INSTITUTE FOR GOVERNMENT

Tackling Covid-19 over the long term

How to strengthen international efforts to end the pandemic

Tom Sasse

Introduction

Covid-19 has thrown the world into turmoil. In some places vaccines are beginning to turn the tide, but the global path out of the crisis will not be straightforward. This paper is part of a joint project between Wellcome Trust and the Institute for Government that has seen us bring together leading international scientists and policy makers at roundtables and events, in May and June 2021, to discuss how the pandemic could develop and the policies needed to end it.

The UK, like many other rich countries, is looking hopefully towards an escape from the Covid-19 vice. With the completion of the initial phase of its vaccination programme in sight, the government removed almost all public health restrictions on 19 July. It plans to move on from Covid-19 as far as possible, to "learn to live with the virus". Infections are spreading rapidly and the prime minister has admitted that he may yet need to reimpose some measures. But for now vaccines have blunted the threat from the virus. The UK has dropped off the charts of weekly Covid-19 deaths per capita, and is already planning a booster vaccination campaign to begin as soon as autumn 2021.

Around the world, however, the crisis rages on. At the peak of India's brutal second wave, in spring, more than 4,000 people were recorded as dying each day; the true figure was likely much higher. Many died with no access to health care as hospitals were overwhelmed. The humanitarian disaster on the sub-continent was spurred on by the new Delta variant, more transmissible and deadly than previous variants. Identified first in India, it has spread around the world and is now dominant in large parts of Europe, North America, Africa and Asia – and proving difficult to contain. In South America, the Gamma variant (first identified in Brazil) has caused a similar surge in cases and deaths. The world faces the awful prospect of repeated India-style outbreaks across poorer countries lacking either the vaccines or health care capacity needed to fight the virus.

The world is split. Most rich countries have developed high levels of immunity (though some, including those that chose to close their borders, lag behind). Meanwhile, many low- and middle-income countries are facing the deadliest stage of the pandemic to date. The speed at which the virus is evolving and spreading – and the ease with which new variants move across borders between highly connected countries – should tell us that, as much as they might like to, no country or group of countries will exit the Covid-19 crisis alone.

World leaders have dutifully repeated the incantation that "the crisis will not be over anywhere until it is over everywhere". Yet efforts to end it everywhere have been (and remain) weak and fragmented. The most obvious data point for this is vaccination rates: just 1% of people in low-income countries have received a first dose. Although vaccine doses are vastly cheaper than the cost that will be imposed by a prolonged Covid-19 crisis, there remain few plans for financing, producing, sharing and administering doses on anything like the scale that the moment demands.

But even if vaccines are our best weapon for fighting Covid-19, they are not the only one the world needs. The absence of adequate surveillance or the infrastructure to share data quickly between countries means we are 'flying blind' – unable to track transmission and viral evolution. The rapid spread of the Delta and Gamma variants has shown just how vulnerable much of the world still is. Further dangerous variants, likely given large caseloads, threaten to chip away at the efficacy of vaccines. Alongside surveillance, countries also need their health care systems – hospitals, equipment, medical goods, trained staff – to get the basics right and be able to control outbreaks.

The recent G7 summit, hosted by the UK in June, was supposed to be a turning point. It did not live up to its billing. For all the warm words about a "shared determination to beat Covid-19", on practical action rich countries fell woefully short. World leaders need an agreed plan for a route out of the crisis that is global, equal to the scale and urgency of that task, and realistic about the effort and resources it will require.

Throughout the pandemic, Wellcome Trust and the Institute for Government have, from different perspectives, analysed the ways that policy makers have responded to Covid-19. Wellcome Trust has aimed to help policy makers understand the science and take a long-term view. At the IfG our focus has been on decision making and how policies have been made in government.

This paper builds on that work to assess the global path out of the Covid-19 crisis. A list of participants in our roundtables is included at the end.

The paper is structured as follows:

- The first section discusses possible future scenarios for how the pandemic could develop, drawing on work first undertaken in June 2020
- The second section sets out implications for policy makers
- The final section reflects on the G7 summit and suggests future priorities.

Future Covid-19 scenarios

Compared to scientists' forecasts a year ago, the past year has produced a mix of best- and worst-case outcomes

Wellcome Trust first convened a group of scientists in the summer of 2020 – including experts in viral biology, epidemiology, anthropology and global health – with the aim of helping policy makers take a longer view of where the crisis could be heading.

This was during the early days of the pandemic. The UK had lifted its first lockdown but many other countries were still in the throes of their first waves (or yet to experience them). There was relatively little discussion of vaccines or variants. A huge amount about the virus itself remained uncertain.

The value of revisiting these scenarios is not only to see how far we have come in our understanding of the virus, but to gain a sense of how to think about the possibilities ahead.

The group produced a set of best-, middle- and worst-case scenarios across six biological features:

- **Immunity** – the strength and duration of protection after catching the disease
- **Vaccines** – whether effective vaccines would be produced, how long that would take, and how easy they would be to manufacture and distribute
- **Antivirals** – whether effective treatments would be produced, how easy they would be to manufacture and distribute, and what antiviral resistance would emerge
- **Antigenic evolution** – how quickly the virus would evolve and how that would affect reinfection and the protection offered by vaccines

- **Virulence, transmission, and seasonality** – the severity of the virus and how easily (and in what conditions) it would spread
- **Interaction with other pathogens** – the risk of Covid-19 interacting with other viruses to become more dangerous.

They are then grouped these into four stylised future scenarios:

- "Vaccines work, antivirals fail"
- "Antivirals work, vaccines fail"
- "Medical interventions are effective and evolution works for us"
- "Medical interventions fail and evolution works against us".

Table 1 **Best-, middle- and worst-case scenarios for different aspects of SARS-CoV-2 biology, Wellcome Trust, June 2020**

Biological feature	Best-case scenario	Middle-case scenario	Worst-case scenario
Immunity	Strong and long-lasting (potentially lifelong) protective disease and transmission blocking immunity following infection in all population groups. Robust correlates of protection allow identification of immune individuals. Possible immunological cross-protection from co-circulating coronaviruses.	Some protective immunity (to disease and/or transmission), but the extent varies greatly among population groups and individuals. Immunity wanes after ~2 years. False positives make identification of immune individuals unreliable.	No long-lasting or protective immunity. Reinfection possible after <1 year. Antibody-dependent enhancement by other coronaviruses and/or vaccination exacerbates disease.
Vaccines (noting that our lens on vaccine efficacy is modulated by the phase of the outbreak)	Vaccine developed in 12 months. Fully protective and long lasting (~5 years). Relatively easy and quick to produce in large quantities. No antibody-dependent enhancement.	Vaccine developed in 18–24 months. Offers partial protection. Takes several months to produce so limited doses and global supply chain issues.	No effective vaccine developed in the next 5 years. No protective immune response induced. Antibody-dependent enhancement and/or other negative consequences.
Antivirals	Multiple and easy to produce broad-acting antivirals are available from those currently undergoing clinical trials. No large-scale evolution of antiviral resistance over the next 12 months but resistance emerges in the following years. Non-toxic prophylactic drugs identified, making mass drug administration a viable control tool (particularly in LMICs).	A limited number (1–2) of partially effective antivirals developed over the next 12 months. Efficacy depends on host specifics (e.g. genetics, immunology, treatment stage). Conflicting results from clinical trials. Some supply chain issues.	Clinical trials fail to identify an antiviral for Covid-19 in the next 5 years. No antivirals in development.

Biological feature	Best-case scenario	Middle-case scenario	Worst-case scenario
Antigenic evolution	No large-scale antigenic evolution/escape in the virus, even following widespread vaccination.	Antigenic escape mutations are gradually fixed in the virus, particularly following the implementation of vaccination programmes. Vaccines need to be updated every 2–3 years.	Widespread and rapid antigenic evolution, even before the onset of widespread vaccination. Reinfection possible on short time horizons. Vaccines need to be updated on an annual basis.
Virulence, transmission and seasonality	Virulence gradually declines over the next 12 months with no increase in transmissibility. The use of vaccines and antivirals further reduces virulence. Develops into a winter seasonal disease within 12 months.	Virulence stays as it is now. No effective selection pressure on virulence evolution, including following the deployment of treatment protocols. Transmission increases in younger cohorts. Develops into a winter seasonal disease on a timescale of 12–24 months.	Virulence increases over the next 12 months because it increases virus transmissibility, particularly in the face of ongoing vaccination. Virulence increases in younger cohorts *In utero* transmission becomes a problem (*sensu* rubella, Zika). Evolution or amplification of novel transmission routes (e.g. fomites persisting, faecal/oral). No seasonality evolves, with infections potentially occurring at any time or place.
Interaction with other pathogens and/or comorbidities	Possible weak cross-protective immune responses elicited by other pathogens (e.g. co-infecting cold-causing coronaviruses).	Interactions with other pathogens at moderate prevalence in some specific populations increase Covid-19 morbidity and mortality.	Interactions with pathogens commonly circulating in some populations increase morbidity and mortality. Beyond known comorbidities, interactions with features that affect children (malnutrition, anaemia, etc.).

One year on, the predictions have had mixed success, pointing to the unpredictable way in which different viruses behave. On some biological features we have had better outcomes, on others worse.

- **Immunity** is in the middle case and worked out broadly as predicted: people appeared to develop some immunity to the disease and transmission, but there was variation among population groups and individuals, and uncertainty remains over duration.
- The arrival of effective **vaccines** within 12 months is firmly within the best case forecasted – indeed, it was an incredible scientific achievement given the usual timeframes involved. However, while many of the vaccines work very well, they do not appear to offer perfect, long-term protection (like the single-dose five-year protection envisaged in the best-case scenario). The availability of doses also appears set to be constrained by global supply chain issues.
- The development of **antiviral** treatments is in the middle case, though not as expected: while there are still not effective antiviral treatments, a small number of partially effective non-antiviral treatments have emerged. For example dexamethasone, a drug long used to treat autoimmune conditions like arthritis, has been found to reduce deaths among those hospitalised with Covid-19. The efficacy of other treatments appears to depend on hosts and there are conflicting results from clinical trials. Again, there are also supply chain issues – many poorer countries do not have access to treatments.
- **Antigenic evolution** and changes in **virulence, transmission and seasonality** are firmly in the worst case. Four notable variants have emerged and spread widely; multiple others are being monitored. There is some (albeit limited) evidence of these reducing the effectiveness of some vaccines. Even in their worst-case scenario the group had not predicted the emergence of variants with increased transmissibility and virulence among unvaccinated people.
- There has been no obvious **interaction with other pathogens**, which is in the best case.

We are in a dangerous second phase of the pandemic, with new variants spreading rapidly

The first 12 months was 'easy mode' for the virus, as it moved around within largely susceptible populations. This changed around the turn of the year. Natural immunity and vaccination increased selection pressure, forcing the virus to optimise itself to find new hosts. In 2021 the virus has evolved more quickly than many had anticipated it would.

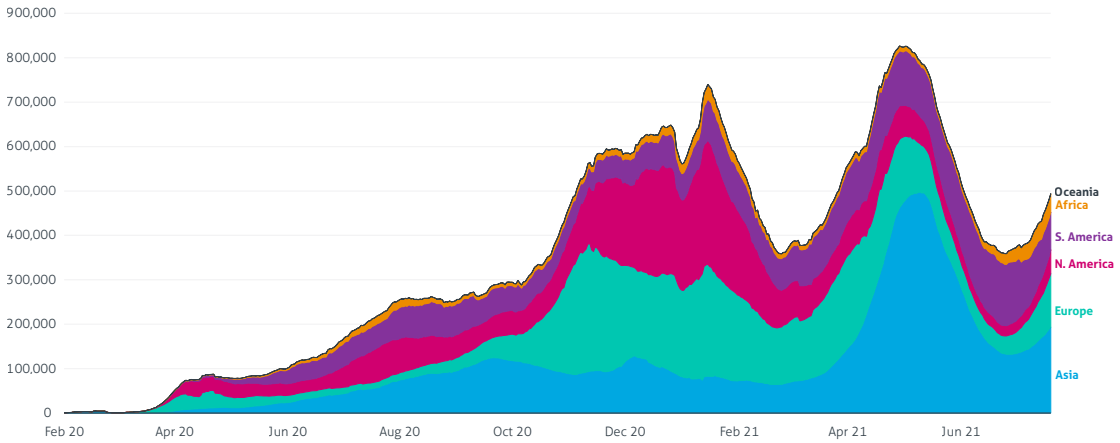
The scientific group saw little sign that this phase would end soon. In fact, it appeared to be accelerating, driven by large outbreaks and the spread of new variants around the world. In India, a country that largely avoided a severe first wave, the emergence of the more transmissible Delta variant caused a very large outbreak that overwhelmed health care capacity in much of the country. The outbreak peaked in May 2021 with more than 400,000 new cases and 4,000 deaths being reported daily, which was likely to be a significant underestimate. There was evidence of higher infection among young people and signs of what had largely been an urban pandemic taking root in rural communities. Without effective interventions, the scientists at our roundtable warned, this pattern would be repeated, with "waves of India-style outbreaks" across the developing world.

Tragically, this is happening already. As of early July, Africa is experiencing its worst surge in Covid-19 cases since the pandemic began.[1] With just 2% of the continent's population fully vaccinated, the Delta variant has been recorded in 18 African countries and is spreading rapidly. Most have limited capacity to track and isolate cases or treat infected people in hospital. In Tunisia, which as of July 2021 had one of the highest death rates in the world,[2] health authorities warned of a "catastrophic situation" and stated that "the health system has collapsed".[3]

South America is also suffering from a large spike in cases, hospitalisations and deaths. Paraguay, Suriname, Argentina, Uruguay, Colombia and Brazil have all experienced rapid and deadly outbreaks since March; each has recorded more than three times as many deaths per million from Covid-19 than India.[4]

These outbreaks have shown the scale of the threat posed by new variants. The Delta variant is around 50% more transmissible than the Alpha variant (which emerged in Kent and caused the UK's January wave).[5] Data from the UK suggests it is also more likely to cause hospitalisation and death among the unvaccinated.[6] Having emerged in India in the spring, it has now been recorded in more than 80 countries and is dominant (or becoming dominant) in the UK, US, Europe and much of Africa and Asia. Scientists worry that poorer countries will find it impossible to contain. The Gamma variant, which emerged in Brazil and is also more transmissible and deadly than earlier variants, is the main variant now spreading throughout South America.

Figure 1 **Daily confirmed cases of Covid-19 by region, seven-day rolling average, Feb 2020–July 2021**



Sources: Our World in Data; Johns Hopkins University CSSE Covid-19 Data. The number of confirmed cases is lower than the number of total cases. The main reason for this is limited testing.

With approaching half a million new cases being recorded per day globally – a figure that is rising – it is likely that further dangerous variants will emerge.* There is a large 'viral reservoir', and this looks set to remain the case for some time. It is impossible to know how the virus will evolve, but it is important to consider the range of possible outcomes. While most scientists do not currently expect a new variant to emerge that will fully evade vaccines, what are more likely are variants that 'chip away' at vaccines' effectiveness.[7] Based on previous pandemics, some scientists expect the virus will eventually evolve to become less deadly, though others are less sure.[8]

Low- and middle-income countries, which have both low vaccination rates and weaker health care infrastructure, are likely to suffer most from the emergence and spread of more dangerous variants. There is a major risk that new variants will drive repeated waves as Covid-19 spreads to all corners of the world.

But richer countries will remain vulnerable to new variants, too. Most either have low levels of immunity or are highly globally connected. Countries like Australia, which has successfully implemented tough border quarantine policies but has very low vaccination rates, are currently struggling to contain outbreaks.[9] An Australia-based scientist at our roundtable described the country as in a "gilded cage", committed to stamping out all Covid-19 cases and with governments politically unable to open borders yet also facing a struggle to achieve immunity through vaccination, with the level of risk remaining low.

Infections are spreading rapidly not only in the UK but in much of Europe, and this includes in regions in which over 70% of people have been vaccinated (more transmissible variants have raised the bar for reaching 'herd immunity', whether through vaccination or infection). These countries have found it impossible to keep

* Hundreds of 'variants of interest' are being tracked at any one time; these are upgraded to 'variants of concern' or 'high consequence' based on the threat they pose. Centers for Disease Control and Prevention, 'SARS-CoV-2 Variant Classifications and Definitions', retrieved 22 July 2021, www.cdc.gov/coronavirus/2019-ncov/variants/variant-info.html

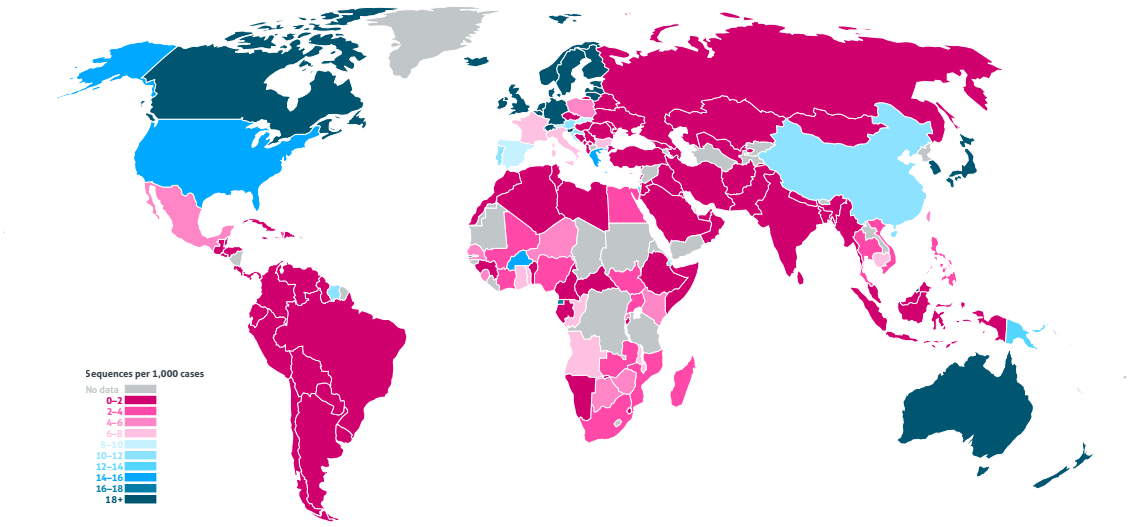
new variants out. Overwhelmingly, new infections are among the not fully vaccinated, but there is evidence of double-vaccinated people becoming infected. Uncertainty remains about how much harm so-called 'exit waves' could cause as countries try to make up the remaining 'immunity gap'. In some countries, a lack of vaccine confidence in some groups may also impede the final stage of the roll-out.

The duration of protection vaccines will provide is also unclear. In the UK, the NHS is planning a booster programme for the autumn and scientists expect another wave in winter, partly caused by waning immunity as well as seasonal effects that will make it easier for the virus to spread.

Weak surveillance is undermining efforts to prevent the spread of new variants

The current global situation is so difficult partly because we are 'flying blind', which makes us slow to respond to threats as they emerge. Most low- and middle-income countries have limited ability to track transmission or viral evolution; whereas the UK currently sequences around one in ten cases, many poorer countries sequence less than two cases per thousand.[10]

Figure 2 **Coronavirus genomic sequencing by country, July 2021**



Source: CovidCG Database, https://covidcg.org

India's particularly limited capacity for sequencing prevented it from doing more to identify and contain the Delta variant before it spread across the world, according to leading epidemiologists.[11] While some data collected in India is studied elsewhere, much of it in the UK, the lack of local capacity made it harder to respond quickly and effectively. A study in *The Lancet* found genomic surveillance capacity across African countries is low due to among other factors a lack of the necessary skills, expertise and technology infrastructure.[12]

A lack of capability is not the only reason for patchy surveillance. Professor Gagandeep Kang, a leading Indian microbiologist who took part in the roundtable, told an IfG event in June that in many low- and middle-income countries "governments see it as not in their interests to report outbreaks or admit there is a problem, which can be equated with political or administrative failure". Politicians put political pressure on health authorities to mask the true extent of the problem. Professor Kang warned that the situation in poorer countries was volatile, with what is seen as a public health problem in the West threatening to become a law-and-order problem elsewhere. The strain of Covid-19 outbreaks has helped to fuel often violent disorder in several countries including South Africa, Colombia and Sudan.[13]

Covid-19 is not going away, but there is a huge difference between possible best- and worst-case outcomes

The scientists at our roundtable in May 2021 agreed that, whatever happens, Covid-19 will remain endemic for many years to come. This will require further development of treatments and diagnostics. However, they set out a broad range of possible best- and worst-case outcomes from now.

Table 2 **Best- and worst-case outcomes, May 2021**

Best case	Worst case
• Vaccine shared equitably	• Vaccine supply constrained and concentrated in richer countries
• Outbreaks managed locally	• Waves of India-style outbreaks across low- and middle-income countries
• Mortality substantially reduced	• Public fatigue hinders outbreak management
• Further lockdowns avoided	• Variants further reduce effectiveness of vaccines
• Vaccines adapted and remain broadly effective against all variants	• Further outbreaks and lockdowns in highly vaccinated countries
• Flu-like situation in which people receive booster vaccinations	• Vaccine hesitancy remains prevalent in some countries
	• Covid-19 compounded by bad influenza pandemic

In the best-case scenario, we reach a situation in which, reasonably quickly, Covid-19 can be treated like flu – that is, managed through mass vaccination – and deaths are minimised. Our experts warned against drawing on influenza too heavily as a comparison, given it is much less deadly and transmits differently (and less easily). Over-reliance on influenza models and response plans has been the reason for some governments' failures during Covid-19. But the 1918–19 influenza was the last pandemic on such a global scale as the Covid-19 crisis. The way it was brought under control and managed in the last century – through a successful vaccination programme, with boosters updated each year to track viral evolution – does provide useful lessons.

In the worst-case scenario, the global situation continues to deteriorate, and harms are much greater, with continuing antigenic evolution fuelling large and deadly outbreaks and further lockdowns. This worst-case could also be compounded by a bad influenza epidemic or other endemic infections exacerbated by the build-up of susceptibility through lockdowns.

Our scientific group agreed there were three main factors that could be controlled:

- **Vaccine distribution** – sharing vaccines was seen as the most important: there is strong evidence that it is the optimal strategy for preventing vaccine escape. Modelling from a group of international scientists – including several who attended our roundtable – found that countries stockpiling vaccines is likely to increase overall infections and increase the risk of antigenic evolution.[14]
- **Genomic surveillance** – increasing the capability and willingness to monitor how the virus spreads and evolves will be another crucial pillar of the global response, particularly as the virus spreads more in poorer parts of the world. As long as surveillance remains weak, there will be a risk of switching rapidly between best- and worst-case outcomes with little warning.
- **Outbreak management** – managing the pandemic over the coming years will continue to require "doing the basics right", as one participant at our roundtable noted. Countries will need to continue to retain the ability to implement distancing and hygiene measures, and control outbreaks through border quarantine, while testing and local restrictions will remain critical for a long time to come. This will require both government capacity and public support.

At our roundtable, held in advance of the G7 meeting, scientists thought that policy makers in most countries had not yet absorbed the long-term outlook for the pandemic and the importance of these and other tools for securing a better outcome.

This phase of the pandemic could last several years, while the after-effects could be felt for decades

It could take several years to bring the period of turbulence caused by antigenic evolution to an end, even if the world does take co-ordinated action. In previous pandemics there has been a similar 'burst of adaptation' before things settled down.

Even when this happens with Covid-19, the virus will continue to demand attention for decades. Given how widely it has spread, the scientists thought the "initial earthquake was likely to be followed by repeated tremors". The 1918–19 flu was followed by bad influenza pandemics in 1929 and 1934 and continuing (though less deadly) waves in the decades after.

Table 3 **Mortality associated with Influenza pandemics and selected seasonal epidemic events, 1918–2009**

Years	Circulating virus (genetic mechanism)	Excess deaths from any cause Per 100,000 persons/yr
1918-19	H1N1 (viral introduction), pandemic	598.0
1928-1929	H1N1 (drift)	96.7
1934-1936	H1N1 (drift)	52.0
1947-1948	H1N1 A' (intrasubtypic reassortment)	8.9
1951-1953	H1N1 (intrasubtypic reassortment)	34.1
1957-1958	H2N2 (antigenic shift), pandemic	40.6
1968-1969	H3N2 (antigenic shift), pandemic	16.9
1972-1973	H3N2 A Port Chalmers (drift)	11.8
1975-1976	H3N2 (drift) and H1N1 ("swine flu" outbreak)	12.4
1977-1978	H3N2 (drift) and H1N1 (viral return)	21.0
1997-1999	H3N2 A Sydney (intrasubtypic reassortment) and H1N1 (drift)	49.5
2003-2004	H3N2 A Fujian (intrasubtypic reassortment) and H1N1 (drift)	17.1
2009	H3N2 and H1N1 (drift) and swine-origin H1N1 (viral introduction), pandemic	?

Source: Morens, DM, Taubenberger, JK & Fauci, AS, 'The persistent legacy of the 1918 influenza virus', *New England Journal of Medicine*, 361, 225–229, doi:10.1056/NEJMp0904819 (2009).

The impact of any further Covid-19 tremors – or other viruses that could follow in its wake – will depend on how well countries around the world learn lessons from the current pandemic, including around building health care capacity.

Policy implications

There is a risk that, as wealthy countries complete their initial vaccination programmes and then lift restrictions, the impression takes hold that the Covid-19 crisis is nearing an end. By the middle of 2022, leaders keen to return to domestic priorities may struggle to find time for international engagement. Covid-19 could become seen as a "poor world disease", a policy maker at our second roundtable warned.

The uncomfortable reality is that it will remain a major threat for years to come, and the danger to everyone will be much greater without a co-ordinated global response to tackle it.

Poorer countries face a long wait for vaccinations

As of late July, more than 3.75 billion vaccine doses have been administered worldwide and over a quarter of the world's population has received at least one dose.[15] Many wealthy countries have succeeded in rolling out vaccines very quickly. Canada, the UK and Israel have reached around two thirds of their adult populations with a first dose; Italy, Germany, the US and France have reached over half.

But in low-income countries just 1% of people have had their first dose.[16] Efforts to share vaccines and boost the roll-out in poorer parts of the world – alongside domestic vaccination programmes – have been sluggish. Covax, the worldwide vaccine-sharing programme directed by the World Health Organization (WHO) and funded by rich countries in Europe and America, has distributed just 136 million doses, split between more than 120 countries.*

G7 leaders, including Boris Johnson, have expressed a desire to vaccinate the world by the end of 2022. That would require a huge acceleration. Based on current financing and production, many parts of the world appear set to face a much longer wait. Modelling by the Economist Intelligence Unit in January suggested more than 85 poorer countries will not have widespread access to Covid-19 vaccines before 2023, and in the poorest countries "mass immunisation will take until 2024, if it happens at all".[17]

This is partly a reflection of constrained global supply, which looks set to remain the case well into next year. Some forecasts suggest vaccine supply will increase rapidly in the second half of 2022, easing this problem. The numbers are uncertain, though, and experts warn that manufacturers could face bottlenecks in supply chains. With the threat of variants leading richer countries to plan booster campaigns, it remains unclear how quickly vaccines will be shared.

It is inevitable that democratic countries will look after their citizens first and prioritise them when they first receive deliveries. Yet many, the UK among them, have ordered six or seven doses per person and have long since moved on from vaccinating the clinically vulnerable. Some have started vaccinating children (or are considering doing so). This is blocking potential supply from reaching poorer countries, at a time when even many health care workers remain unprotected.

Covax's supply schedule has also been hit by the progression of the pandemic. Its main supplier this year was due to be the Serum Institute in India, but since India's spring wave it has kept more of the vaccines the institute has produced. Covax still says it hopes to meet its target of making two billion doses available by the end of 2021, but this would require almost all of this figure being delivered in the latter part of this year.

Co-ordinated action is required to vaccinate the world much faster

Accelerating the global vaccine roll-out will need brave leadership of a coherent global effort that covers vaccine financing, sharing, production and distribution.

First, it will require politicians to make the politics of global vaccination work. There are strong self-interest arguments for vaccine sharing: variants emerging abroad could lead to domestic progress being lost and restrictions on freedoms being reimposed (with all the associated economic costs). These arguments need to be made. But countries

* China and India have shared some vaccine outside of the Covax facility, but not much. 'Covid-19 vaccine donations have yet to take off', *The Economist*, 5 May 2021, www.economist.com/graphic-detail/2021/05/05/covid-19-vaccine-donations-have-yet-to-take-off; Gavi, 'Covid vaccine roll-out', retrieved 22 July 2021, www.gavi.org/covax-vaccine-roll-out

will still need to define an acceptable level of domestic vaccination and supply, and what surplus and wider resources can be committed to the global effort. Making such commitments will work only if countries act together.

Second, it will need much more money. Vaccinating the whole world to the level of rich countries would require around 11 billion doses, at a cost of around $50bn.[18] But the ACT (Access to COVID-19 Tools) Accelerator – the main financing mechanism of which Covax is part, but which also includes treatment and testing – still has a huge funding gap. Ahead of the G7 meeting in June around £15bn had been committed but the International Monetary Fund has estimated that at least a further $31bn is needed.[19]

Sir Suma Chakrabarti, former permanent secretary at the Department for International Development (DfID) and president of the European Bank for Reconstruction and Development, argued at our event in June that the G7 should agree to make up two thirds of the total (it fell some way short, as we discuss in the next section). That level of support would have required the UK to commit $1bn–$2bn more than it had already pledged – not a small amount but insignificant when compared to what the UK has borrowed to deal with the pandemic.[20]

Third, there will also need to be a huge increase in dose sharing. This will require countries to agree a clear formula for dictating the quantity and timing of deliveries. Without this, lower-income countries could repeatedly be put to the back of the queue. It is also important to establish stable supply: inconsistent delivery has made it difficult for poorer countries to plan and implement vaccine roll-outs effectively. In June, the WHO warned that many African countries did not have enough supply to continue with their vaccination programmes.

Fourth, there needs to be an increase in production. Stronger financing is of course a prerequisite for this. But other participants at our roundtable noted that more needs to be done to boost production capability in middle- and low-income countries. So far there has been considerable focus on a patent waiver, although this led to political disagreements between the US and the EU. This may be a useful long-term step, but it is unlikely to boost supply much in the short term.

Fifth, there needs to be a focus on equipping countries to distribute vaccines effectively. Some countries in Africa are struggling to administer vaccines due to a lack of the trained health care workers, infrastructure and the logistical capability needed to deliver large roll-outs. Low vaccine confidence also appears to be an issue in some areas.[21] This situation is not helped by the fact that most health care workers are unvaccinated and face continuing exposure to Covid-19 as countries experience large waves.

Covid-19 needs to be treated as a systemic global challenge

Vaccines are the best tool we have for bringing an end to the pandemic, but they will not achieve that on their own. Increasing access to treatments and diagnostics will be critical – particularly in countries that face a long wait for vaccine doses. One of the biggest concerns in Africa at the moment is a severe oxygen shortage, with international health authorities warning of a "growing crisis" that is leading to many preventable deaths.[22]

More broadly, Covid-19 will need to be treated as a systemic global health challenge that requires improvements in health care infrastructure, surveillance and global data sharing.

Problems such as a lack of ICU capacity, or even hospital beds, and limited ability to monitor disease outbreaks are not new. But roundtable participants agreed that global health care has suffered from years of under-investment, which has left the world vulnerable to pandemics such as this one. The UK's genomic sequencing capability, which has been critical for identifying variants around the world, is an example of how such investments can pay off – but these have been all too rare.

The global response needs an integrated plan for building capability across all these areas, particularly in countries, cities and local areas where there is high vulnerability. This will require renewed focus – and, again, financing – co-ordinated through international institutions. In addition, the Covid-19 pandemic has highlighted the need for much stronger data infrastructure and sharing – current processes for sharing information between scientists and health care authorities are much too slow.

Policy makers should frame investment in global health infrastructure as needed to protect against future threats as well as Covid-19.

Countries need to look at how to build resilience

Beyond the need to strengthen health care, Covid-19 has also highlighted several factors that have made countries less resilient than expected to the pandemic.

For many countries, these include a lack of adequate preparedness. With the exception of some countries that had greater experience of the 2003 SARS outbreak, many had not fully grasped the types of risks that a new respiratory virus could pose to their societies, or the types of responses that would be needed to tackle them. Even in countries like the UK where such risks had been identified, the implications had often not been carried through into operational planning, for example in schools and hospitals. In the wake of Covid-19, countries will need to examine how they prepare for future threats, and what mechanisms are needed to ensure they stay alert.

Yet if the conversation about resilience stops at that point it will have failed. Across the world, Covid-19 has disproportionately affected disadvantaged communities, revealing a much deeper lack of societal resilience. The pandemic has shown that individuals belonging to certain groups are more vulnerable for multiple, often overlapping

reasons: they may be more likely to have chronic ongoing health problems and higher levels of obesity, live in cramped multigenerational households with poor ventilation, or work in front-line jobs in which they are more exposed, for example.

As policy makers address the lack of resilience to health threats that Covid-19 has exposed, they will need to recognise that infections have been clustered in areas of social deprivation. This raises difficult and long-term societal questions that will need to be grasped alongside immediate pandemic response measures.

Policy makers across the world will face difficult choices in bridging the gap to the 'new normal'

At the domestic level, even in countries with high levels of vaccination, policy makers will continue to face difficult questions including on border policies, ongoing public health restrictions and risks to different groups.

The spread of the Delta and Gamma variants has illustrated the difficulty of containing outbreaks, or more dangerous variants, in any one part of the world. The UK's slow decision to add India to its 'red list' of countries, at a time when the two countries were about to open trade negotiations, showed that border quarantine policies may be vulnerable to other political considerations. Yet evidence from border quarantine policies around the world show they are likely to work only if countries are prepared to invest heavily in capacity, for example to provide space in hotels, and accept very high costs in terms of damage to travel and trade.[23]

This makes it unlikely that most countries will be able to seal themselves off from outbreaks abroad. Even countries like Australia will eventually have to find a measured way to let the virus in and use vaccination as a primary tool of control.

Policy makers also need to retain a range of non-pharmaceutical interventions for responding to outbreaks at home and abroad. They have some evidence about what works from earlier waves but many still appear to lack a clear understanding of the effectiveness of different approaches from basic restrictions on social interaction to more targeted measures like local lockdowns and surge testing. There could be limited political appetite in some countries for re-implementing suppression measures, even if they were required. In the UK, it is unclear whether the prime minister, should he want to reimpose some restrictions, would have enough support from his backbenchers to do so without needing to rely on opposition votes.

Beyond this, policy makers need to start a conversation about what the public will accept in the longer term – in terms of levels of mortality, levels of risk and ongoing behavioural measures. Current debates about the release of restrictions in Europe and the US have shown these calculations remain highly complex.

Where next?

Eighteen months into the Covid-19 crisis, the global community faces two challenges. First, it needs to find a path out of the pandemic, while countries' experiences look set to further diverge. Second, it must implement reforms to better prepare for future threats. The two should be seen as closely linked.

The G7 was a missed opportunity

A lot of attention was focused on the G7 meeting in June – as Tom Whipple, science editor at *The Times*, told one of our events, it was billed to be the "Bretton Woods for Covid-19". Yet while the summit was notable for much signalling about "the return of the West" and the US being back playing a more conventional role on the world stage than during Donald Trump's presidency, on the detail of tackling Covid-19 over the long term it fell a long way short.

G7 leaders agreed to a vague target of ending the pandemic by 2022 but offered little clue as to how that would be achieved. The communiqué said meeting this target would require vaccinating at least 60% of the global population (which looks optimistic given the Delta variant is spreading rapidly in countries like the UK, where more than this proportion of people have had their first dose).

Even if one accepts that as the target, the G7 agreed to share only 1 billion doses within the next year – enough to give around 13% of the global population just one dose.[24] As Gordon Brown, former UK prime minister, wrote after the meeting, this falls "billions of doses short" and represented an "historic failure".[25] Nor did countries come up with a longer-term agreement or formula for how they would share vaccines in the coming years, including the question of how much they will reserve for booster campaigns compared with what they will share. They could afford to be ambitious and take some risks on this point, given the threat posed by further variants emerging abroad, yet they failed to develop a proposal to take to a wider set of countries.

On funding and wider vaccine policies, G7 leaders failed to approve the comprehensive delivery plan for global vaccination prepared by the ACT Accelerator before the meeting. Rather than agreeing to make up two thirds of the funding gap – around $20bn – they agreed to fund just $7bn worth of vaccines. Disputes over the patent waiver, asked for by many poorer countries to get access to vaccine technology, were not resolved. This means questions remain about whether there will be sufficient infrastructure to maintain the global supply required over the long term – currently there is a lot of pressure on a small number of manufacturing hubs, such as the Serum Institute.

The G7 did commit to the creation of a new international pathogen surveillance network and the development of standards for data sharing. This is welcome, but further policy detail and investment will be required to support the aim of boosting surveillance capacity on the ground. A scientist at our roundtable suggested this needed to happen "bottom up", with local experts explaining to international institutions the challenges they faced in building capacity, rather than the other way around (as often happens).

Overall, given the G7 group includes the world's richest countries, the communiqué failed to make clear how these commitments were consistent with the target of ending the pandemic by 2022.

The G20 needs plot a path out of the pandemic

The G20 meeting due to be held in Rome in October needs to succeed where the G7 failed – in producing an ambitious global plan for ending the pandemic.

Given the divergence in countries' experiences, the broader group may be better placed to confront global challenges than a small group of highly vaccinated countries. India, Brazil, Indonesia and South Africa will all be able to draw on their own experiences when it comes to the danger of new variants or the concerns many countries have about the long wait for vaccines.

Top of the list should be much more ambitious deals on vaccine funding through the ACT Accelerator and vaccine sharing through Covax. As richer countries near the completion of their vaccination programmes, they should examine whether they are being generous enough in supporting the global vaccine roll-out.

The G20 would also make for a more natural forum for discussing the challenge of strengthening global health care infrastructure. It should develop the high-level G7 ambition on surveillance into a concrete plan for supporting countries to build capacity.

G20 countries should prepare now for the commitments they will make: these should not just target Covid-19, but also future threats. Given the urgency of the health crisis in many parts of the world, countries should also be thinking about what they can do immediately, in advance of the G20. This may require acting unilaterally.

Countries need to focus on long-term resilience

There have been a range of international commissions on the Covid-19 response and recovery – including the Independent Panel (established by the WHO), the Monti Commission (led by the former Italian prime minister, Mario Monti), the UK G7 Pandemic Preparedness Partnership (chaired by Sir Patrick Vallance, the UK government's chief scientific adviser) and the High-Level Independent Panel (set up by the G20 with a focus on financing).

These have looked at preparedness for future health threats, which come in many forms. The High-Level Independent Panel warns that without significant investment and reform "Covid-19 will likely be a forerunner of future catastrophic pandemics". The Monti Commission framed the challenge as looking at a wide range of risks that arise from human activity including climate change, emerging zoonotic infections, and anti-microbial resistance.

All of these commissions – as well as our research – point to the need for strengthened architecture for tackling global threats. Despite new initiatives like Covax, international collaboration during the pandemic has been weak. Participants at our roundtables thought the responses to Ebola in 2014 and the financial crisis in 2008–09 were much

stronger. This may partly be the result of geopolitical tensions, including between the US and China, frustrating co-operation. Yet there is nothing inevitable about the world drifting into a situation in which it struggles to muster a credible response to the range of threats it faces.

New international institutions are needed to monitor and respond to health threats. These could come in the form of a global board or councils that report to finance ministers and guide the allocation of resources, as proposed by several commissions. A key aim is to secure stable and predictable global financing, while some commissions have proposed the creation of a dedicated fund to support pandemic preparedness.

The WHO is seen by many as in need of reform, too. It has come in for much criticism during the pandemic, though it is constrained by a budget that has flatlined for two decades and regulations, set by member states, which govern its activities. Its rules and constitution may need to be renegotiated if it is to become a more assertive player in future.

Countries will also need to strengthen resilience at the domestic level. There is always a risk of 'fighting the last war' – and countries will need to be careful to focus, not only on pandemics. This will mean looking at the types of response (including health, economic or social policies) required by a range of threats and how to ensure they have the capability to implement those responses effectively, covering everything from health systems to supply chains.

Our research found that UK governments failed to implement many of the recommendations of inquiries into past crises from BSE to foot and mouth disease and swine flu. Maintaining the political and administrative attention, and resources, required to make changes is difficult when everyday pressures return.[26]

Conclusion

The Covid-19 pandemic if far from over. More transmissible and deadly variants mean infections are spreading rapidly, including in countries that lack the means to manage them. Further variants are likely to emerge, meaning all countries remain in a dangerous phase.

The next few months will be crucial. The world needs to take urgent action to avoid repeated India-style outbreaks. That means not only developing a much stronger plan for vaccinating the world, but investing in the surveillance and health care capacity that will be critical to fighting Covid-19 over the coming years.

Countries need to start preparing now if a credible plan is to be agreed by the G20 in October. They should see their contributions not only as necessary to end an awful pandemic, but as the best way to begin the process of better equipping the world to face future threats.

About the author

Tom Sasse

Tom is an associate director at the Institute for Government. His research has covered government outsourcing, civil service reform and policy making, including recent work on net zero and the coronavirus crisis. He also delivers the Institute's training programme on how government works.

Previously Tom worked at the Open Data Institute, where he advised governments and businesses on data policy, and the think tank Reform, where he researched health and criminal justice.

Acknowledgements

We would like to thank Wellcome Trust for supporting and collaborating on this project. We would also like to thank everyone who contributed to our roundtables and commented on an earlier draft of this report, including those who did not want to be named.

Roundtable participants

Professor Devi Sridhar, professor of global public health, University of Edinburgh

Professor Edward C. Holmes, ARC Australian Laureate Fellow, member of the Marie Bashir Institute for Infectious Diseases and Biosecurity, University of Sydney

Professor Gagandeep Kang, professor of microbiology, Division of Gastrointestinal Sciences, Christian Medical College

C. Jessica Metcalf, associate professor of ecology, evolutionary biology and public affairs, Princeton University

Bryan Grenfell, Kathryn Briger and Sarah Fenton professor of ecology, evolutionary biology and public affairs, Princeton University

David Lidington, former Cabinet Office minister and justice secretary

Dame Una O'Brien, former permanent secretary at the Department of Health

Dame Clare Moriarty, former permanent secretary at the Department for Environment, Food and Rural Affairs, and the Department for Exiting the European Union

Sir Suma Chakrabarti, former permanent secretary at the Department for International Development and the Ministry of Justice and incoming chair of the Overseas Development Institute; and president of the European Bank for Reconstruction and Development from 2012–2020

Paul Kissack, group chief executive, Joseph Rowntree Foundation

Jude Diggins, director of nursing, policy and public affairs, Royal College of Nursing

Chris Hopson, chief executive, NHS Providers

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+44 (0) 20 7747 0400 **+44 (0) 20 7766 0700**

@instituteforgov

Institute for Government, 2 Carlton Gardens
London SW1Y 5AA, United Kingdom

July 2021