. A global shortage of bioreactor bags delayed production worldwide, with lead times stretching to as long as a year at points; meanwhile, simultaneous demand for glass vials and stoppers across multiple countries strained supply. Lipid nanoparticles, which are essential for mRNA vaccines, also experienced severe bottlenecks, owing to reliance on a small number of international suppliers.

Countries responded in what should now be considered predictable ways. When India faced a domestic Covid-19 surge, vaccine production was requisitioned for domestic use and international supply was subsequently disrupted. In Europe, the European Commission introduced an export-authorisation mechanism, allowing it to block vaccine exports from the EU if supply obligations were not being met.

These dynamics mattered to the countries on the other end of those vaccine-sharing agreements. They delayed vaccine availability, complicated rollout planning and demonstrated that contracts and markets alone do not guarantee supply when countries are under pressure to prioritise their own populations.

Today the geopolitical situation is potentially even more fraught. Conflict, tariffs and growing recidivism on the part of multilateral institutions (including those governing trade and the sharing of pathogens) are constraining the free flow of information, goods and expertise that is necessary for effective vaccine production. The prioritisation of national interests – reflected in domestic-first provisions, export controls and "most favoured nation" policies, alongside the spread of more authoritarian governance models – has weakened trust and reduced predictability in terms of international cooperation. In this environment, access to essential goods can no longer be assumed, even between close partners.

Importantly, these risks are not confined to pandemic scenarios: in a more fragmented and protectionist world, the UK also faces growing difficulty in securing routine vaccines in non-pandemic times.

A Changed Domestic Landscape

The UK's domestic landscape has also changed since 2020. In this section we consider the UK's current vaccine resilience – reviewing capacity and capability across the entire lab-to-jab pathway – and consider how well suited it is to meet or mitigate today's emerging risks.

RESEARCH

When Covid-19 hit UK shores in 2020, it was new, but it wasn't alien. The University of Oxford had been conducting research into a similar coronavirus – Middle East respiratory syndrome (MERS) – for the past four years. That pre-existing research gave the UK a headstart on developing an effective vaccine for Covid-19 (the technology developed for MERS went on to become the Oxford-AstraZeneca vaccine[17]), but the initial advantage would not have been possible without previous UK investment in its world-class research base, structured funding streams and global outlook – factors that have altered significantly since then.

Since 2020 the financial and structural resilience of the UK's scientific research base has weakened significantly. The Oxford-AstraZeneca vaccine benefited from two cash injections: speculative investment from the UK Vaccine Network in 2016 when it was a vaccine in development against MERS, then subsequent targeted investment from the National Institute for Health Research (NIHR) and UK Research and Innovation (UKRI) when it was explicitly being developed as a vaccine for Covid-19.[18,19] As well as being generous, that original funding allocation was also extremely outward-facing: at the time MERS was a purely foreign pathogen that had only affected citizens in the Middle East and Asia.

By contrast, UK universities collectively incurred a research deficit exceeding £5 billion in 2023, driven by the chronic under-recovery of research costs.[20] Evidence suggests that four out of five universities are considering cuts to research spending, with nearly one-fifth already having reduced investment.[21] While UKRI distributes more than £8 billion annually, this funding is insufficient to address the underlying structural gap.[22] If left unresolved, these pressures risk eroding the expertise, facilities and institutional capacity that underpin rapid vaccine discovery.

The UK's ability to support startups and academic spinouts is also diminished. This is important because spinouts often focus on niche disease areas, novel platforms and early-stage technologies – all critical to the development of vaccines against novel pathogens. In addition, spinouts are often small and agile, meaning they are better able to pivot research focus in response to emerging threats.

As of early 2023, the UK had 1,166 spinouts, representing a significant share of all high-growth companies.[23] However, increasingly the UK is struggling to retain and scale these companies domestically. Across the UK economy, less than 1 per cent of startups achieve formal scaleup status, and biotech startups in particular face persistent barriers related to access to capital, regulatory alignment and manufacturing pathways.

In 2024, investment in UK biotech startups reached £3.4 billion, its highest level since 2021.[24] While this highlights strong sector confidence in UK science abilities, more than 40 per cent of funding originated from international investors; 26 per cent came from North America, with the majority in late-stage rounds.[25] While this investment is welcome, an over-reliance on overseas backing risks more founders choosing to relocate or incorporate abroad (most commonly the US), where there is access to deeper capital markets and greater commercial support.[26] This risks hollowing out the UK's innovation pipeline and weakening the link between discovery, development and domestic manufacturing capacity.

With vaccine R&D such a strategic national asset, the UK would also benefit from greater clarity and transparency around how much public funding is being specifically directed towards this aspect of pandemic preparedness. While targeted investments exist – such as the £12 million awarded to the Future Vaccines Manufacturing Hub in 2023[27] – there is limited visibility of how vaccine-relevant capability is supported across UKRI's wider portfolio. Without a clearer link between biological risk assessment, funding priorities and national-preparedness objectives, there is a risk that investment will remain fragmented and reactive rather than strategic.

More broadly, it is imperative that the UK's strategic framework for biological preparedness keeps pace with the changing threat environment. It will be important to keep revisiting the UK's 2023 Biological Security Strategy to maintain alignment between evolving biological threats and long-term decisions to invest in vaccine research and development.[28] The UKHSA, established as a response to the pandemic, now monitors and analyses pathogen data; this strategy will also need to keep pace with evolving risks.

There have been some encouraging developments. For example, the Francis Crick Institute recently collaborated with Apriori Bio, exploring how AI can be used to anticipate emerging biological threats.[29] Unfortunately this kind of work remains nascent and fragmented, and does not yet constitute a national capability that could be rapidly mobilised in a crisis.

CLINICAL TRIALS

In 2020 the UK had a clinical-trials system with sufficient scale, coordination and credibility to both lead and participate in critical phase 3 vaccine trials. This reflected genuine capability built up over many years. The UK hosted a pivotal phase 3 trial for the Novavax vaccine enrolling about 15,000 participants across 35 sites,[30,31] and UK data played a central role in multinational phase 3 trials for the Oxford-AstraZeneca vaccine.[32,33] However, this level of participation was only possible because the UK already had a nationally integrated clinical-trials infrastructure, experienced investigators and trusted regulatory oversight – factors that remain strong but no longer set the UK apart from international competitors.

The UK's ability to lead these trials was not simply a function of its preparedness: emergency legislative changes were required to enable the lawful processing and sharing of patient data for Covid-19 research through Control of Patient Information notices, plus a national registry of research volunteers had to be created at speed.[34] These measures reflected institutional agility rather than standing capability. However, if not for the UK's underlying clinical-trials infrastructure – spanning NHS sites, academic centres and NIHR-supported networks – it would not have been able to adapt so quickly or contribute so effectively to global vaccine development.

The scale of the UK's clinical-trials activity during that time also depended heavily on a reprioritisation of activities: its clinical system was temporarily reoriented almost entirely towards Covid-19 research. Non-Covid trials, including those in oncology, chronic disease and other vaccines, were delayed or paused; many are only now being completed.[35] This exceptional reprioritisation enabled rapid delivery of Covid-19 trials, but it was not sustainable. As a result, overall clinical-trials activity in the UK remains below pre-pandemic levels, despite gradual recovery since 2021.

Commercial clinical trials started to pick up after the pandemic but have since fallen back down to below pre-Covid levels.[36] And although successive government strategies and reviews have sought to reverse this trend, the UK continues to trail the likes of the US, the EU, China and

Australia in trial initiation and delivery. For global sponsors, the UK is increasingly perceived as slower and more complex to operate in compared to competing jurisdictions.

In 2020, the UK demonstrated that it could mobilise its clinical-trials system at extraordinary speed under emergency conditions, but this relied on a combination of pre-existing capability, temporary legal and institutional flexibility, and a willingness to defer large parts of the wider research portfolio. Much of that capability has since eroded, while the contextual conditions that enabled such a single-minded focus no longer exist.

Future vaccine preparedness cannot be based on the assumption that the clinical-trials system can again be rapidly repurposed at scale without significant cost or disruption. Sustained investment, clearer prioritisation and a more resilient trials ecosystem will be required if the UK is to remain a preferred location for late-stage vaccine trials – and be able to secure early access to vaccines when it matters most.

REGULATION

The Medicines and Healthcare products Regulatory Agency (MHRA) has been widely praised for its role in supporting the UK's vaccine response during the pandemic. The speed and agility with which the MHRA acted enabled the UK to host multiple phase 3 clinical trials for potential vaccines, achieve the first authorisation of a successful Covid-19 vaccine in the world (Pfizer-BioNTech) and be the first to commence deployment of that vaccine to its population.[37]

As the table below shows, that speed is in stark contrast to the MHRA's European and US counterparts. Authorisation of the Pfizer-BioNTech vaccine was more than a week ahead of the Federal Drug Administration (FDA) and almost three weeks ahead of the European Medicines Agency (EMA). UK authorisation of the Oxford-AstraZeneca vaccine was more than five weeks ahead of Europe, while the US never approved it.

FIGURE 2

Regulator turnaround for distribution of Covid-19 vaccines in the UK, EU and US

Vaccine	Region and regulator	Rolling review start	Final data received	Approval granted	First dose administered
Pfizer-BioNTech	UK (MHRA)	1 Oct 2020	23 Nov 2020	2 Dec 2020 (emergency)	8 Dec 2020
	US (FDA)	~Mid-Oct 2020	20 Nov 2020	11 Dec 2020 (EUA)	14 Dec 2020
	EU (EMA)	6 Oct 2020	1 Dec 2020	21 Dec 2020 (CMA)	27 Dec 2020
Oxford-AstraZeneca	UK (MHRA)	1 Oct 2020	~Mid-Dec 2020	30 Dec 2020 (emergency)	4 Jan 2021
	US (FDA)	N/A	N/A	Not approved	N/A
	EU (EMA)	1 Oct 2020	Jan 2021	29 Jan 2021 (CMA)	~2 Feb 2021
Moderna	UK (MHRA)	~Nov 2020	Late Dec 2020	8 Jan 2021 (emergency)	7 Apr 2021 (caused by supply delay)
	US (FDA)	~Nov 2020	30 Nov 2020	18 Dec 2020 (EUA)	21 Dec 2020
	EU (EMA)	~Nov 2020	Late Dec 2020	6 Jan 2021 (CMA)	12 Jan 2021

Green: first to regulate and administer vaccine Yellow: second to regulate and administer vaccine Red: third to create vaccine

Source: MHRA, FDA and EMA. TBI analysis and composition

The MHRA maintained momentum through a innovative approach using rolling reviews (assessing data as it became available rather than waiting for a complete final submission) and parallel reviews (reviewing phased trial data concurrently rather than sequentially),[38,39] both under Regulation 174 of the Human Medicines Regulations 2012.[40] This reduced approval turnaround times by 90 per cent.[41]

This performance reflected genuine regulatory capability, but it was also shaped by favourable context and timing. The MHRA entered the pandemic with deep scientific expertise, strong international credibility and the legal flexibility to act decisively in an emergency. Four years after the Brexit

referendum and less than two years after the UK's withdrawal from the EU, the MHRA had not yet felt the full impact of its split from the EMA: the loss of shared workload, networks and specialist capacity.

Today the MHRA remains respected for its scientific expertise and technical capability, but its relative influence within the global regulatory ecosystem has diminished. Pharmaceutical companies now overwhelmingly prioritise approvals from the FDA and the EMA, whose decisions unlock access to far larger populations and determine commercial viability at scale. As a result, the UK increasingly sits downstream of global regulatory and development pathways rather than shaping them at source.

This shift has practical consequences. The UK's share of global clinical trials has declined and firms increasingly concentrate early- and late-phase testing in jurisdictions where regulatory approval and reimbursement are perceived as being quicker processes, and market access is considered more predictable. While the MHRA has introduced important reforms to improve clinical-trials approvals and regulatory timelines, regulatory agility alone is no longer sufficient to offset the gravitational pull of larger markets.

These trends present a strategic challenge for vaccine security. In the event of a future pandemic, the UK cannot assume that regulatory speed will guarantee early access to vaccines or preferential treatment from global manufacturers. Which countries are first in line for supply is increasingly determined by where trials are run, where data are generated and where manufacturing is scaled. If the UK is not central to those processes it risks becoming a secondary market, even if domestic regulatory approval is swift.

To mitigate this risk, regulation must be understood as one component of a wider system rather than a standalone asset. The MHRA will need to deepen data-sharing and alignment with global regulators and operate in closer coordination with domestic clinical-trials capacity and manufacturing infrastructure. In future health emergencies, success will depend not only on rapid authorisation but also on ensuring that vaccines approved for use can be manufactured, filled and distributed at scale within the UK. This is crucial to maintaining continuity of supply in an increasingly fragmented and protectionist global environment.

PROCUREMENT

Innovations in vaccine procurement were also critical to the UK's success in 2020, though there was little precedent for this. The VTF – whose role it was to negotiate access to multiple vaccine candidates ahead of regulatory approval – was only assembled that year.[42,43] Prior to that, the UK had limited experience of using advanced purchasing agreements (APAs) beyond arrangements related to flu.[44] By the end of 2020 however, the government had entered into multiple APAs with multiple vaccine developers, securing millions of potential future doses "at risk" (in advance before full approval)[45] and having spent almost £1 billion in down payments.[46,47]

In total the UK invested about £12 billion in vaccine development, purchasing, manufacturing and deployment during the pandemic. This included APAs, funding trials and scaling manufacturing, which placed manufacturers on standby to produce a pre-agreed number of doses once production started.[48,49] These arrangements reflected genuine procurement capability and a willingness to assume risk at pace. In addition, APAs were structured to ensure not only supply rights but also, in some cases, UK-based production, reducing reliance on international supply chains at a time of global scarcity; this also enabled manufacturers to start production ahead of time.

As a result of this innovative approach, the UK was the first country to deploy the Pfizer-BioNTech and Oxford-AstraZeneca vaccines, with the former first deployed on 8 December 2020;[50] by comparison, vaccination in most EU member states began on 26 December.[51] At a time when between 400 and 600 daily Covid-19 deaths were being recorded in the UK, that 18-day advantage translated into a material public-health impact.[52]

However, the effectiveness of this procurement model also depended on favourable context and timing. Global competition for vaccines had not yet fully crystallised, manufacturers still had spare capacity and the UK's

willingness to move early allowed it to secure priority access before export controls and national requisitioning became widespread. These conditions will not necessarily recur in a future crisis.

Despite how valuable APAs were to the UK's vaccine response in 2020, the UK has only two major APAs in place today. Both are for known, common pathogens; there are no active publicly declared APAs for rare or emerging pathogens such as haemorrhagic fever or antimicrobial-resistant bacteria. Compounding the problem is the fact that the VTF, so critical to the UK's coordination of APAs and preparedness planning during the pandemic, was disbanded two years later, resulting in a significant loss of institutional memory and negotiating capability.

Without a standing, resilient procurement framework – and without a body charged with maintaining readiness in non-pandemic times – the UK risks having to recreate procurement capability from scratch in the next crisis. This would mean a repeat of the urgency and uncertainty of 2020 rather than an opportunity to build systematically on its lessons.

MANUFACTURING

The UK was able to produce many of its own Covid-19 vaccines (Oxford-AstraZeneca) during the pandemic, but its vaccine-manufacturing base has shrunk and narrowed since then; meanwhile, the favourable circumstances that allowed it to muddle through using the spare capacity of underutilised contract manufacturing organisations (CMOs) have also changed. Considerable effort will be required to ensure that the UK has access to sufficient capacity across its manufacturing base to deliver end-to-end manufacturing of a diverse range of vaccine platforms.

In 2020, there were more than 200 manufacturing sites registered with the MHRA for human-medicine manufacturing.[53,54] With funding and support from the VTF, a number of these facilities were developed and scaled for Covid-19 vaccine production, including Oxford Biomedica's Oxbox (which partnered with AstraZeneca), Valneva in Scotland (which had high-biosafety facilities suitable for the production of inactivated vaccines) and the

Wockhardt facility in Wrexham (which provided sterile fill–finish expertise despite no prior vaccine experience).[55,56] Even a veterinary-vaccine facility in Kent was readied, though never used.

Even with this capacity however, the UK was not totally self-sufficient: offshore production was necessary to bolster supplies while domestic capacity ramped up. The UK bought about 5 million doses of the Oxford-AstraZeneca vaccine from the Serum Institute of India (SII), for example, which had to be inspected and good manufacturing process (GMP) certified at speed by MHRA in 2021.[57]

The security of this global supply was challenged at times: there were disruptions later in 2021, for instance, when the Indian government requisitioned production facilities to prioritise a domestic need for vaccines.[58] There were also issues with the supply of vaccine component parts coming to the UK from the Netherlands. At one point in September 2021, the UK's entire supply of booster vaccines was manufactured outside the UK after the Joint Committee on Vaccination and Immunisation (JCVI) switched the country's booster programme exclusively to mRNA vaccines.

So, while there was not inconsiderable vaccine-manufacturing capability in the UK in 2020, it lacked breadth (across vaccine platforms), depth (gaps in end-to-end manufacturing capacity), and coordination (few facilities were "warm-lit" and ready to go). Luckily the UK managed to roll out a successful vaccine-deployment programme despite these setbacks, but the circumstances of 2020 might not repeat themselves – and luck is not a credible foundation for future vaccine security.

Since the pandemic, the government has taken steps to strengthen domestic manufacturing capability, including a new Moderna manufacturing site in Harwell[59] and a Centre for Process Innovation (CPI) site in Darlington; other developments include eXmoor Pharma receiving a ribonucleic acid (RNA) manufacturing licence, a new Wellcome Leap R3 programme and CPI securing an additional £30 million investment from the government to establish an RNA Biofoundry at its Darlington site.[60] The Moderna site is able

to produce at least 250 million doses of vaccine bulk annually if required; the CPI's RNA Centre of Excellence further positions the UK as a leading mRNA hub, with capacity for 100 million doses of mRNA vaccine bulk.[61,62]

The Moderna site, joint funded between Moderna and the UK government, operates under a strategic ten-year partnership that secures priority access to mRNA vaccines for UK citizens.[63] This is a critical feature: although Moderna is a US company, the deal ensures that the UK – not the US government – holds procurement rights over the doses produced on UK soil; the US government would not be able to requisition production under the Defense Production Act. However, the site does not currently include fill-and-finish capability.

However, in the same time period, important elements of the UK's manufacturing capability have been lost or weakened. Funding has been reduced at the Valneva site in Scotland,[64] and support withdrawn from the Vaccine Manufacturing Innovation Centre (VMIC) in Harwell.[65] Planned future capacity was lost when AstraZeneca abandoned proposals for a £450 million vaccine-manufacturing facility in Merseyside,[66] and uncertainty now surrounds the Seqirus site, following CSL's corporate restructuring (though they have been delayed).[67] Even UK-based companies such as GlaxoSmithKline (GSK) base their manufacturing sites overseas.

VMIC, once envisioned as a national surge hub, was a diverse vaccine-development site but never had the fill-and-finish capacity to supply the whole country in the event of a pandemic. Valneva might be more significant: it was the UK's only producer of inactivated vaccines before it decided to cease production.[68] Seqirus is a worry too: it is one of the only sites with which the UK government holds an APA, in this instance to provide influenza vaccinations in a pandemic. Meanwhile, the AstraZeneca site would have been the kind of end-to-end, at scale and diverse vaccine-manufacturing plant that the UK would benefit from.

So, while the net impact on total UK manufacturing capacity may be relatively small, the impact on its *capabilities* is more significant. The UK currently has no manufacturing capabilities in inactivated vaccines and

limited capabilities in live attenuated and toxoid vaccines. When you drill down further into which of these manufacturing facilities could produce vaccines at speed and scale in a pandemic (say, 100 million doses in three months), that list reduces even further. That is not to say that existing domestic manufacturing facilities could not work together to achieve that scale and pace across a diverse range of platforms, just that they would have to coordinate their actions and not have their facilities locked up in long-term contracts (as would be the case with most CMOs).

The UK currently manufactures only a limited subset of the vaccines used in its domestic immunisation programme at commercial scale. In practice, this is confined to influenza vaccines: Seqirus produces inactivated (including adjuvanted) influenza vaccines at its Liverpool facility, while AstraZeneca manufactures the live attenuated intranasal influenza vaccine at an adjacent Liverpool site.

Domestic production of mRNA Covid-19 vaccines is expected to start shortly through Moderna's manufacturing facility in Harwell, which is intended to supply the UK market. During the pandemic, viral vector Covid-19 vaccines were also manufactured in the UK, with production supported by Oxford Biomedica (and other contract development and manufacturing organisations) as part of the Oxford-AstraZeneca programme. However, this capacity is no longer active following AstraZeneca's decision to withdraw the product from global markets.

This concentration creates strategic risk. Relying predominantly on a single vaccine platform introduces a clear single point of failure, including exposure to plant outages, supply-chain disruption and commercial viability risks. There is also no guarantee that mRNA will be the optimal platform for the next biological threat.

The concern is that if these facilities did not manage to coordinate, or did not have latent capacity, the UK could be left reliant on just one platform (mRNA) to produce vaccines at scale. This creates a single point of failure for the manufacturing process, with risks including plant failure, supply-chain

disruption and business-model failure; there is also no guarantee that mRNA will be a suitable vaccine platform when the time comes to rely on it – or that it would be accepted by the public.

Also, while mRNA is an exciting and important technology, it is still relatively new. While it is assumed that the platform is pluripotent (able to target any pathogen, be it bacterial, viral or fungal), that hypothesis is unproven. In fact, Moderna's latest mRNA vaccine – designed to tackle the common viral pathogen cytomegalovirus – recently failed its phase 3 trial endpoint, indicating that there may still be some way to go to realise that potential.[69] This further highlights the commercial challenge of keeping mRNA facilities in a state of readiness during non-pandemic times, as mRNA only has a licence for Covid-19 and respiratory syncytial virus (RSV) vaccines at present.

In addition, mRNA's relatively limited duration of action compared with other vaccine types has previously necessitated multiple boosters. This presents a challenge in terms of production (because it requires extra manufacturing capacity) and administration (because it requires people to attend for multiple boosters). In turn, this makes it easier for a mutation of the virus to become dominant (variant escape).

This reinforces the strategic value of platform diversity. Different vaccine technologies offer different strengths: mRNA enables rapid response to novel threats (though often provides a shorter period of immunity); protein subunit vaccines are well suited to known pathogens such as influenza; viral-vector vaccines can generate strong immune responses but face manufacturing and commercial constraints. Regarding the latter, viral-vector vaccines such as Oxford-AstraZeneca undoubtedly saved many lives during the pandemic and may well be suitable again. However, they can be complex and costly to manufacture, they are more difficult to adapt to maintain protection in case of antigenic drift and, in very rare cases, individuals can develop immunity to the vector virus itself, limiting the effectiveness of the vaccine.

So, a resilient manufacturing system requires the ability to pivot between platforms as threats evolve. However, maintaining such diversity requires a supportive non-pandemic-times business environment. Vaccine

manufacturers depend on predictable demand, readiness-based support from government and favourable operating conditions to keep facilities warm-lit (a state of continuous operational readiness) even when they are not producing at full commercial scale. This has been conspicuously absent from the UK in recent years and is behind many of the high-profile exits from the sector, as described in a recent House of Lords report. Stakeholders pointed to structural disincentives – including higher operating costs, limited tax and investment incentives, and pricing frameworks – that undermine the commercial attractiveness of UK manufacturing and constrain sovereign capability development.[70]

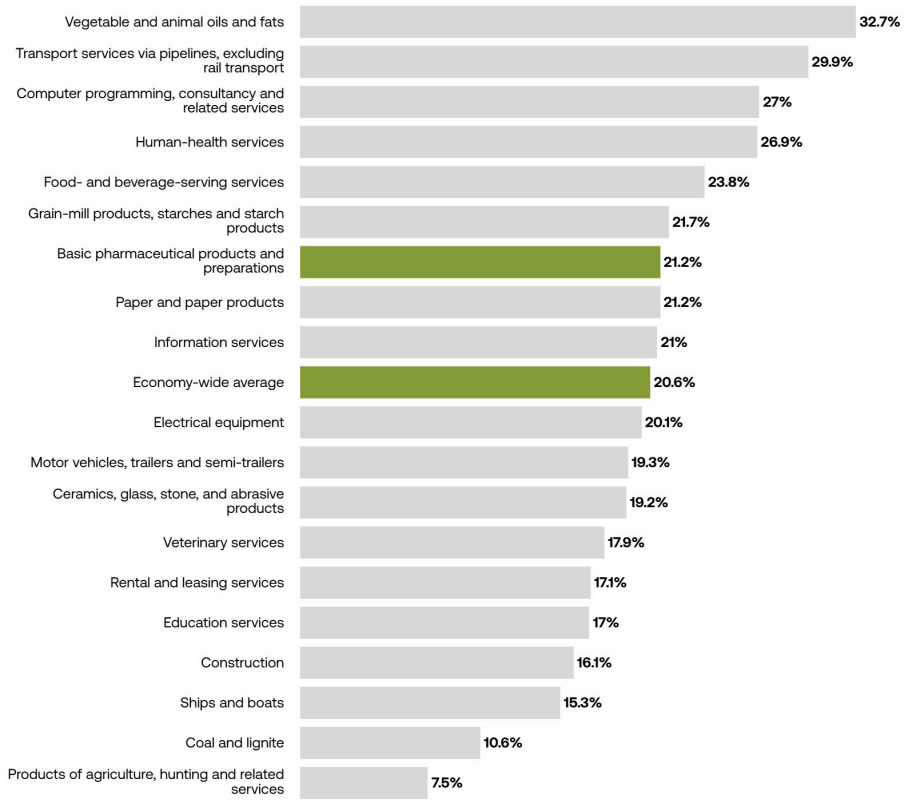
In the UK, funding has historically prioritised early-stage research over sustained GMP operations. This underestimates the true cost of maintaining manufacturing readiness, including specialist staffing, quality assurance, regulatory compliance, utilities and maintenance. As a result, facilities such as CPI have been forced to diversify their activities to remain viable, rather than operating as dedicated warm-lit manufacturing assets.

This exposes a structural funding gap: without long-term procurement commitments or readiness payments, warm-lit manufacturing cannot be sustained at scale. In parallel, global competition for manufacturing investment has intensified. Countries such as India and China offer lower costs, larger domestic markets and more assertive industrial policy. Even established UK firms now manufacture predominantly overseas; GSK, one of the biggest UK pharma companies, manufacturers most of its vaccines in Belgium.[71]

The workforce dimension further compounds this challenge. Research commissioned by the Tony Blair Institute for Global Change and carried out by Public First (Public First's full methodology is available as a downloadable PDF) shows that about 21 per cent of the UK's vaccine-manufacturing workforce is internationally sourced. There is a particularly high reliance on global talents for specialist scientific roles and many of these multinationals are in highly skilled areas of work.

FIGURE 3

The pharmaceutical sector is roughly as reliant on migrant labour as the average UK industry

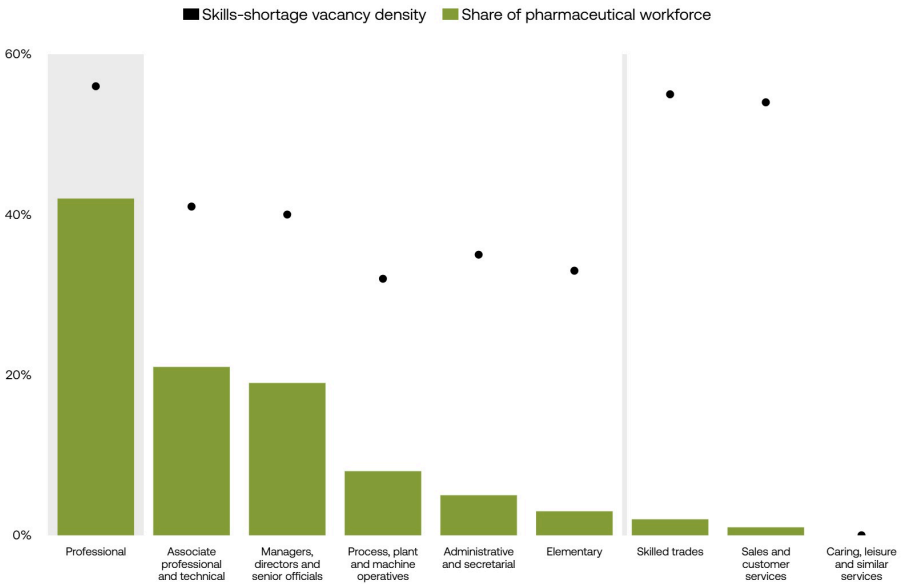


Source: Public First

This makes the UK's vaccine-manufacturing sector particularly vulnerable to changes in migration policy and global competition for talent. Tighter migration rules would rapidly expose labour-market vulnerabilities at both ends of the spectrum, especially for biochemists. Any tightening of immigration rules, or intensifying of global competition for talent, would directly constrain the UK's ability to design, trial and manufacture vaccines at speed.

FIGURE 4

Tighter migration rules would expose labour-market vulnerabilities at both ends of the spectrum

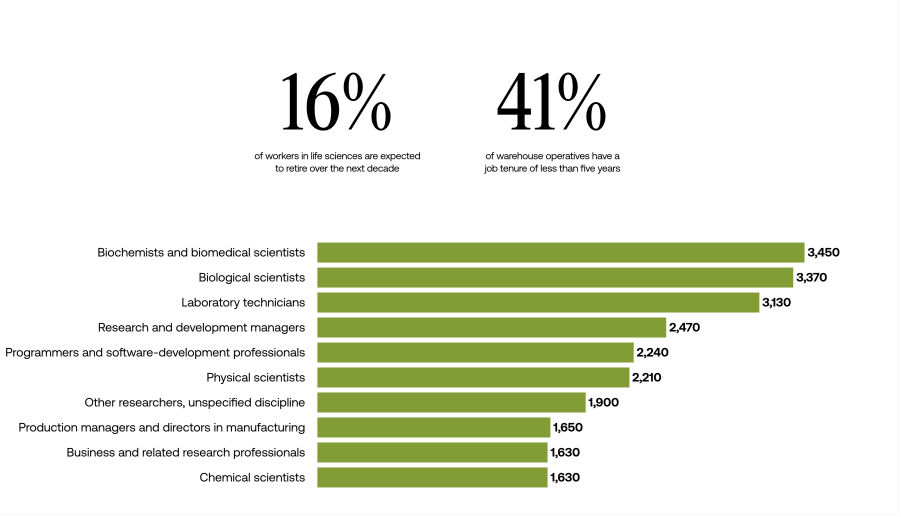


Source: Public First

The UK life-sciences workforce is also ageing; combined with shorter job tenure and a rising demand for life-sciences skills, labour shortages are likely.

FIGURE 5

The UK life-sciences workforce is ageing, with shorter job tenure



Source: Public First

Despite these challenges, the UK retains a critical comparative advantage: institutional memory and skills. Many countries have found that while manufacturing facilities can be built quickly, it takes years to develop the workforce and operational expertise required to run them effectively. Maintaining warm-lit manufacturing facilities is inherently challenging, as it requires continuous operational activity, a skilled GMP workforce and regular execution of validated processes. The UK's recent history as a major vaccine-manufacturing location means that this expertise still exists, but it will diminish if not actively sustained.

SUPPLY CHAIN

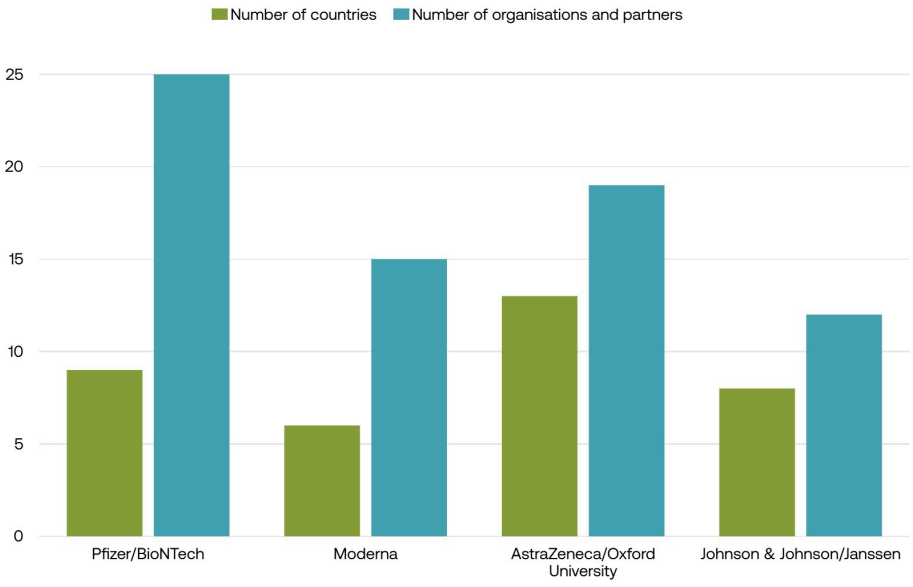
Vaccine supply chains are among the most complex and internationally distributed of any industrial product. The manufacture of a single vaccine can require up to 9,000 distinct materials sourced from about 300 suppliers across 30 countries, in addition to more than 100 specialised components such as vials, filters, tubing and stabilisers.[72] Vaccines routinely cross

borders multiple times to complete different stages of production, including formulation and fill-finish; disruption at any point along this chain can halt production entirely.

A resilient and robust supply chain that is as sheltered as possible from international shifts is essential; it is often achieved either through the onshoring of production or the stockpiling of critical ingredients. Indeed, even where vaccines are manufactured domestically, supply chains remain global. The Oxford-AstraZeneca vaccine, for which technically most UK doses were manufactured in-country, had a supply chain that spanned more than ten countries and just under 20 organisations.

FIGURE 6

Number of countries and partners involved in the manufacturing and supply chain of Covid-19 vaccines



Source: Chad P. Brown and Thomas J Bollyky (2021)

The UK ultimately fared better than many countries during Covid-19, but this outcome owed more to rapid improvisation and favourable circumstances than to pre-existing preparedness.

Early in the pandemic, the VTF correctly anticipated global shortages of key inputs and moved quickly to secure stocks of glass vials, stoppers, raw materials such as borosilicate glass and sand, and the ultra-cold freezers required for mRNA vaccine storage. These interventions were decisive, but they were reactive rather than structural. They worked because the UK moved early and because global competition had not yet fully crystallised; the EU, with its centralised and ultimately more bureaucratic process, was slower off the mark.

In some cases, the UK also benefited from fortuitous supply-chain positioning. A pre-pandemic contract with Croda International (a UK-based supplier of the lipid nanoparticles used in mRNA vaccines) not only enabled domestic mRNA production but also gave the UK leverage during political disputes over vaccine exports.[73] Pfizer's European production depended on these inputs, helping to prevent export restrictions from being applied to UK shipments. This was a strategic advantage, but one that depended on timing and circumstance rather than deliberate national planning.

Individual industry partners also acted proactively. For example, ahead of any regulatory approval, Novavax ordered additional bioreactor bags from mid-2020 to avoid supply constraints.[74] This foresight proved critical, as by early 2021 a global shortage of them was delaying other vaccine makers, with firms facing a wait of up to a year.[75] AstraZeneca also deliberately deployed parallel, multi-country supply chains to accelerate volume and mitigate bottlenecks, and to guard against single-site manufacturing-failure issues. These actions underline the extent to which supply security depended on foresight and flexibility, not system-wide resilience.

Today's geopolitical environment makes such reliance increasingly risky. Vaccine supply chains are highly sensitive to conflict, tariffs and export controls. About 55 per cent of global vaccine-manufacturing capacity is in East Asia, and many critical inputs are geographically concentrated. In addition, the UK imports a substantial proportion of finished vaccines: in

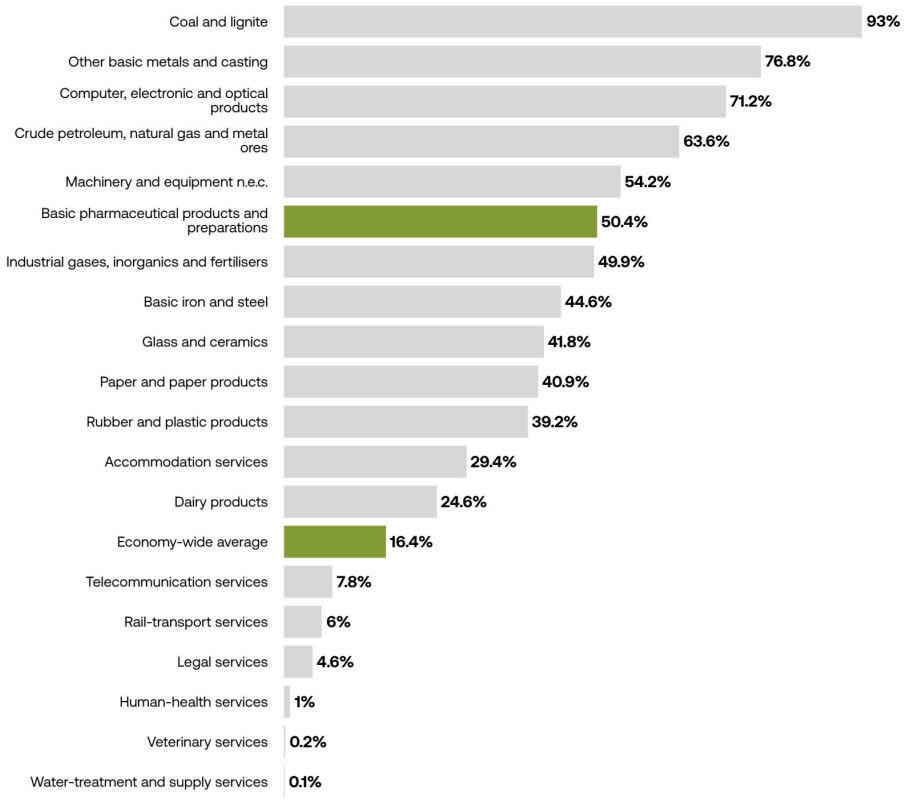
2023 alone,[76] vaccines worth about £1.4 billion were imported. Both routine immunisation and pandemic response are therefore exposed to the same geopolitical shocks.

This exposure was manageable. India was able to supply additional vaccine doses[77] and European suppliers honoured contracts for critical inputs.[78] Today, in a more fragmented and protectionist world, these assumptions are far less reliable. While trade agreements can reduce friction in normal times, they cannot guarantee priority access or rapid mobilisation during crises, particularly when domestic demand pressures intervene.

The research commissioned by TBI and conducted by Public First found that the UK is particularly exposed in this regard. Its pharmaceutical sector, for example, is more than three times as dependent on global imports as other industries, with 50 per cent of its basic products and preparations arriving from abroad, compared with 16 per cent for the economy more widely.

FIGURE 7

Pharmaceutical activities import a greater share of inputs than the wider economy

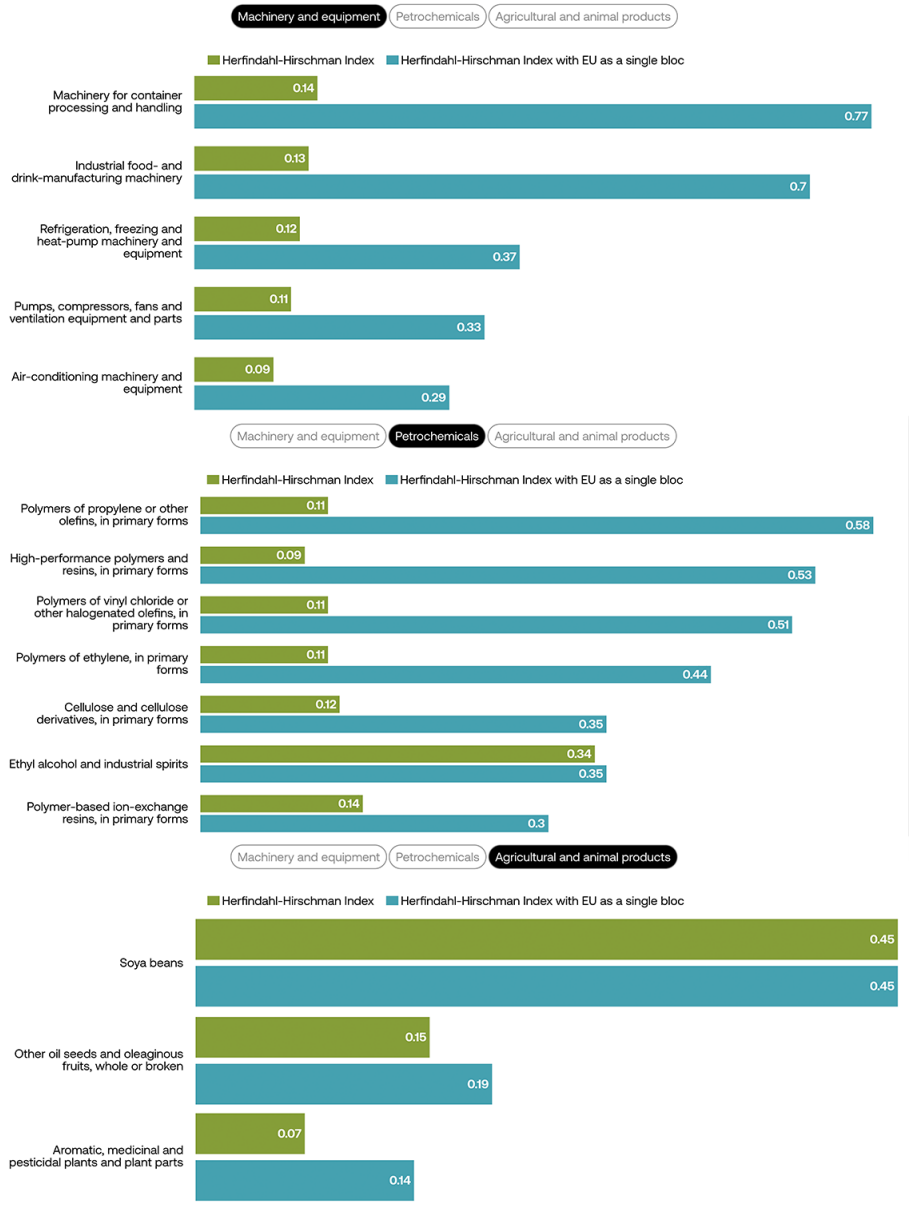


Source: Public First

Mapping these dependencies across continents, the research shows that for machinery and petrochemicals, the UK relies most heavily on the EU.

FIGURE 8

The EU remains a key supplier of machinery and packaging petrochemicals

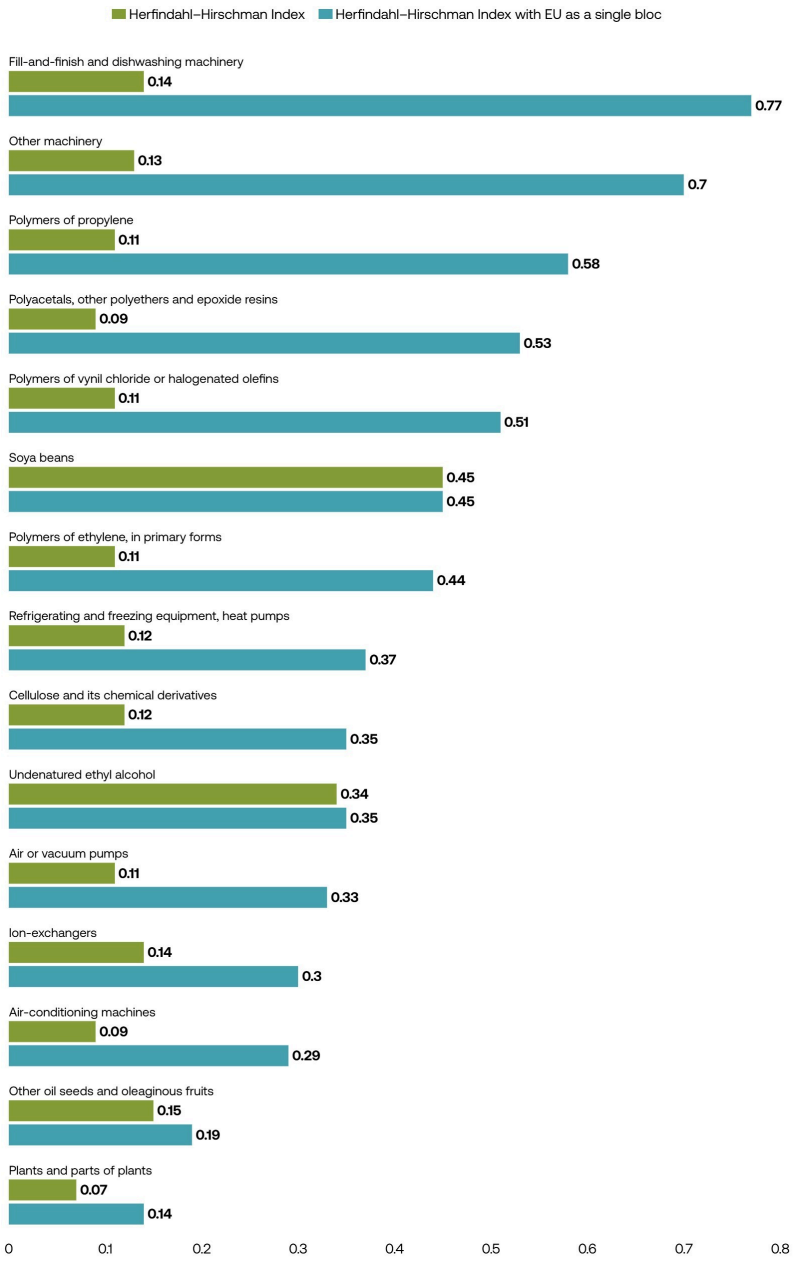


Source: Public First. Note: The Herfindahl-Hirschman Index (HHI) is a measure of market concentration. A higher HHI score indicates greater dependence on a few key markets for imports; a lower HHI score indicates lesser dependence.

For both animal and plant-based agricultural products, the UK leans on Latin America and China.

FIGURE 9

The UK depends on a range of countries for agricultural inputs

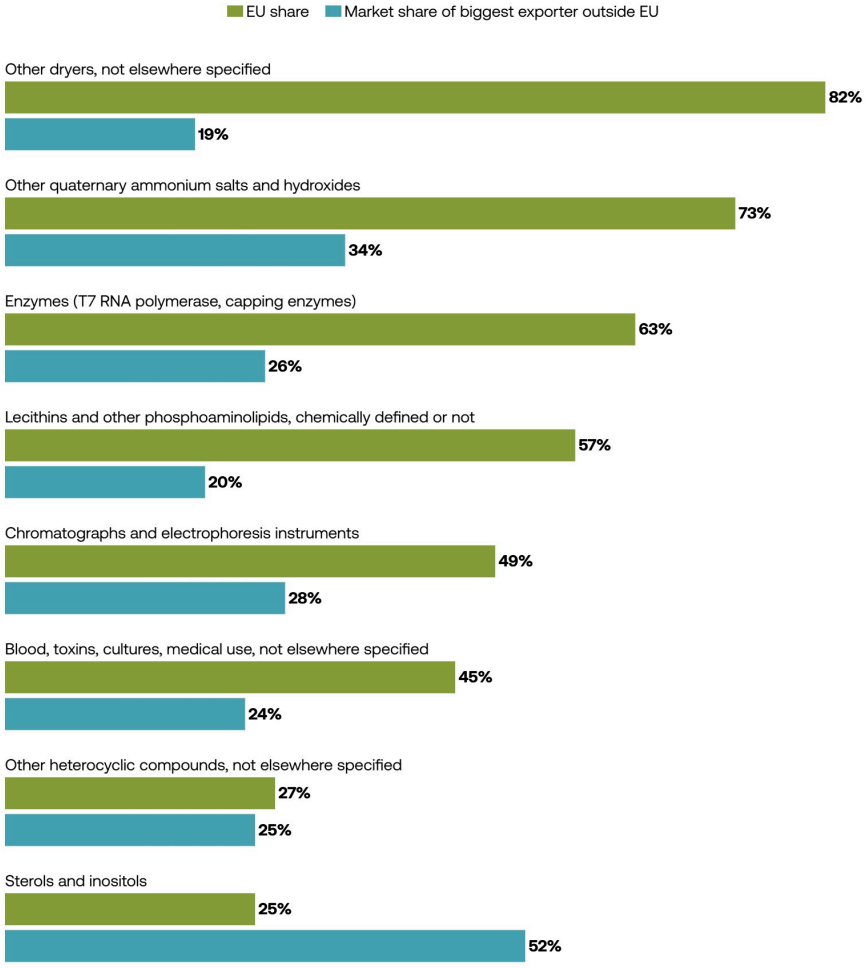


Source: Public First

Critically, for some of the constituent parts of mRNA vaccines, the UK is almost exclusively dependent on China.

FIGURE 10

Imports of mRNA vaccines mostly arrive from the EU and China



Source: Public First

There is one area where the UK has relatively good vaccine sovereignty: the production of influenza vaccines. These usually require more than 30 manufacturers across 20 countries, but the UK's flu APA with Seqirus keeps production entirely in-country, providing insulation from global spikes in demand.

The events of 2020 reveal some hard truths about today's systems. The UK's supply-chain resilience rested on a combination of capability, favourable context and luck. Some strengths remain, particularly in petrochemicals and specialist manufacturing inputs. However, reliance on globally concentrated supply chains is a structural vulnerability, especially for critical vaccine components.

In an era of heightened geopolitical risk and recurring shocks, vaccine-supply security cannot be treated as an operational detail or a problem to be solved during emergencies. It must be deliberately designed, maintained and governed as a core component of national vaccine sovereignty.

ADMINISTRATION

The UK's vaccine rollout is widely regarded as one of the biggest success stories of the pandemic. By mid-2021, more than 90 per cent of adults – equating to more than 36 million people – had received at least one dose, preventing an estimated 105,000 deaths, 262,000 hospitalisations and 24 million infections in England.[79,80] This rapid deployment played a decisive role in reducing mortality, relieving pressure on the NHS and enabling the gradual reopening of society.

This success reflected genuine structural capability. The UK benefited from a single, unified health system in the form of the NHS, which was able to plan and execute a national vaccination campaign at extraordinary speed. Tens of thousands of NHS staff, retired clinicians, volunteers and armed-forces personnel were mobilised to deliver vaccinations. Temporary regulatory changes allowed new cohorts of vaccinators to be trained quickly and indemnified appropriately.[81] Large-scale vaccination centres were established in sports stadiums, conference centres and community venues,

alongside delivery through GP surgeries and pharmacies. A centrally coordinated booking and data system enabled real-time scheduling, recall and monitoring across the population.

Operating as a single system also allowed effective coordination with key advisory bodies. For instance, the prioritisation of at-risk groups and phased rollout was decided upon in tandem with the JCVI, which recommended age as the simplest, quickest and most effective way to sequence groups by vulnerability. Emergency legislation was also key: the Public Health (Control of Disease) Act 1984, and subsequent Covid-19 regulations, provided the government with powers to organise and mandate public-health responses, including vaccination rollout.

However, this mobilisation depended heavily on favourable context and extraordinary trade-offs. Capacity was created by deprioritising large areas of routine and elective care, leaving little residual resilience within the system. The NHS was able to surge because it absorbed significant opportunity costs elsewhere. This was a rational and necessary choice in an emergency, but it was not sustainable.

Five years on, the domestic context has shifted materially. NHS performance has declined, with elective-care backlogs exceeding 7 million patients, emergency departments facing record demand, and more than 100,000 clinical vacancies across the system.[82,83] The ability to divert staff and resources to a future mass vaccination campaign would be significantly constrained, and pausing elective activity again would be both politically and operationally far more difficult. In the near term, coordination risks may also increase as NHS England and the Department of Health & Social Care (DHSC) work through leadership and organisational changes, potentially slowing decision-making in a crisis.

Public confidence has also weakened. Vaccine uptake among children has fallen below pre-pandemic levels, with MMR coverage at 24 months remaining below the threshold required for herd immunity.[84] Outbreaks of measles have become more common in unvaccinated children;[85] the UK actually lost its measles elimination status in early 2026.[86] Uptake of

seasonal influenza vaccination among health-care workers has also declined sharply, falling to about 37.5 per cent for the 2023–24 season.[87] This is particularly concerning given the role that health-care professionals play in shaping wider public attitudes to vaccination.

The pandemic also left a legacy of disruption for routine immunisation programmes. Gaps in childhood vaccinations, influenza campaigns and occupational vaccination have created cohorts of under-vaccinated individuals. In a future outbreak, the NHS would not only have to deliver the necessary vaccines at scale under operational pressure, but also rebuild public trust and ensure uptake across multiple population groups.

The UK's Covid-19 vaccine rollout succeeded because capability, context and urgency aligned at the same moment. Capability remains an asset, but context has deteriorated and the trade-offs that enabled rapid delivery have already been absorbed. Without deliberate action to rebuild resilience, strengthen routine immunisation and restore public confidence, even assured vaccine supply will not be sufficient to protect the population in a future crisis.

GOVERNANCE

As previously mentioned, the UK's ability to shepherd vaccine candidates from lab to jab was in large part due to the efforts of the VTF: a small, expert-led team established to accelerate the development, approval and deployment of Covid-19 vaccines in the UK.[88] No other country set up a unit with the equivalent combination of centralised authority, cross-sector expertise, and willingness to assume financial and operational risk at pace. With the NHS as delivery partner, the VTF achieved one of the highest vaccine-uptake rates globally by 2021.

The VTF's success was neither inevitable nor easily replicable. It was created from scratch amid a crisis and operated almost continuously on a "wartime" footing. Decision-making was highly centralised, timelines were compressed and normal processes were suspended or bypassed. This intensity was appropriate – and arguably essential – during a national emergency, but it was not intended to be sustainable in non-pandemic times. The VTF was

disbanded following the pandemic, with its functions redistributed across DHSC and, later, UKHSA; much of the institutional memory, specialist expertise and cross-sector connectivity that underpinned its effectiveness was also lost.

While it is neither necessary nor desirable to maintain a permanent emergency footing, the UK has not replaced the VTF with a standing capability for rapid vaccine response. In practical terms, if a new pathogen emerged tomorrow, there is no dedicated team with the mandate, authority or established operational relationships to activate vaccine procurement and distribution at pace. Coordination would instead rely on conventional departmental structures, increasing the risk of slower decision-making, siloed accountability and delays in deploying at scale.

The broader UK crisis-management framework provides structure, but not the specialised capability required for rapid vaccine response. Cabinet Office systems – including COBR, the Resilience Directorate and the National Situation Centre – coordinate across departments, while DHSC, UKHSA and the NHS maintain pandemic-preparedness frameworks. Surveillance has improved, as demonstrated by rapid detection of SARS-CoV-2 variants in 2020 and mpox variants in 2022.[89,90] However, countermeasure infrastructure – particularly the ability to translate early warning into rapid vaccine development, procurement and manufacture – remains limited compared to institutionalised models such as the US's Biomedical Advanced Research and Development Authority (BARDA).

Without a forward-leaning, pre-prepared mechanism that preserves institutional memory, governance agility and operational networks, the UK risks reverting to a reactive posture in future crises. It would result in the country rebuilding capability under pressure rather than activating it deliberately and early.

COST

The fiscal cost of Covid-19 was unprecedented. UK government spending on the pandemic response has been estimated at between £310 billion and £410 billion,[91] including about £70 billion on the furlough scheme[92] and about £500 million on the Nightingale hospitals programme.[93] In today's much tighter fiscal environment, it is highly unlikely that the UK could borrow at this scale again in response to a future crisis.

Within that vast expenditure, vaccines stand out as having been the most cost-effective intervention. Rapid access to effective vaccines enabled population-level protection, reduced mortality and hospitalisation, and accelerated the lifting of restrictions, allowing economic and social activity to resume sooner. Compared with the scale of spending required to support the economy during lockdowns, the cost of vaccines represented exceptional value for money.

This experience highlights a critical lesson: while emergency spending during a crisis is extraordinarily expensive, investment in preparedness is comparatively cheap. There is a strong argument that investing more strategically in vaccine capability in advance of 2020 – even without knowing the precise nature or timing of a future pandemic – would have reduced the scale and duration of emergency measures, lowered overall public expenditure, and delivered greater protection for both health and the economy.

The government has since made progress in that direction, establishing targeted funding initiatives to stimulate broader life-sciences manufacturing capacity. The £520 million Life Sciences Innovative Manufacturing Fund (LSIMF) supports diverse vaccine production models across the UK;[94] the Biomanufacturing Fund provides up to £38 million in capital grants to incentivise investment in vaccines and biotherapeutics;[95] and the Future Vaccines Manufacturing Hub, a £12 million partnership led by the University of Oxford and University College London. This focuses on next-generation vaccine-manufacturing technologies,[96] representing important progress in supporting domestic life sciences and manufacturing capability.

However, as evidence to the Centre for Long-Term Resilience has highlighted, the scale and structure of these programmes remain modest relative to the capital intensity, long investment horizons and strategic importance of vaccine and biologics manufacturing.[97] Funding is spread across multiple subsectors and project types, limiting the potential to anchor large-scale, sovereign manufacturing capacity or to materially shift long-term investment decisions. Much of the support is also time-limited or focused on capital expenditure, offering less certainty around the ongoing operational costs required to sustain readiness.

Private investment, meanwhile, remains fragile. AstraZeneca's decision to pause its £200 million Cambridge expansion – in turn halting a wider £450 million UK investment plan[98] – illustrates how sensitive large manufacturing investments are to policy stability, fiscal incentives and long-term confidence in the operating environment. While the UK has secured important private-sector commitments, reliance on market forces alone leaves domestic vaccine capability exposed to shifting commercial incentives and global competition.

The implication is that vaccine preparedness should not be treated as a discretionary cost to be minimised, but as a form of national insurance. The relatively modest and predictable expenditure required to sustain capability in non-pandemic times stands in stark contrast to the scale of emergency spending incurred when preparedness is lacking. In fiscal and public health terms, sustained investment in vaccine capability is a cost-effective strategy to avoid far larger losses in the future.

02

The Case for Strategic Investment in Vaccine Sovereignty

There is a case to be made for greater vaccine sovereignty, not just on health and economic grounds but also for national security. To help make this case, TBI commissioned research consultancy Public First to conduct modelling into the health and economic outcomes associated with different levels of vaccine preparedness, ahead of a hypothetical pandemic in ten years' time.

Specifically, the modelling considers the impact of two government investment strategies: a 25 per cent uplift in vaccine-preparedness spending and a 25 per cent drop (compared with the level of investment today). For both scenarios, the impact on health outcomes and the economy was considered; the modelling further accounted for the impact of changed geopolitical context (EU and US protectionism respectively). The modelling was also applied to a flu-like illness. The results were as follows.

FIGURE 11

Relative risk inherent to investment and disinvestment in UK vaccine manufacturing in the case of a Covid-19 pandemic

	Baseline	Domestic investment	Domestic disinvestment	Domestic disinvestment + EU protectionism	Domestic disinvestment + US protectionism
Cases	100%	98%	110%	112%	111%
Hospitalisations	100%	96%	115%	118%	117%
Deaths	100%	95%	122%	128%	126%

Source: Public First

Below are the projected cases, hospitalisations and deaths for a flu-like pandemic in ten years-time, under different investment and geopolitical scenarios.

FIGURE 12

Relative risk inherent to investment and disinvestment in UK vaccine manufacturing in the case of a swine Influenza pandemic

	Baseline	Domestic investment	Domestic disinvestment	Domestic disinvestment + US protectionism
Cases	100%	96%	109%	113%
Hospitalisations	100%	98%	104%	106%
Deaths	100%	100%	100%	101%

Source: Public First

The Health Case for Vaccine Sovereignty

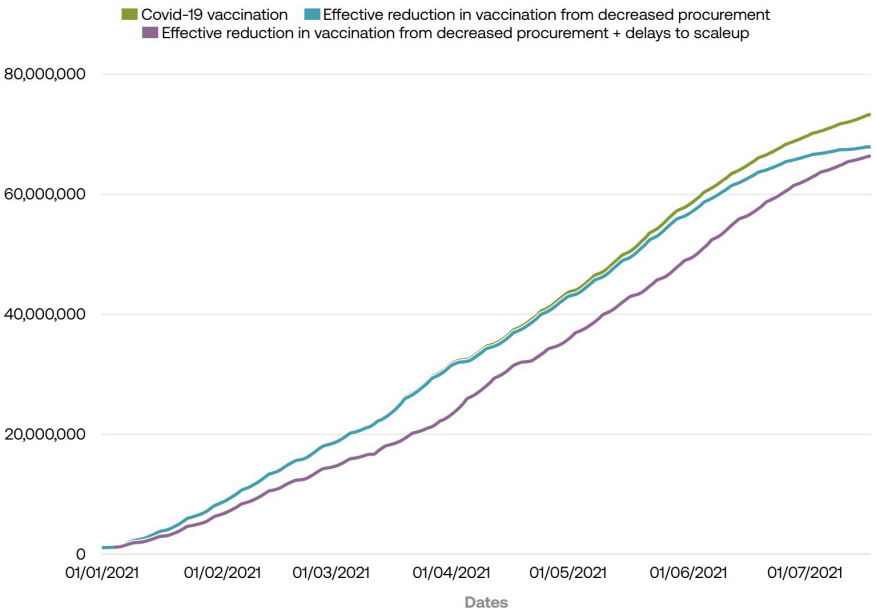
The modelling reveals that disinvestment has by far the biggest impact on health outcomes. Under a disinvestment scenario, a Covid-like virus in ten years' time would lead to 10 per cent more cases in the UK than in 2020, as well as 15 per cent more hospital admissions and 23 per cent more deaths.

Disinvestment has a strong impact on health outcomes because it slows the pace of vaccine discovery and rollout. During a pandemic, when cases and death tolls rise exponentially, every day that the vaccine is delayed leads to a disproportionately high increase in cases. In the UK, data now suggest that

more than 7,000 hospitalisations and deaths combined could have been averted during a four-month period in the summer of 2022 if the UK population had been fully vaccinated.[99]

FIGURE 13

Disinvestment production timelines if the UK disinvests from vaccine manufacturing



Source: Public First

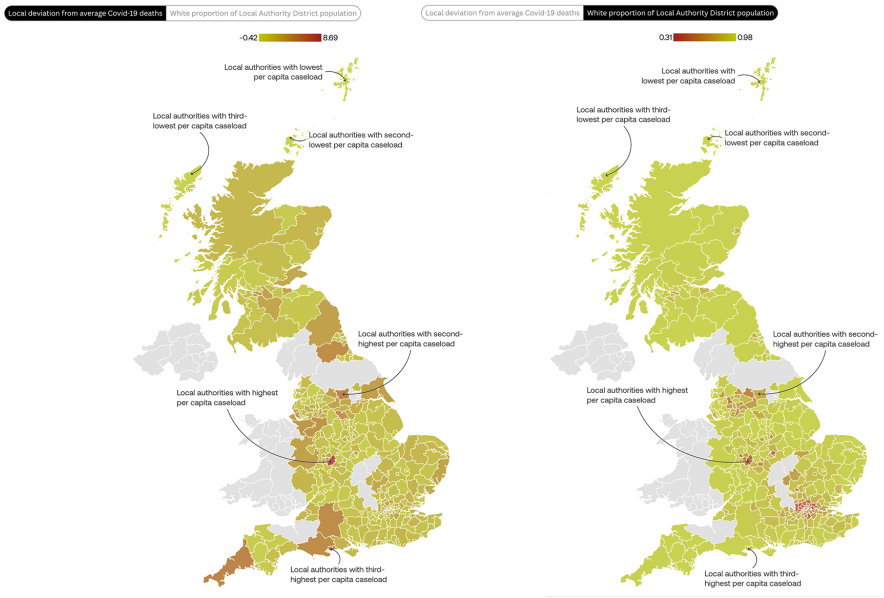
The health impact of disinvestment is further amplified by negative changes to the geopolitical context. EU protectionism would have the greater effect due to the fact that the UK's vaccine supply chain is reliant on the bloc.

- **US protectionism:** For a Covid-like virus, additional US protectionism would lead to 11 per cent more cases, 17 per cent more hospital admissions and 26 per cent more deaths than in 2020. A swine-flu like virus would lead to 13 per cent more cases, 6 per cent more hospital admissions and 1 per cent more deaths.
- **EU protectionism:** For a Covid-like virus, additional EU protectionism would lead to 12 per cent more cases, 18 per cent more hospital admissions and 28 per cent more deaths than in 2020. Swine-flu modelling was not done for this scenario.

It is also likely that outcomes would vary by geographical outcome, as they did during Covid-19. This reflected entrenched health inequalities, with some local authorities experiencing disproportionately high caseloads and hospital pressures, and hospital-bed occupancy rates more than double the average faced in other regions.

FIGURE 14

During the last pandemic, ethnicity and deprivation had important implications for health outcomes



Source: Public First

An NHS under significantly more pressure today than in 2020 only furthers the case for better vaccine access: a 15-day headstart on vaccine rollout would reduce the expected caseload by 4 per cent and therefore reduce pressure on NHS acute services. By contrast with disinvestment, a 25 per cent boost in pandemic preparedness spending would see the UK experience 2 per cent fewer cases, 4 per cent fewer hospital admissions and 5 per cent fewer deaths than in 2020.

The Economic Case for Vaccine Sovereignty

The economic case for vaccine sovereignty is two-fold:

1. **The dividend from a swifter vaccine response:** This can shorten lockdowns (reducing the economic impact of prolonged inactivity) and reduce government expenditure on public-services liabilities such as the health service and furlough payments.
2. **The dividend from investing in life sciences:** Funding the research, development and manufacturing of vaccines is a growth driver for the economy.

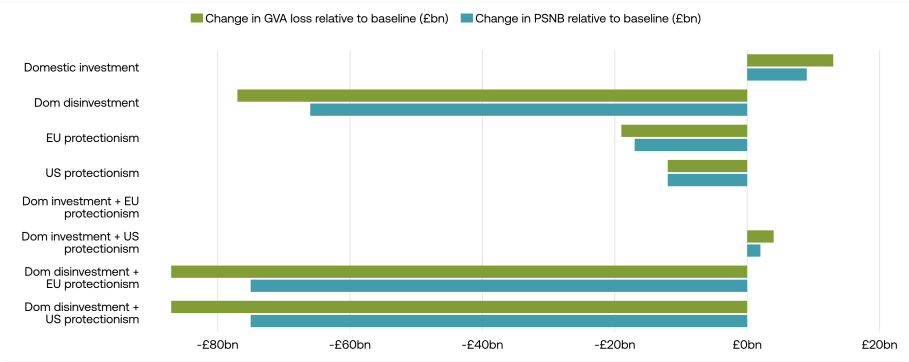
A SWIFTER VACCINE RESPONSE

The modelling commissioned by TBI and conducted by Public First (for which Public First's full methodology is available as a downloadable PDF) shows the positive economic impact of a swifter vaccine response – and the negative economic impact of a slower one.

For instance, if the government was to disinvest by 25 per cent in pandemic preparedness compared with the level of investment today, the impact of another event like Covid-19 in ten years would lead to 75 per cent more public-sector net borrowing than in 2020, and the loss of almost 90 per cent more gross value added (GVA) compared to 2020.

FIGURE 15

Disinvestment in vaccine preparedness would lead to high GVA losses

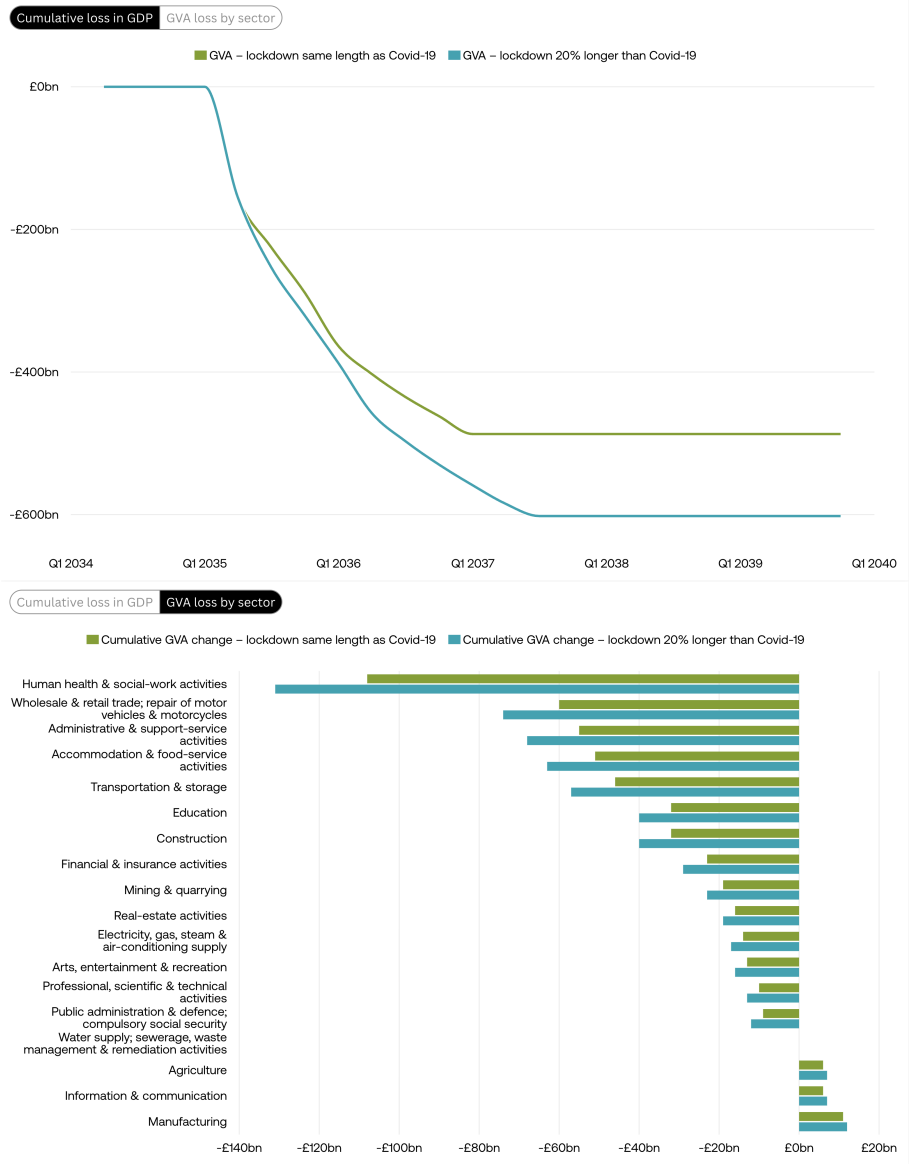


Source: Public First

The graph below shows how this effect on public-services expenditure and economic output is mediated through a longer lockdown period.

FIGURE 16

Longer lockdowns lead to disproportionately high GDP losses



Source: Public First

These economic impacts would be further amplified by negative changes to the geopolitical context:

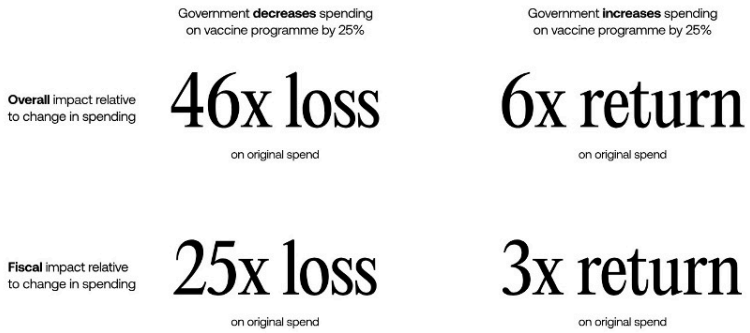
- **US protectionism:** In the case of a pandemic similar to Covid-19, disinvestment would lead to £458 billion in total public-sector borrowing and £574 billion total GVA loss.
- **EU protectionism:** Again, the combination of disinvestment plus EU protectionism would lead to £458 billion in total public-sector net borrowing and £574 billion total GVA loss.

By contrast, a 25 per cent boost in spending on pandemic preparedness could see the UK spend about 10 per cent less on public-sector net borrowing, and lose about 8 per cent less in GVA.

As the table below shows, the return on investment (ROI) for this increased spending is good (threefold) and would avert a much larger potential cost of 46 times the original outlay.

FIGURE 17

Vaccine "insurance" results in small, steady premiums that help avoid enormous losses



Source: Public First

At first sight, this rather shallow payoff might seem a poor ROI for the government but such outcomes (small upside if you invest, large downside if you don't) are typical of insurance policies, and this is how an investment in vaccine preparedness should be considered. And while the cost of this insurance might seem like a luxury at a time of tight fiscal constraints for the UK, it's important to bear in mind what would be insured: the entire economy.

A THRIVING LIFE-SCIENCES SECTOR

Investment in vaccine sovereignty would deliver benefits well beyond pandemic preparedness, in that it would also strengthen the UK's life-sciences sector. This is a key area of comparative advantage that has, in recent years, faced headwinds and capacity loss, particularly in manufacturing and scaleup.[100,101]

The UK life-sciences sector has historically combined world-class research with vibrant innovation, contributing significantly to economic growth and global competitiveness. The government still aspires for the UK to become the third-largest life-sciences economy in the world by 2035, and initiatives such as the £520 million LSIMF are intended to support this ambition.[102] However, structural challenges remain that could undermine both growth and sovereign capability.

The life-sciences ecosystem spans research, clinical trials, innovation and manufacturing. Universities have a record of translating world-leading scientific discovery into innovative companies and technologies.[103] Of the almost 2,000 university spinouts tracked since 2011, about 20 per cent are pharmaceutical companies, with biotechnology as a particularly active area. However, the UK has struggled to scale these startups into globally significant firms – a problem explored in *From Startup to Scaleup: Turning UK Innovation Into Prosperity and Power*, which highlights the systemic barriers present in capital mobilisation, institutional structures and growth pathways for innovative companies.[104]

While research and early innovation remain strong, manufacturing offers a particularly valuable opportunity for economic growth and sovereign capability. Medicines manufacturing contributed about £32 billion in GVA to the UK in 2019, with annual exports exceeding £30 billion.[105] However, recent months have seen a number of manufacturers exit the UK due to global competitive pressures and unfavourable market conditions, and planned investments have been withdrawn or postponed.

Investment decisions across the lab-to-jab vaccine pathway should therefore consider not only economic growth but also strategic value for sovereignty. Although any part of the pathway may warrant support, manufacturing capacity offers the greatest security for access to vaccines (particularly those developed abroad) because it underpins the UK's ability to produce doses domestically once licences and technology-transfer arrangements are secured.

The likelihood of any vaccine candidate successfully reaching the end of the lab-to-jab pathway (that is, from pre-clinical stages to market entry) is 6 per cent in any given year.[106,107] Even in 2020, with amplified political attention and unprecedented financial support, the likelihood of finding a successful Covid-19 vaccine was 15 per cent.[108] So while investment in research and clinical trials are valuable, if national security is the priority, then manufacturing represents the most critical step over which the UK should secure sovereign capability.

Experience gained during Covid-19 demonstrates how complex and time-consuming such technology transfers can be; even established European manufacturers encountered challenges scaling up production of the Oxford-AstraZeneca vaccine. However, this only underlines why maintaining domestic manufacturing expertise, validated processes and skilled workforces in non-pandemic times is essential for rapid mobilisation in future crises.

A thriving life-sciences ecosystem that produces and scales innovative companies has positive spillover effects across the economy. Strengthening domestic demand, skills, infrastructure and investment channels not only supports vaccine sovereignty but also reinforces long-term growth, job creation, export earnings and technological competitiveness.

The National-Security Case for Vaccine Sovereignty

At its core, national security is about protecting the state and its citizens from threats that could undermine safety, sovereignty or societal stability, and to preserve the state's ability to govern and provide essential services in times of crisis. As such, in a modern context, it extends beyond military defence to encompass economic resilience, health security, technological capability and the protection of critical supply chains.

Central to national security is the preservation of national choice, agency and autonomy, and the ability of the state to make decisions in its own interests, free from undue dependence or coercion by other states or

external actors. National security therefore seeks not only to deter and respond to threats, but to ensure that the country can withstand shocks, maintain public trust and act independently under conditions of uncertainty.

During the Covid-19 pandemic, countries with early and reliable access to vaccines lifted restrictions sooner, reopened their economies faster and reduced pressure on their health systems more effectively. They also enjoyed greater freedom of action. Some chose to share vaccines widely, others prioritised domestic populations; in some cases access was conditioned (explicitly or implicitly) on diplomatic, commercial and/or strategic considerations. In practice, vaccine access became a determinant of national autonomy.

Domestic vaccine-manufacturing capacity is therefore an asset of strategic influence as well as resilience. This has particular relevance for the UK. Since 2020, the UK's contribution to global health has waned, reducing its diplomatic leverage. The UK's Office for Development Assistance, for instance, has declined from 0.7 per cent to 0.5 per cent of gross national income (GNI), amounting to a £3.8 billion reduction in support for development and global health abroad.[109] Projections suggest that this could fall further to 0.3 per cent of GNI by 2027, which would be the lowest level in real terms since 1999.[110] Meanwhile, the UK's funding for Gavi (the Vaccine Alliance) has been reduced by 24 per cent – a change that is estimated to reduce the number of child lives saved globally by about 400,000.[111,112]

In this context, a more agile UK vaccine-manufacturing base would strengthen national security in two ways. Domestically it would ensure faster and more reliable access to vaccines in a crisis. Internationally it would enhance the UK's ability to contribute meaningfully to global health responses at moments when supply is constrained, reinforcing diplomatic influence and strategic partnerships. Investment in global health has consistently demonstrated high returns: every £1 invested in aid and global health is estimated to generate up to £1.50 in wider economic and strategic benefits through trade, influence and cooperation.[113]

Bioterrorism also has clear implications for the UK's role within NATO and the wider Euro-Atlantic security architecture. A deliberate biological attack in Europe would not only constitute a public-health emergency but also a collective security challenge, placing immediate strain on alliance solidarity and supply-sharing arrangements. In such a scenario, countries with limited sovereign manufacturing capability would be highly exposed to unilateral export controls by allies prioritising domestic populations. Vaccine sovereignty should therefore be understood as a component of alliance resilience: the ability of the UK to contribute credibly to collective response, rather than compete for scarce supply, strengthens both national security and NATO cohesion.

However, sovereignty does not mean complete self-sufficiency, which is neither realistic nor desirable. Rather, it means ensuring sufficient domestic capability, redundancy and control to manage risk and avoid catastrophic dependence. It also involves cooperation with trusted partners, while recognising that even close allies may prioritise domestic needs in an existential crisis. As with energy or defence supply chains, resilience is a result of diversification, domestic anchors and the ability to act independently when required.

Paradoxically, vaccine sovereignty can strengthen international cooperation. Countries that bring credible domestic capability to the table are better partners when it comes to multilateral initiatives, joint manufacturing arrangements and data-sharing efforts. During Covid-19, states with strong vaccine capabilities exercised disproportionate influence over global supply, standards and timelines.

In 2020, the UK benefited from being on the right side of the vaccine "haves" and "have-nots"; next time it might not be so lucky in a future pandemic, when the whole world is waiting in line for the same vaccine. When global demand surges, export controls are imposed, supply chains fracture and economic pressure mounts; the UK can either be at the back of the queue waiting for vaccines or at the front of the line handing them out. Access to vaccines is neither automatic nor equitable: it is a choice.

THE CASE FOR SUSTAINED, REGULAR INVESTMENT

Sustained and predictable funding for vaccine capability is far more effective (and far less costly) than attempting to mobilise large sums of emergency spending once a crisis has hit. As mentioned previously, increased domestic capacity during a pandemic comparable in scale to Covid-19 would materially reduce the UK's exposure to trade disruption. Even under scenarios of EU protectionism, hospitalisations and deaths would remain below 2020 levels; under comparable US protectionism, the dampening effect would be greater still. These findings highlight the role of domestic capability as a stabilising force in an increasingly volatile global environment.

There is also a strong fiscal case for spreading this investment over time. Phasing capital expenditure across a ten-year period reduces the upfront burden on the Treasury while maximising long-term value. Public First modelling indicates that a phased approach would generate an additional £57 million in terms of net present value (measured as GVA) and £22 million in additional tax receipts. This is equivalent to a 14 per cent uplift on the original investment compared with a single upfront capital outlay.

These gains arise from sustained investment in domestic manufacturing infrastructure, workforce development and supply-chain resilience, rather than short-term capacity spikes. By maintaining facilities in a warm-lit state and steadily building skills and capability, the UK would retain the ability to rapidly scale vaccine production when needed, without relying on fragile global bottlenecks or emergency improvisation. The evidence supports a shift away from episodic, crisis-driven spending towards a model of regular long-term investment. In both security and fiscal terms, this offers a more resilient, affordable and credible foundation for future vaccine preparedness.

03

Global Best Practice and Policy Options for the UK

Countries across the world are moving decisively to secure a greater degree of vaccine sovereignty. In the US, for example, BARDA (the federal body responsible for US strategic preparedness and response) has invested in a number of "ever warm" manufacturing sites, while simultaneously onshoring production capabilities for critical vaccine inputs such as fill-finish capacity and adjuvants.[114]

For smaller countries, true vaccine sovereignty is more difficult to achieve due to scale; in these cases, a shared-resources approach with trusted allies is preferable. The EU, for instance, has established the EU FAB, a programme designed to boost manufacturing capacity within the bloc by up to 700 million doses per year across a range of vaccine platforms and modalities. It would also adopt an ever-warm approach, backed by a budget of €160 million that corresponds to the preparedness contracts and associated annual fees paid to vaccine manufacturers to keep capacities ever warm (rather than an annual spend on production).[115,116,117]

Some countries and regional groups are going even further, strengthening others' vaccine sovereignty by supplying or building manufacturing capacity for others. The EU, for instance, has made vaccine diplomacy in Africa a central pillar of its global health and development engagement; it is combining strategic investment, technical support and capacity-building to support African countries in strengthening their vaccine ecosystems.[118] The SII meanwhile, is working with the Coalition for Epidemic Preparedness Innovations (CEPI) to help set up pandemic-preparedness facilities across the world as part of CEPI's 100-day mission, with the EU covered by a plant in the Netherlands.

In determining their vaccine-production strategies, countries and regional alliances must consider a range of factors. Is this production capacity sufficient? Does it cover a broad enough range of platforms? Is the supply

chain secure? Are facilities truly sovereign, warm-lit and affordable? Does the plan invest in domestic skills and growth? Are the plans aligned to national interests, as opposed to being guided by simple market forces?

Common considerations include the following.

- **End-to-end capacity:** Countries should be able to manufacture enough vaccine in a suitable timeframe (typically two doses per citizen in the space of months). Production capacity includes facilities, trained staff and vaccine licences, covering the entire production pathway from vaccine creation to fill and finish.
- **Platform diversity:** Drawing on a range of vaccine technologies means protection against the widest possible range of pathogens.
- **Supply-chain security:** Access to critical inputs should be assured, including raw materials, reagents, adjuvants and specialised machinery. This can be achieved through onshoring production and strategic stockpiles.
- **Sovereignty:** Sovereign rights over a product in an emergency is crucial. This could be achieved through government-controlled facilities, requisition rights of domestic facilities or agreements with other countries.
- **Commercial viability:** Domestic manufacturers must be able to remain commercially viable in non-pandemic times so that they are "warm lit" and ready to pivot production rapidly in an emergency. APAs or agreements guaranteeing purchase of stock during non-pandemic times can help in this instance.
- **National interests:** Centralised oversight and a degree of control over the domestic vaccine ecosystem are key. This should include research, regulation and manufacturing, aiming to align production with national economic and health priorities.

Global Best Practice

This section highlights global examples where the above factors have been effectively incorporated, with some instructive lessons for the UK.

EUROPEAN UNION

The EU is a good example of regional vaccine sovereignty: it has pooled resources across member states to overcome national scale constraints, while retaining collective control.

EU FAB network: Under the EU's Health Emergency Preparedness and Response Authority, the EU FAB initiative maintains ever-warm manufacturing capacity for key vaccine platforms (mRNA, vector-based and protein-based) across Belgium, Ireland the Netherlands and Spain.[119] These facilities stay operational in non-pandemic times so that they can be rapidly activated to produce up to 325 million doses per year of any given vaccine in a major public-health emergency.[120] This creates reserve manufacturing capability that can be called upon quickly and bridges the gap between raw capacity and rapid scaleup during a crisis.[121]

Pan-EU mechanisms and partnerships: The EU has pursued broader resilience tools in addition to FAB – including joint procurement mechanisms, supply-chain stockpiling and market-shaping strategies – to close gaps between normal and crisis production. These efforts are part of the EU's wider vaccination strategy, linking production capacity to emergency-response planning.

UNITED STATES

The US is a good example of institutionalised vaccine preparedness, with innovation baked into the system and an explicit ambition to free itself from foreign dependencies.

BARDA: The federal government agency responsible for developing, procuring and stockpiling medical countermeasures.[122] It sits between early research and commercial procurement, helping to move promising

technologies through late-stage development and into manufacturing at scale. It also allows the government to derisk private-sector investment, secure domestic manufacturing capacity, ensure rapid access to vaccines and therapeutics in emergencies, and retain leverage over supply chains and intellectual property (IP) during crises.

BARDA DRIVe: BARDA's Division of Research, Innovation, and Ventures is a specialised unit launched in 2018 to accelerate breakthrough health-security technologies. It focuses on high-risk, high-reward innovations and operates more like a strategic venture fund than a conventional government programme. BARDA DRIVe invests in next-generation vaccine platforms, AI-enabled drug and vaccine discovery, advanced diagnostics and biosurveillance, novel manufacturing technologies, and antimicrobial resistance solutions.[123]

Generation Gold Standard: This is an innovative strategy, operating out of BARDA DRIVe, to develop universal vaccines using beta-propiolactone (BPL) inactivated whole-virus technology (in which the virus is killed so that it cannot replicate). These vaccines are being engineered to provide broad, variant-proof protection against pandemic-prone pathogens such as seasonal and avian influenza, RSV, metapneumovirus and coronaviruses. The BPL platform is fully government-owned, ensuring transparency and public control. Trials are underway, with FDA approval planned for 2029, including an intranasal flu vaccine that targets virus-transmission interruption.[124]

BIOSECURE Act: This proposed act is driving the reshoring and diversification of critical vaccine supply chains.[125] By restricting federal contracts with "biotechnology companies of concern", it effectively compels US contractors to unwind foreign dependencies if they want to remain eligible for government work.

INDIA

India has achieved vaccine sovereignty through scale and export capacity.

High volume, high-tech production: India is the world's largest vaccine manufacturer by volume, with companies such as the SII and Bharat Biotech producing billions of doses annually for routine immunisation and pandemic response.[126,127] Indian manufacturers are also piloting frontier production techniques. Several SII sites, for example, have platform neutrality, retaining capability across mRNA, viral vector, protein subunit/novel adjuvants and rapid fill-finish. They also maintain at least one line of multi-dose vials and one line of pre-filled syringes.

Global vaccine supply: Indian manufacturers supply a significant proportion of WHO-distributed vaccines, underscoring their role in global vaccine sovereignty. Furthermore, Indian firms such as the SII are establishing pandemic-ready production facilities overseas (through EU FAB partnerships, for example), providing surge capacity and rapid technology-transfer channels. This approach reinforces India's ability to mitigate supply-chain disruptions, meet international commitments and maintain influence over global vaccine allocation during a crisis.

The fact that the Indian government implemented a diplomatic programme that supplied vaccines to many countries during Covid-19 illustrates how domestic manufacturing capacity can translate into influence and health diplomacy. However, temporary export suspensions during India's second Covid surge highlighted the tension between domestic demand and export commitments.

Responding to emerging threats: Indian vaccine manufacturers are actively expanding into work on new vaccines and cutting-edge technologies, moving beyond their established focus on routine immunisation and Covid-19. This includes large-scale efforts in malaria vaccine production, novel viral-vector platforms and research into next-generation mRNA and protein-subunit vaccines. By developing capabilities across multiple platforms, India is reducing dependence on a single technology and building resilience against a broader spectrum of potential biological threats.

AFRICA

Vaccine sovereignty is emerging as a strategic regional priority across the continent, driven by the experience of inequities during the pandemic. Collective initiatives constitute a de facto reindustrialisation strategy for vaccine-related manufacturing, reducing reliance on foreign suppliers and strengthening security around health and genomic data.

Goals for productive capacity: The African Union has set an ambitious target for the continent to produce 60 per cent of its vaccine needs locally by 2040, compared with negligible domestic production today. This reflects a regional strategy for health security, reducing dependence on external suppliers.[128]

African Vaccine Manufacturing Accelerator: Launched with support from Gavi and international partners, AVMA will provide up to €1 billion over the course of ten years to support commercially viable vaccine manufacturing in Africa, addressing financing, regulatory and technical barriers.[129]

Global partnerships: External partners – notably the EU through its Team Europe Initiative – are investing in regulatory capacity, skills training and physical infrastructure, including an mRNA facility in Rwanda. As such, Africa's vaccine sovereignty supports both local resilience and global health security.[130]

SINGAPORE

Singapore has pursued a hybrid model of vaccine sovereignty: accepting that it cannot manufacture all vaccines at scale domestically, but ensuring priority access, platform diversity, supply-chain security and sovereign control through trusted partnerships and legal authority. In this context, the definition of "sovereignty" includes logistics, inputs and coordination, not just factories.

Platform-agnostic facilities: Sanofi's next-generation Modulus facilities are flexible manufacturing sites capable of producing multiple vaccines or biomedicines (including monoclonal antibodies), on the same production

floor. Thanks to the use of standardised modular units, production lines can be reconfigured within weeks or even days across validated technological platforms; this enables rapid transition from early biologics production to scaled vaccine manufacture.[131]

Supply-chain security: The government maintains strategic stockpiles of critical medical inputs. It has built in redundancy through diversified sourcing, long-term supplier relationships and logistics dominance (ports, air freight and cold-chain capacity), and treats medical supply chains as critical national infrastructure, overseen centrally rather than left to market forces.

Sovereignty and control: Strong emergency powers allow the government to requisition facilities, redirect production and prioritise domestic needs in a crisis. Sovereignty is achieved not through ownership alone, but through clear legal authority and preparedness.

National interests: Singapore's vaccine strategy is tightly aligned with national security, economic policy and health governance; decisions are coordinated centrally across health, trade, industry and security agencies. Vaccine access is treated as part of national resilience planning, alongside energy, water and food security; this alignment enabled rapid decision-making, early procurement and public trust during the pandemic.

GULF STATES

The Gulf States provide a strong example of capital-intensive, state-directed vaccine sovereignty, leveraging financial power, geopolitical positioning and regulatory agility rather than domestic scale alone. Their model demonstrates how smaller populations can achieve meaningful vaccine sovereignty through partnerships and centralised authority, even without the industrial depth of larger manufacturing countries.

Strategic manufacturing partnerships: Rather than building end-to-end vaccine ecosystems from scratch, Gulf countries have pursued sovereign capacity through joint ventures with global manufacturers. The United Arab Emirates, for example, partnered with Sinopharm to establish local fill-finish and, later, manufacturing capacity,[132] while Saudi Arabia has entered

agreements with multinational pharmaceutical firms to localise vaccine and biologics production.[133] These partnerships typically include technology-transfer clauses and guaranteed domestic supply in emergencies, allowing governments to retain sovereign access without assuming full R&D risk.

Platform flexibility and regional hubs: Gulf investments have prioritised flexible biologics facilities that can handle multiple platforms, including Lifera (a Saudi Arabia Public Investment Fund project set to be commissioned in 2027), to build a contract development and manufacturing organisation to make a range of inactivated vaccines, protein-subunit vaccines and, increasingly, mRNA and cell-based technologies.[134] Facilities have been designed as regional hubs,[135] intended to supply not only domestic populations but also neighbouring Middle Eastern, African and South Asian markets. This regional orientation supports commercial viability while ensuring surge capacity in a crisis.

Supply chain control and logistics dominance: The Gulf States compensate for limited domestic input manufacturing by exercising tight control over logistics, trade routes and stockpiles. World-class infrastructure in the form of ports, air freight and cold-chain capacity allows for the rapid import of critical inputs, and the export of finished products.[136]

Sovereignty through state authority rather than ownership: As in Singapore, sovereignty in the Gulf is achieved primarily through legal and political authority. Governments retain broad power to direct production priorities and restrict exports in emergencies. This ensures effective national control, even where facilities are operated by private or foreign partners.

Alignment with national development strategies: Vaccine manufacturing is explicitly linked to broader industrial-diversification agendas, such as Saudi Arabia's Vision 2030[137] and the UAE's life-sciences and advanced-manufacturing strategies.[138] Health security, economic diversification and geopolitical influence are treated as mutually reinforcing objectives.

LATIN AMERICA

Latin America offers an example of state-anchored vaccine sovereignty rooted in public institutions, legacy manufacturing capability, technology transfer and regional self-reliance ambitions. In this summary we also highlight some of the constraints that are a factor: financing and fragmentation, as well as the risks of insufficient demand during non-pandemic times.

Public-sector manufacturing anchors: Countries such as Brazil and Mexico have long relied on state-linked institutions to ensure vaccine access. Brazil's Fiocruz and Butantan Institute operate as vertically integrated public manufacturers, combining research, clinical development, manufacturing and public procurement.[139] During Covid-19 these institutions rapidly absorbed technology transfers for vaccines such as Oxford-AstraZeneca and CoronaVac, enabling domestic production at scale.

Technology transfer: Latin American countries have used licensing and technology-transfer agreements to build domestic capacity across platforms, particularly viral-vector and inactivated vaccines; there is also a growing interest in mRNA.[140,141] While these agreements do not always confer full IP control, they provide time-limited sovereign access and workforce skill development, reducing dependency during emergencies.

Regional supply and solidarity: Domestic manufacturing in Brazil and Mexico has historically supported wider regional supply through the Pan American Health Organization's Revolving Fund, reinforcing collective resilience.[142]

Constraints on commercial viability and warm-lit capacity: Unlike the US or EU, Latin America has struggled to sustain warm-base manufacturing in non-pandemic times. Production is often episodic as a result of being dependent on government procurement cycles and external financing.[143]

Strategic ambition without full industrial integration: Recent regional strategies have increasingly framed vaccine manufacturing as a national security and development priority, particularly in Brazil.[144] However, fragmented regional coordination, fiscal constraints and dependence on imported inputs continue to limit full end-to-end sovereignty.

Policy Options for Greater Vaccine Manufacturing Sovereignty in the UK

Taken together, the international examples in the previous section demonstrate that vaccine sovereignty is not achieved through a single institutional form or a certain level of self-sufficiency, but through deliberate choices about where control is exercised and how risk is managed.

The US shows the value of permanent institutional capability, deep platform diversity and strong demand-side intervention. The EU illustrates how shared sovereignty can overcome national scale constraints while retaining collective control. India demonstrates the power of manufacturing scale and export capacity, while Africa highlights the importance of long-term ecosystem-building to correct structural dependency. Latin America underscores the role of public manufacturing anchors and technology transfer as tools of sovereign access, while also demonstrating the risks of insufficient demand during non-pandemic times and under-capitalised ecosystems. Singapore and the Gulf States show that smaller countries can preserve agency through selective investment, legal authority, logistics dominance and trusted partnerships.

A common thread across the most resilient systems is that sovereignty is treated as a function of access rights, priority supply, legal authority and preparedness, rather than simply ownership of assets. The countries that performed best during Covid-19 were those that were able to act decisively when markets failed: to secure inputs, redirect production, activate dormant capacity and negotiate from a position of strength. Crucially, this capability was underpinned by institutions in place from before the pandemic, standing agreements and warm-lit facilities that could be mobilised rapidly.

For the UK, which sits between these models in terms of scale and capability, the point is not that it must replicate the industrial depth of the US or the manufacturing scale of India. Rather, it must define a configuration between domestic capacity, allied partnerships and sovereign control, and then institutionalise that settlement so that it persists beyond crisis conditions. Without this reset, the UK risks reverting to an ad hoc, reactive posture in future emergencies.

The rest of this section examines a set of policy options that would strengthen UK vaccine-manufacturing sovereignty. These options range from coordinating access to existing domestic and international capacity to establishing new UK-based manufacturing models under varying degrees of public control. Each is assessed against the core criteria identified above: sovereignty and control, speed and scale, platform diversity, supply-chain security, commercial viability, and alignment with national interests.

We have presented seven policy options – three that coordinate the use of existing manufacturing capacity and four that build new manufacturing capacity in the UK. We consider each in turn; in the next chapter we suggest a combination of models that would deliver a feasible and desirable vaccine-sovereignty strategy.

UK FAB (UK DOMESTIC CONSORTIUM)

UK FAB would be a standing, government-backed manufacturing framework designed to guarantee rapid domestic-vaccine production in a crisis. Rather than building a single state-owned facility, it would operate as a network of preselected, contractually committed manufacturers across different platforms, kept in a state of readiness through advance agreements and periodic stress-testing. In non-pandemic times these facilities would operate commercially, but under surge clauses that would give the UK priority access and the ability to pivot production rapidly when triggered.

Operating Model

- The government would pay a consortium of providers (vaccine manufacturer, developer and fill-finish facility) an annual fee to keep their sites warm-lit and ready. This funding would maintain trained staff, validated equipment, raw materials and up-to-date licences, guaranteeing that the UK could deliver 100 million doses at speed under a first-rights agreement.
- Deploying this consortium model across three distinct vaccine platforms would secure access to diverse platforms and reduce single-point-of-failure risk.
- In non-pandemic times, these manufacturers would operate on a commercial basis as pharmaceutical companies, contract manufacturers or Catapult-style facilities (publicly supported innovation centres that bridge research and industry while maintaining advanced manufacturing capability), supplying domestic and international markets. Where appropriate, the government could help stabilise demand through routine NHS procurement that is aligned to resilience and supply-security requirements, rather than through explicit origin-based preference.
- Paying more for UK-manufactured routine vaccines would be treated as a "sovereignty premium". The UK could request help from CEPI to assist with negotiations for long-term pandemic agreements that sustain domestic capability.
- The commercial model would involve shared risk/reward between public and private sectors and the use of incentives (retainer fees, surge payments and innovation grants) to drive production.
- Funding could be achieved through the British Business Bank's Long-term Investment for Technology and Science initiative, first-rights payments, APAs and potential LSIMF allocation. There would be potential to offset a significant proportion of operational costs through NHS procurement that values resilience, assured supply and surge capability, rather than origin. If designed carefully, such procurement could support domestic manufacturing while remaining consistent with international trade obligations.

Evidence and Examples

- **UK:** The Covid-19 VTF created a temporary consortium, investing in multiple platforms. Valneva's Livingston plant has demonstrated benefits but faces sustainability challenges.
- **International:** Germany's BioNTech uses multiple CMOs to maintain surge capacity.[145]

Pros and Cons

A UK FAB would deliver a high degree of sovereignty at relatively low cost by coordinating existing UK developers, manufacturers and fill-finish operators under warm-lighting agreements. It would also enable strong end-to-end domestic capability and platform diversity if replicated across several consortiums. This model offers fast deployment, significant UK industrial benefits and high commercial viability, particularly if the government uses routine procurement of NHS vaccines to stabilise demand. The main challenges are the need for ongoing stipends, coordinating across multiple private organisations and mitigating risks of industry disinvestment.

A UK FAB is a strong, affordable sovereignty option with a clear domestic economic upside. However, these policy options do not have to be mutually exclusive, and there is an opportunity to interlink a UK FAB with either the EU FAB or a new Global FAB (see below) to create a hybrid model for UK assurance.

EU FAB (THIRD-COUNTRY PARTICIPATION)

The EU FAB is a European programme that maintains ever-warm vaccine-manufacturing capacity across multiple platforms within the EU. As a third-country participant, the UK could attempt to purchase access to guaranteed surge-manufacturing capacity without building new domestic facilities. Participation would give the UK rapid, multi-platform, large-scale production capability during a biological emergency, using pre-existing EU infrastructure.

Operating Model

- The UK would buy annual guaranteed-availability slots (readiness) within the EU FAB system, covering multiple vaccine platforms (such as mRNA, protein subunit and viral vector).
- UK activation of this capacity would be tied to a shared emergency trigger, coordinated with EU partners, that would allow rapid scale-up in a future pandemic.
- Vaccines produced in EU FAB facilities could be imported efficiently using MHRA/EU reliance or equivalence mechanisms, minimising regulatory delay.
- The UK could optionally contribute its own mRNA capacity (the RNA capabilities that sit with CPI, for example) into the FAB network, deepening mutual access arrangements.
- Government costs would be limited to access fees and activation costs rather than capital expenditure, with spending treated as a contingency measure rather than an ongoing domestic industrial investment.
- The commercial model would involve pay-per-use for pandemic-access capacity, with no ongoing capital-expenditure commitment. Costs are tied to activation and utilisation during emergencies.
- The proposed funding source would include Treasury contingency budgets and pandemic-specific APAs.

Evidence and Examples

- **UK:** The UK's participation in Horizon Europe demonstrates both the opportunity and political constraints of participating in shared medical research.[146]
- **International:** The EU FAB model is an example of shared vaccine production capacity, created post-Covid in Europe to avoid over-reliance on single countries.

Pros and Cons

The EU FAB offers rapid, large-scale manufacturing capability across multiple vaccine platforms, without requiring any domestic capital investment on the part of the UK. It is fast and cost-efficient, and benefits from the EU's substantial industrial base. However, the UK's sovereignty would be limited: activation would be tied to EU-level triggers, the UK would lack unilateral control over production, and jobs and economic gains would mostly accrue to the EU. While complexity is moderate and commercial viability is strong due to the pay-per-use model, the UK would remain dependent on offshore facilities. That makes this a low-sovereignty but highly affordable option (albeit politically delicate after Brexit). There is also the potential that future UK governments might not be so favourable to arrangements where the UK collaborates with Europe, which could result in future withdrawal from any agreements.

GLOBAL FAB (NON-EU INTERNATIONAL CONSORTIUM)

A UK-led Global FAB would mirror the principles of the EU FAB but be made up of non-EU partner countries. The UK would coordinate a shared ever-warm network with trusted allies, pooling manufacturing capacity across multiple continents to reduce geopolitical risk. This model would expand the UK's strategic resilience by diversifying supply chains and strengthening collaboration with traditional key partners such as Australia, Canada and Japan. The alternative would be to work with a wider set of partners such as Singapore, the Gulf States and Norway; the latter recently bought submarines from the UK, which could be the start of a strategic defence alliance, including biodefence.

Operating Model

- The UK would help establish a multinational agreement guaranteeing reciprocal access to vaccine-manufacturing capacity across several countries.
- Partner countries would commit defined capacity blocks across multiple platforms, which would remain in a warm-lit state and could pivot rapidly to pandemic production.

- The UK would participate in governance structures that define emergency triggers, allocation rules and tech-transfer protocols.
- UK domestic manufacturing (mRNA and potentially other platforms) could contribute to the shared FAB pool, ensuring reciprocity and enhancing UK leverage.
- Funding would come from government subscriptions, access fees and limited capital contributions, with shared costs reducing domestic fiscal pressure.

Evidence and Examples

- **International:** EU FAB is most analogous to the Global FAB model.

Pros and Cons

A UK-led Global FAB would widen strategic resilience because it would see the country partnering with trusted international allies, thereby diversifying supply chains and reducing geopolitical dependence on Europe. It would offer stronger sovereignty than the EU FAB and potentially greater platform diversity. However, establishing a new multinational system would be administratively and diplomatically complex, and reliant on partners' commitment and infrastructure maturity. It would also be slow to operationalise thanks to logistical challenges, including the vast shipping distances between certain actors.

The upfront costs of this option would be low, but coordination costs would be significant; jobs and growth benefits, meanwhile, would depend on the UK's capacity contribution. On a broader note, collaboration with non-traditional partners could be a good route for the UK in an increasingly volatile world order, given traditional multilateral institutions are under pressure.

GOVERNMENT OWNED AND OPERATED

A GovCo model would involve the UK government fully owning and operating a vaccine-manufacturing facility, giving the state maximum control over capacity, platforms and emergency readiness. This approach prioritises national security above commercial considerations and would ensure that the UK can direct production without reliance on private partners.

Operating Model

- The government would fund and build new facilities or use existing mothballed sites such as the Cell and Gene Therapy Catapult's Manufacturing Innovation Centre (CGTC MIC) in Essex. The result would be a dedicated vaccine-manufacturing centre with its own MHRA licences and regulatory compliance structures. It would retain skilled staff and validated production lines across selected platforms, remaining in a permanent warm-lit state.
- In the event of a pandemic, the government would be able to immediately redirect all resources to producing vaccine candidates without negotiation or commercial constraints.
- In non-pandemic times, the site could produce limited routine vaccines or operate on standby, depending on government strategy.
- All capital expenditure, operating costs and commercial risk would be borne by the state, ensuring full sovereignty but requiring substantial ongoing investment.
- The commercial model would see this approach fully funded via public capital expenditure and/or operating expenses. Surplus production could be exported.
- The proposed funding source is Treasury capital budgets, as well as APAs for surge capacity.

Evidence and Examples

- **UK:** Porton Biopharma Limited (PBL) was retained in public ownership to manufacture niche strategic biologics (including the UK's licensed anthrax vaccine and Erwinase), which shows both the value of sovereign

capability and a single-product manufacturer's vulnerability to market shifts. This culminated in DHSC's 2025 decision to cease PBL's manufacturing after review; future stock availability is expected to be constrained as a result.

- **International:** Bio Farma in Indonesia is wholly state-owned, exports at volume and holds longstanding WHO prequalification across multiple vaccines. It recently secured prequalification for nOPV2 (polio), showing that public ownership can deliver global-grade quality and competitiveness.

Pros and Cons

GovCo offers the highest possible level of sovereignty and control: the government would own the facility, direct production and determine platform choices independently of private industry. It would ensure maximum national security and clarity of responsibility. However, it would be extremely expensive, requiring substantial capital and ongoing operating expenditure. Build times can be lengthy if new facilities are required, and the state bears all commercial, regulatory and utilisation risks. Although job and growth benefits are strong, this is the least cost-effective option and the slowest to deliver meaningful capability. GovCo is a high-control, high-cost model suitable only where budgets and timelines are unconstrained.

GOVERNMENT-OWNED, CONTRACTOR-OPERATED

A GOCO model would allow the government to maintain ownership of a flexible, multi-platform vaccine-manufacturing site while outsourcing day-to-day operations to private industry. This hybrid model combines sovereign control with industrial expertise, ensuring rapid pivot capability while sharing operational risk.

Operating Model

- The government would build a new facility or use an existing unused site that would become a modular, multi-suite facility (a UK vaccine centre); operational control would be leased to one or more private contractors.

These contractors would run the facility during non-pandemic times for commercial production, retaining staff and equipment while adhering to regulatory compliance.

- The government would retain the right to activate a 72-hour pandemic-pivot protocol, redirecting production capacity to emergency vaccines.
- Shared utilities, quality-control labs and GMP infrastructure would enable parallel use by different platform providers, supporting platform diversity.
- Lease income would offset some operating costs, while government funding would maintain surge readiness and strategic reserves.
- The commercial model would see tenants manage routine output and government oversee surge readiness. Lease revenue would offset longer-term costs; APAs would fund emergencies.
- The proposed funding source for construction would be public capital expenditure. Lease revenue and APAs would be used for operations.

Evidence and Examples

- **UK:** GOCO has been used in nuclear and military sectors; VMIC and CGTC MIC partially followed this principle.
- **International:** Canada has operated its federal nuclear laboratories under a GOCO model since 2015. Atomic Energy of Canada Limited (AECL) remains the federal Crown owner, setting strategy and holding the assets, while Canadian Nuclear Laboratories (CNL), which is run by a competitively appointed contractor, manages and operates the sites under performance terms. The model is periodically recompeted, with AECL completing a re-procurement in June 2025 to secure management of CNL beyond the contract's September 2025 expiry. This is a good example of a long-running, safety-critical GOCO with clear owner/operator separation, which has measurable KPIs and is renewed through competitive tender.[147]

Pros and Cons

GOCO balances sovereignty with private-sector operational expertise. The government retains ownership and pandemic-direction rights, while contractors run the facility commercially during non-pandemic times. This model enables high platform diversity and strong end-to-end capability; it also supports UK industrial growth. However, the downsides are substantial: upfront capital expenditure, long build timelines (if existing sites are not repurposed) and complex governance, leases and step-in rights. While more commercially viable and flexible than GovCo, it is expensive and takes a relatively long time to establish.

JOINT VENTURE (CO-OWNED AND CO-OPERATED FACILITY)

A joint venture (JV) involves the government and one or more private vaccine manufacturers co-owning a domestic facility. This model blends public strategic control with private-sector innovation, allowing rapid capability development while maintaining some governmental leverage over platform choice and emergency access.

Operating Model

- The government and an industry partner would jointly fund and own a new or expanded UK vaccine-manufacturing site under a formal JV agreement.
- Operational decisions would be shared, with the government holding special rights (such as veto powers and step-in authority) to guarantee emergency access.
- The industry partner would provide platform technologies, manufacturing expertise and commercial pipelines to ensure efficient utilisation in non-pandemic times.
- The government would use APAs or long-term procurement to stabilise demand, while private partners would invest in scaling and optimising the facility.
- Capital expenditure and risk would be shared, with JV governance determining platform mix, emergency triggers and tech-transfer obligations.

- The commercial model would involve mixed public/private capital expenditure and revenue-sharing during routine operations. APAs would fund surge.
- The proposed funding source is joint investment by government and private partners, with APAs for emergency surge.

Evidence and Examples

- **UK:** The Advanced Manufacturing Research Centre, a joint venture between the University of Sheffield and Boeing, demonstrates the benefits of co-ownership and knowledge transfer;[148] the Oxford-AstraZeneca vaccine partnership shows partial success in an R&D context.
- **International:** South Africa's Biovac began as a public-private partnership and now operates as a joint venture with government shareholders (Department of Science & Innovation and the Technology Innovation Agency), alongside a private partner.[149]

Pros and Cons

A JV model blends public and private ownership, enabling the government to share costs and risk while securing platform expertise from industry. This model can deliver strong domestic capability and high-quality end-to-end production. However, sovereignty is limited by shared governance, platform diversity depends on the partner's technology stack, and the UK risks commercial lock-in. JVs require complex negotiations and ongoing governance arrangements and tend to be short- to medium-term focused, rather than long-term. Upfront costs are significant but shared. This model delivers strong economic benefits but provides only medium sovereignty, with a high degree of operational and contractual complexity.

PUBLIC-PRIVATE PARTNERSHIP

Under a PPP model, a private company would own and operate a UK vaccine-manufacturing site, while the government secures priority access through long-term strategic agreements and APAs. This model would leverage private-sector efficiency, capital investment and platform expertise, while ensuring domestic availability during emergencies.

Operating Model

- A private vaccine manufacturer would build, own and operate a UK facility, with government commitments such as APAs, milestone payments and partnership agreements securing priority access during a crisis.
- Government step-in rights would ensure that the facility can pivot immediately to pandemic vaccine production when emergency triggers are activated.
- In non-pandemic times the company could use the site for its commercial pipeline (including mRNA, viral vector and/or protein-based products), strengthening the UK's life-sciences base.
- The government would pay for emergency capacity rather than infrastructure, reducing public capital expenditure while enabling industry to scale quickly.
- The facility's platform focus would be determined by the private partner, meaning the UK would secure high-quality capacity but with limited platform neutrality.
- The commercial model would be private capital expenditure leveraged for public benefit. Risk would be shared via contractual agreements.
- The proposed funding sources are APAs, strategic partnership budgets and innovation grants.

Evidence and Examples

- **UK:** Moderna's Harwell site and Oxford-AstraZeneca Covid-19 vaccine production illustrate PPP benefits and challenges.

International: BARDA PPPs in the US are explicitly designed to support advanced development and domestic manufacturing capacity for vaccines and countermeasures,[150] helping bridge commercial market gaps and enhance national preparedness. That said, they do not represent a direct sovereign production guarantee.

Pros and Cons

A PPP model allows the private sector to build and operate domestic capability while the government secures priority access through APAs and contractual step-in rights. It offers strong domestic jobs and innovation benefits, low public capital expenditure and high operational speed. When well designed, PPPs can also be used to deliberately build capability on government-prioritised platforms by specifying technology scope and flexibility at contract formation.

However, sovereignty can still be constrained if platform choices and upgrade pathways are driven primarily by partner commercial priorities, and vendor lock-in remains a risk without explicit provisions for technology refresh, platform diversification and exit. Governance complexity is high, particularly around renegotiations and emergency pivot rights. PPPs can deliver reliable, high-quality domestic capability quickly, but with limited platform neutrality and only medium government control.

04

Policy-Options Appraisal and Recommendations

While maintaining a vibrant life-sciences ecosystem in the UK would be a primary way to mitigate against potential gaps in the vaccine ecosystem and supply chain, TBI's assessment is that the most effective and affordable route to vaccine sovereignty is through a hybrid strategy that combines the following elements.

1. **Marshalling existing capabilities** by creating a UK FAB-style model as the core mechanism for domestic sovereign capability.
2. **Building out international collaboration** via either EU FAB membership or spearheading the creation of a Global FAB with non-traditional allies, as an insurance policy that expands surge capacity at low capital cost.
3. **Pinpointing targeted solutions to fill gaps in the UK's national end-to-end manufacturing pipeline.** This would crowd in private investment for critical bottlenecks such as fill-finish, lipid-nanoparticle production and platform-specific upgrades.

This three-pronged approach strikes the optimal balance between cost, control, speed and flexibility, giving the UK meaningful sovereign capability without requiring the large capital expenditure associated with GovCo and GOCO models at a time when government funding is tight. It also reduces the strategic risks inherent in relying solely on mRNA capacity at Harwell, or presuming international goodwill during emergencies.

A UK FAB could form the core of the UK's strategy. This approach provides the highest level of sovereignty for the lowest fiscal outlay, and allows the government to coordinate existing domestic manufacturing capacity through annual warm-lighting agreements. This guarantees rapid pivoting to pandemic vaccine production of 100 million doses across multiple platforms, with updates for each refresh cycle rather than on an annual basis. A UK

FAB could function as an insurance premium rather than a capital-intensive infrastructure programme, while also securing the government first rights to those doses in an emergency.

Establishing international collaborators would be a way to fill gaps in the UK's existing manufacturing base. It is unrealistic to expect the UK to build out full capability across all platforms, so guarantees with allied countries could help secure access to platforms where the country has less capability. In this regard, joining the EU FAB would offer immediate access to large-scale, multi-platform, warm-lit facilities across Europe, significantly strengthening surge capacity without requiring substantial UK capital investment.

However, that is not a substitute for domestic capability: access is not guaranteed, political triggers could delay activation and manufacturing occurs offshore, while there are no assurances that the European Commission would consider the UK joining. The EU FAB should therefore be treated as a strategic supplement and a second line of defence, rather than the primary mechanism for UK sovereignty. Similarly, the UK could spearhead the creation of a Global FAB network with partners outside the EU, to build cooperation. Supply-chain challenges could occur given the distance between potential allied countries, but this is a good alternative if EU-UK relations are not conducive to the UK joining the EU FAB.

Finally, targeted interventions such as PPPs are necessary. This is because even in the event of a UK FAB and international cooperation, certain capabilities would remain bottlenecks – most notably fill-finish capacity, LNP production for mRNA, and specialist QC and analytical testing. PPP arrangements would allow the government to secure priority access at low public cost while leveraging private-sector R&D pipelines and capital investment. These targeted partnerships would strengthen the resilience of the UK FAB model and see the UK retain platform flexibility. There are many ways to incentivise private-sector engagement, as demonstrated above, so understanding which method will fill the gaps most effectively requires consideration.

Recommendations

To implement this blended model, the government should elevate vaccine sovereignty to an issue of national security, establish leadership and governance structures to oversee its implementation and develop a strategy to deliver this through three primary pillars of action: increased domestic capacity, coordinated allied capacity and targeted new investment. These should all be underpinned by enabling reforms.

ESTABLISH CLEAR NATIONAL LEADERSHIP FOR VACCINE SOVEREIGNTY

The UK requires a permanent governance structure to replace the coordinating function previously performed by the VTF, and to embed vaccine preparedness in non-pandemic times rather than recreate it during crisis.

This should consist of two complementary bodies: a strategic oversight board and an operational delivery unit.

Create a Vaccine Sovereignty Oversight Board

The VSOB would oversee the development of national vaccine resilience in the UK. The purpose of this board would be to ensure that the UK is able to retain access to critical vaccines in non-pandemic times and be ready to develop new vaccines as novel threats arise. To achieve this, the VSOB would meet regularly to review the evolving biological risk, stress-test the UK's vaccine resilience across the lab-to-jab pathway and consider the measures necessary to calibrate the country's vaccine response. It would then set a strategic course to strengthen the UK's vaccine resilience through a suite of suggested government policy measures.

The VSOB would operate across five core pillars.

1. Risk and Threat Intelligence

The VSOB would maintain oversight of the evolving biological-threat landscape, drawing on UKHSA surveillance, international data-sharing mechanisms and emerging intelligence on accidental, deliberate and hybrid

biological risks. This dynamic risk assessment should then activate a tiered vaccine response, whereby prototype vaccines are developed in response to evolving biological threats. This function ensures that preparedness is dynamic rather than reactive. The board should also regularly conduct system-wide stress tests of the UK's lab-to-jab pathway.

2. Platform and Capability Portfolio Management

The VSOB would oversee the UK's vaccine platform portfolio, ensuring that manufacturing and R&D capability is not overly concentrated in a single platform (for example, mRNA) or dependent on a narrow set of facilities. To do this it would monitor platform diversity and surge scalability, identify capability gaps (including inactivated, protein subunit, viral vector), recommend targeted investment or procurement mechanisms to preserve optionality, and assess risks arising from plant closures, corporate restructuring and inward investment shifts. This portfolio approach would reframe vaccine sovereignty as a system-level capability rather than a facility-level question.

3. Market Shaping and Industrial Sustainability

Vaccine-manufacturing readiness cannot be sustained without predictable demand and credible commercial frameworks. The VSOB would therefore provide strategic guidance on the market-shaping instruments necessary to maintain warm-lit capacity in non-pandemic times. This would include multi-year procurement outlooks, readiness-based payments or capacity contracts, co-investment thresholds for strategic facilities, forward demand signalling for priority pathogen families, and oversight of first-right-of-access agreements. By integrating health security and industrial policy, the VSOB would ensure that manufacturing viability aligns with national resilience objectives.

4. Regulatory and Delivery Readiness

Procurement and manufacturing resilience are ineffective without regulatory and delivery readiness. The VSOB would oversee surge preparedness across MHRA emergency-authorisation pathways, clinical-trial acceleration

capacity, data-sharing frameworks, NHS deployment infrastructure, and public confidence and vaccine uptake. It would identify systemic friction points and recommend reforms to ensure that emergency pathways are legally robust, operationally credible and internationally aligned.

5. International Positioning and Alliances

In an increasingly fragmented geopolitical environment, vaccine sovereignty depends partly on strategic interdependence. The VSOB would assess the UK's participation in multilateral frameworks (such as EU FAB or potential Global FAB models) and maintain visibility over international supply-chain dependencies, export-control risks and component concentration. This would allow the UK to calibrate domestic capability against alliance-based risk-sharing, rather than defaulting to either full autonomy or overreliance.

The VSOB would not manage contracts directly. Rather, it would set strategic direction, identify vulnerabilities and recommend coordinated cross-government action. It should sit within the Office for Life Sciences, report to a designated DHSC minister and include representation from DHSC, the Department for Science, Innovation & Technology (DSIT) and the Treasury, alongside structured private-sector input. In recognition of the fact that vaccine readiness is a combination of public policy and private-sector investment, the VSOB should have representation from both the public and private sector. The split between public and private should be 50:50 and public-sector involvement should include representation from both the DHSC and DSIT.

To carry out this function, the VSOB would require a diverse range of information from across the UK's lab-to-jab pathway. This would include data on global and domestic pathogen surveillance, R&D activity across the UK (in universities and industry), pipeline products in the UK and beyond, regulatory capacity, clinical-trials capacity, domestic manufacturing capabilities (and health of the industry), supply-chain dependencies and NHS performance. It should also include insights into public vaccine hesitancy and levels of vaccine coverage across the population.

Establish a Vaccine Sovereignty Delivery Unit

The VSDU would implement the strategy set by the VSOB. Located within UKHSA, it would serve as the operational engine of vaccine preparedness in non-pandemic periods.

Its responsibilities would include:

- Managing UK FAB consortium selection and contracts
- Conducting annual readiness audits across manufacturing platforms
- Negotiating and managing first-right-of-access agreements
- Coordinating surge activation and platform prioritisation
- Aligning procurement commitments with manufacturing sustainability

Unlike the original VTF, the VSDU would operate permanently, not only during crises. Its remit would extend beyond emergency contracting to maintaining viable business conditions for vaccine manufacturing in non-pandemic times, including forward demand signalling and identification of strategic market gaps.

The VSDU should be jointly sponsored by DHSC and DSIT, with Treasury participation and formal cross-government authority. This would ensure that investment and industrial decisions are taken with full alignment across health security, science policy and fiscal strategy.

The unit would not duplicate existing programmes. Rather, it would integrate them by drawing on threat intelligence from biosurveillance systems, aligning with supply-chain intelligence initiatives, and translating capability mapping into actionable contracting and investment decisions.

PILLAR 1: SECURE AND INSTITUTIONALISE DOMESTIC SOVEREIGN CAPACITY

The UK should establish a UK FAB model as the core of its sovereign manufacturing capability.

UK FAB would not mean building entirely new state-owned factories. Instead it would coordinate and contract with existing UK-based manufacturers through competitively selected consortiums, each combining a vaccine developer, a GMP manufacturing facility and a fill-and-finish provider. These consortiums would enter into multi-year warm-lighting agreements, under which facilities would be kept in a state of operational readiness during non-pandemic times. In return for an annual retainer, the government would secure first rights to surge production in a crisis (including sufficient doses for the UK population).

This approach preserves and stabilises latent domestic manufacturing capacity, avoids reliance on a single platform or site, reduces the cost and delay of rebuilding capacity from scratch, and anchors skills and supply chains within the UK. Routine NHS procurement, where clinically appropriate, should be used to provide predictable baseline demand to sustain these facilities commercially in non-pandemic times.

To effectively implement UK FAB, the government should:

- **Run a competitive process to select three UK FAB consortiums:** Each consortium should combine a vaccine developer, a GMP manufacturer and a fill-finish provider, ensuring platform diversity.
- **Sign multi-year warm-lighting agreements with each consortium:** Provide annual stipends to each consortium to maintain ready-to-activate capabilities through trained contingency staff, stockpiled materials and consumables, validated production lines and maintained licences.
- **Secure first-rights agreements for 100 million doses with each consortium:** Secure contractual priority for the UK government to commandeer manufacturing lines across all three consortiums to ensure surge access that is equivalent to two doses per adult.
- **Support stable demand for domestic producers:** Domestic procurement – such as purchasing a portion of routine NHS vaccines – should be used to underpin commercial viability and reduce industry-disinvestment risk. The government would consult JCVI about the best candidate vaccines for this agreement, committing to purchasing a

portion of routine NHS vaccines domestically, such as (where appropriate) influenza, shingles or childhood vaccines. This would provide stable demand and keep FAB consortiums commercially viable. This could be complemented with publicly funded clinical trials as a route to warm-lit facilities, by incentivising or requiring the UK-based GMP manufacturing of trial materials. This would help sustain capacity, build skills and strengthen the UK life-sciences ecosystem. It is important to note that any such approach must be carefully designed to preserve market health and competition in accordance with international law. Implicitly favouring UK-based manufacturers in competitive tenders would risk discouraging international suppliers, particularly for vaccines where multiple suppliers are needed to ensure resilience and price discipline. To mitigate this, the costs associated with sovereignty and preparedness should be distinguished from routine unit pricing wherever possible. These sovereignty-related costs should be assessed transparently using established valuation and prioritisation processes (including those used by JCVI and the Joint Biosecurity Centre Programme) alongside considerations of affordability, supply security and system resilience. This would ensure that decisions to support domestic production would be grounded in clear public value, rather than distorting routine procurement outcomes.

- **Support preparation for emerging threats:** Create contracts with manufacturing companies for preparation of vaccines against strains at risk of zoonotic spillover, enabling rapid deployment in the event of an outbreak. A tiered vaccine response would enable advance preparation and significantly shorten the timeline to development completion. These contracts could support continued surveillance and ensure the availability of rapid vaccines for priority groups such as health-care workers. By having critical preparatory work completed ahead of large-scale production, this approach would reduce the time from lab to jab and help contain early spread.

PILLAR 2: PARTNER WITH TRUSTED ALLIES TO SECURE ADDITIONAL SURGE CAPACITY AND CAPABILITY

To establish strategic interdependence with global partners, the UK should take the following actions.

- **Undertake a formal options appraisal of EU FAB and Global FAB:** The government should commission a rapid but robust appraisal, led jointly by the Cabinet Office and Department for Business & Trade, to assess:
    - the legal, financial and governance terms of EU FAB third-country participation
    - the feasibility, costs and diplomatic requirements of establishing a Global FAB arrangement with trusted allies (such as Australia, Canada, Japan or others)
    - relative levels of sovereignty, speed of activation, platform diversity and certainty of access under each model
    - implications for UK regulatory alignment, supply-chain security and national resilience.

This appraisal should explicitly test whether EU FAB, Global FAB or a phased or hybrid approach best serves the UK's strategic interests.

- **Develop conditional engagement pathways with priority partners:** As soon as the appraisal is underway, the UK should prepare engagement pathways for both options, including exploratory discussions with the European Commission on third-country participation in EU FAB, and parallel diplomatic engagement with potential Global FAB partners to test appetite, governance models and reciprocal capacity commitments. This would ensure that the UK can move quickly once a preferred route is identified, without foreclosing alternatives.
- **Prepare regulatory and operational frameworks to support allied manufacturing:** To ensure that any allied manufacturing arrangement delivers real speed in an emergency, the UK should pre-establish regulatory reliance or equivalence pathways (including MHRA–EMA mechanisms where relevant); agree batch-release and Qualified Person

recognition processes; and fast-track import and customs protocols for pandemic vaccines. These frameworks should be platform-agnostic and capable of supporting either EU FAB or Global FAB activation.

- **Integrate allied surge capacity into the UK's biosecurity and pandemic response plans:** Whichever model is ultimately pursued, allied manufacturing arrangements should be fully embedded within the UK's biosecurity architecture, with clear activation triggers, defined decision-making authority and agreed allocation, logistics and deployment plans. This would ensure that allied capacity would function as a genuine second line of defence, rather than an ad hoc contingency.

PILLAR 3: BUILD TARGETED NEW CAPACITY WHERE GAPS PERSIST

Where structural bottlenecks exist, the UK should deploy targeted PPPs to close them. Priority areas include fill-and-finish capability, lipid nanoparticle production, quality-control and release analytics, and other critical supply-chain inputs. The government should use resilience contracts, advance purchase agreements and selective co-investment to crowd in private capital where national-security value is clear. This pillar would ensure that the UK can deliver full end-to-end readiness across a range of diverse vaccine platforms.

To achieve this, government should implement the following.

- **Launch targeted PPPs for fill-finish, LNP production and QC analytics:** The government should issue APAs or resilience contracts to crowd in private capital for these critical capabilities.
- **Offer government co-investment where needed:** LSIMF, the National Wealth Fund (NWF) and/or innovation grants can be used to derisk private investment in the infrastructure that is essential for pandemic response. To unlock capital, the Treasury and the government should amend the parameters of the NWF, either to include vaccine manufacturing under the "advanced manufacturing" category or render life sciences as the fifth priority sector. Another option would be to adapt

this mandate to permit smaller investments below their minimum of £25 million for projects, with national security and resilience as part of the NWF's remit.

- **Consider investment zone/freeport site for future PPPs:** The government should consider building PPPs within an investment zone or freeport tax site to crowd in private partners, who would be motivated by tax incentives and greater planning flexibility.

UNDERPINNING ENABLERS

The three pillars described above must be supported by structural reforms and sustained investment.

Modernise Regulatory, Legal and Planning Frameworks

To ensure that the UK's regulatory legal and planning frameworks support the three pillars, the UK should:

- **Update the planning act so that vaccine facilities qualify as nationally significant infrastructure projects:** An update will be necessary to fast-track vaccine-manufacturing sites and reduce planning delays for any new or upgraded manufacturing facilities.
- **Consider abolishing the Industrial Development Act to reduce planning bureaucracy for new infrastructure investments:** The government should review and potentially abolish the Industrial Development Act 1982, as it requires investments of more than £30 million be approved by the House of Commons, thereby slowing strategic and fast-paced decision-making.
- **Establish emergency regulatory pathways with the MHRA:** The government should enable rapid pivots in vaccine production, platform choice, product packaging and release testing during activation of UK FAB or PPP facilities. Advance regulatory pathways should be secured with the MHRA to validate multi-platform suites, pre-approve emergency pack changes and streamline release testing via EU/MHRA reliance. This reduces the time lost between "recipe in" and doses out.

- **Standardise indemnity and liability rules for rapid scaleup:** Clarified compensation and IP arrangements would provide certainty for private partners in emergencies.
- **Undertake a formal options appraisal of EU FAB and Global FAB:** The government should conduct a structured assessment of the costs, benefits and sovereignty implications of participating in EU FAB or establishing a Global FAB arrangement. This appraisal should evaluate how alliance-based surge mechanisms compare with purely domestic capacity in terms of speed, reliability, geopolitical exposure and fiscal sustainability.
- **Develop conditional engagement pathways with priority partners:** The UK should pre-negotiate conditional cooperation frameworks with trusted partners to enable rapid technology transfer, reciprocal supply arrangements and coordinated procurement during emergencies. Establishing these mechanisms in advance reduces reliance on ad hoc diplomacy when political pressure is highest.
- **Prepare regulatory and operational frameworks to support allied manufacturing:** Regulatory recognition, batch-release protocols and legal authorisations should be pre-aligned with priority partners to enable rapid cross-border production and distribution during activation. Without advance regulatory harmonisation, allied manufacturing capacity cannot be mobilised at speed.
- **Integrate allied surge capacity into the UK's biosecurity and pandemic response plans:** International manufacturing arrangements should be formally embedded within UK pandemic planning, including clear trigger thresholds and activation protocols. This ensures that alliance-based surge capacity is treated as an operational asset rather than a political aspiration.

Strengthen Supply-Chain Resilience and Skills

The UK should:

- **Onshore or secure critical inputs:** To end reliance on just-in-time global supply chains, the government should introduce resilience clauses in all pandemic-vaccine contracts and mandate either UK-based buffer stockholding or guaranteed surge access from domestic facilities. Specifically the UK should onshore a domestic or strategically assured supply of critical inputs, prioritised by the materials most likely to create a bottleneck during an emergency response, such as lipid nanoparticles, adjuvants, vials and consumables, and specialist reagents for QC release.
- **Develop specialist vaccine-workforce programme:** The government should fund apprenticeships, GMP conversion courses and retention schemes tied to UK FAB and PPP operators.
- **Conduct annual stress tests of entire system:** To ensure that the UK's vaccine-response strategy remains agile, the government should simulate 100-day missions, supply-chain disruptions and simultaneous activation of UK FAB and EU FAB pathways. In addition, to ensure strategic diversity rather than duplication, the government should commission regular scenario analyses to determine whether the balance of domestically produced vaccine platforms is correct. It should define which platforms each consortium must cover based on threat modelling and CEPI/WHO alignment.

INVESTMENT AND FISCAL CONSIDERATIONS

To support this investment in UK manufacturing capacity, the UK should:

- **Use NWF to support UK FAB consortiums and any new PPP agreements:** Classifying vaccine manufacturing as an "advanced manufacturing" priority would reduce the government's reliance on Treasury capital budgets and align with the UK's growth objectives.
- **Use LSIMF to support site upgrades:** The targeting of grants to refurbish or expand existing GMP suites, cold-chain areas and fill–finish facilities would keep Treasury costs low by reusing existing funding envelopes.

Establish multi-year funding settlement for vaccine sovereignty: The government should provide certainty for industry by avoiding year-to-year funding volatility. This would demonstrate long-term government commitment and ensure that private investment crowds in.

Investment in R&D

To support long-term investment in UK R&D, the government should:

- **Invest in strategic long-term UK vaccine R&D funding as part of domestic-capacity consortium contracts:** Incentivising R&D for new vaccine technology should be part of the new offer to vaccine manufacturers during non-pandemic times. This research could be concentrated on areas currently underfunded, such as vaccines to support the UK's fight against anti-microbial resistance, or against infectious diseases that could migrate to the UK in future as a result of climate change. UKRI could provide this long-term strategic funding, which is something that vaccine innovation has not benefited from previously, or it could be built into contracts with the consortiums as part of UK FAB.
- **Encourage investment in manufacturing:** The government should review the Science and Technology Act 1965 to broaden the focus from investing public funds in research – or basic science – to also include the end-to-end innovation pathway, from research to manufacturing.

Conclusion

The UK's success in deploying Covid-19 vaccines at speed in 2020 was not the product of a fully sovereign system, but of a uniquely favourable alignment of circumstances: early access to innovation, goodwill from global partners, temporarily open supply chains and exceptional regulatory flexibility. Those conditions no longer hold. The geopolitical environment is more fragmented, biological risks are more diverse and competition for critical inputs is sharper. In future crises, access to vaccines and their components cannot be assumed to be timely, equitable or insulated from political pressure.

Vaccine sovereignty must therefore be understood as a core element of national resilience, not as an industrial ambition or a contingency plan. It is about preserving agency, choice and autonomy when markets fail, supply chains fracture or other states prioritise their own interests. Countries that lack credible sovereign options in these moments risk delayed response, constrained policy choices and exposure to coercion at precisely the point of greatest vulnerability.

The global examples examined in this paper demonstrate that sovereignty does not require full self-sufficiency. Instead it rests on a combination of domestic anchors, warm-lit capacity, legal authority, priority access rights and trusted alliances. The most resilient systems institutionalise preparedness in non-pandemic times, align industrial capability with health-security objectives and ensure that the state retains the ability to act decisively in extremis.

This points to a blended model for the UK. Domestically the UK should marshal and coordinate existing manufacturing capability through a UK FAB-style arrangement that preserves platform diversity, sustains skills and guarantees surge access. Internationally it should embed itself within allied manufacturing networks, such as the EU FAB or a broader Global FAB construct, to secure additional scale and redundancy without inefficient duplication of capacity. Together, these approaches would restore strategic depth while remaining fiscally and industrially realistic.

Crucially this is not a one-off investment decision but a long-term strategic commitment. Manufacturing capability, regulatory readiness, workforce skills and supply-chain resilience all take years to build and cannot be recreated at speed once lost. Sustained, predictable investment and clear governance are therefore as important as physical infrastructure.

Ultimately, vaccine sovereignty is a political choice. It reflects a judgement that the premium associated with domestic capability and preparedness is justified by the value of independence, speed and security in future crises. For the UK, making that choice now would help ensure that when the next biological shock arrives, the country is not left to rely on favourable circumstances, but equipped with the capability, authority and partnerships needed to protect its population, economy and national security.

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