



TONY BLAIR
INSTITUTE
FOR GLOBAL
CHANGE

Learning to Live Alongside Covid-19

BENEDICT MACON-COONEY
RYAN WAIN
DANIEL SLEAT
RUTI WINTERSTEIN
KASRA AARABI

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Overview

Our economy is beginning to restart after the necessary lockdown that slowed the spread of Covid-19. Case numbers have fallen, and the R rate has hovered below one. These are important factors and demonstrate that the conditions are in place for lockdown to ease. However, easing presents new challenges, and the threat posed by Covid-19 is very much alive. There are now three significant challenges to overcome if citizens are to become fully active again – economically and socially – and if the country is to avoid implementing damaging future largescale lockdowns.

These challenges are:

- New outbreaks across the UK
- Fear of the virus leading to public inertia
- A second wave resulting in a further lockdown

Each challenge emanates from the same source: a lack of information and understanding on the health impacts of Covid-19 and how, where and between whom Covid-19 is transmitted.

Therefore – and absent a game-changing vaccine or treatment – this paper argues that these challenges can be addressed by the same thing: a deep, evolving understanding of Covid-19 that informs both individual and collective measures to contain the virus.

This means understanding what we *don't* know. This paper sets out some of these key questions and makes the case for trusted data and information to be made publicly available on the health impacts and transmission of Covid-19. The paper also makes recommendations on collective measures informed by this information, including mass mask-wearing and mass testing, and calls for an individual categorisation of risk – A, B, C, D – that would correlate to specific measures such as higher-grade protective masks and the wearing of face shields.

Through these steps, we believe daily life can begin to resume as we learn to exist alongside the virus with more confidence.

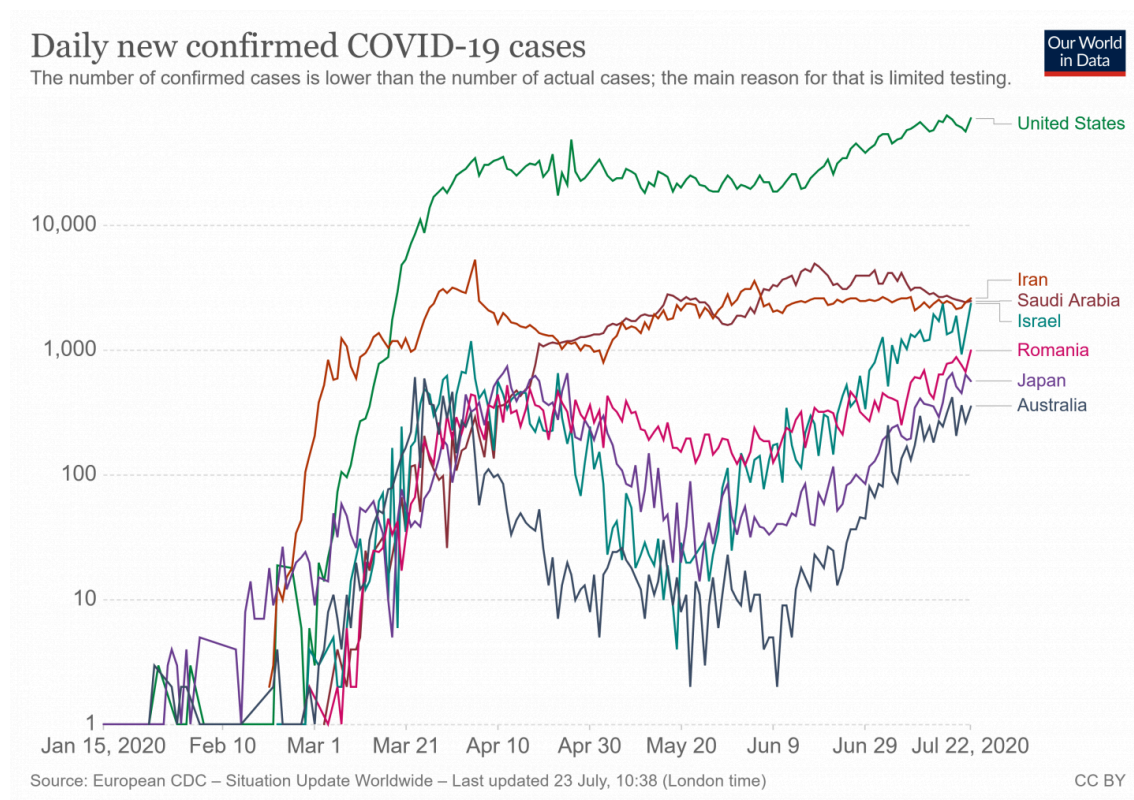
Critically, we argue, this confidence must rest on the need for collective action to mitigate risk. Lockdown can only be ended, with public confidence ensured, if the right architecture of containment is in place.

With this infrastructure in place, when future outbreaks occur, the public can be reassured by the fact treatment is improving, widespread mask use has been mandated in public to inhibit the spread of the virus and a mass testing regime is in place, to quickly catch, treat and isolate cases.

The Threat of Outbreaks as Lockdown Eases: Evidence from Around the World

Since lockdown measures have gradually been eased around the world, there have also been further outbreaks of the virus.

Figure 1 – Daily new confirmed Covid-19 cases by country



Source: European CDC, Situation Update Worldwide/Our World in Data ¹

The Telegraph recently compiled information on some of these recent global outbreaks. ² From these examples, a number of key themes emerge. New outbreaks of Covid-19 are often linked to:

- Hot-spot environments such as bars and clubs
- Large social gatherings
- The breaking of social distancing guidelines
- The role of young people in spreading the virus
- The absence of masks

The United States

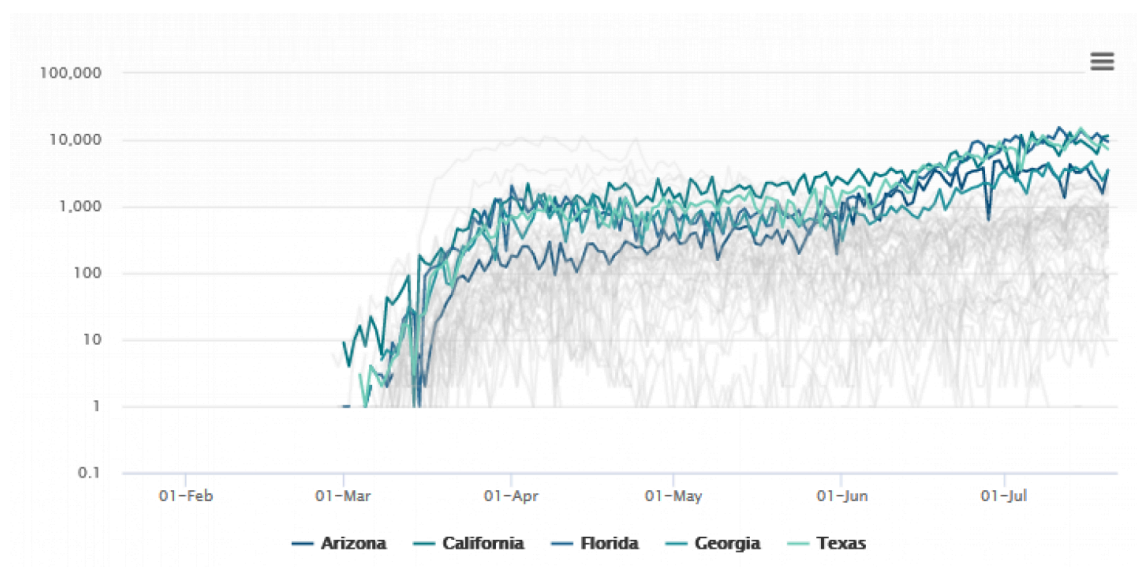
In the US cases are rising across much of the country, with particular spikes recently across the so-called “Sun Belt” states (including Florida, Arizona, Tennessee, Texas, South Carolina and Nevada).

It is believed a key factor in the outbreaks has been the role of younger people, gathering at parties, bars and restaurants.

In Florida, for instance, young people between ages 15 and 34 now make up 31 per cent of all cases. ³

Dr George Lemp, a retired University of California epidemiologist, has been investigating the demographics of cases since the start of the pandemic. In the last two weeks of June, he saw cases rise 74 per cent among people aged 18 to 34 in California, compared with the two previous weeks. ⁴

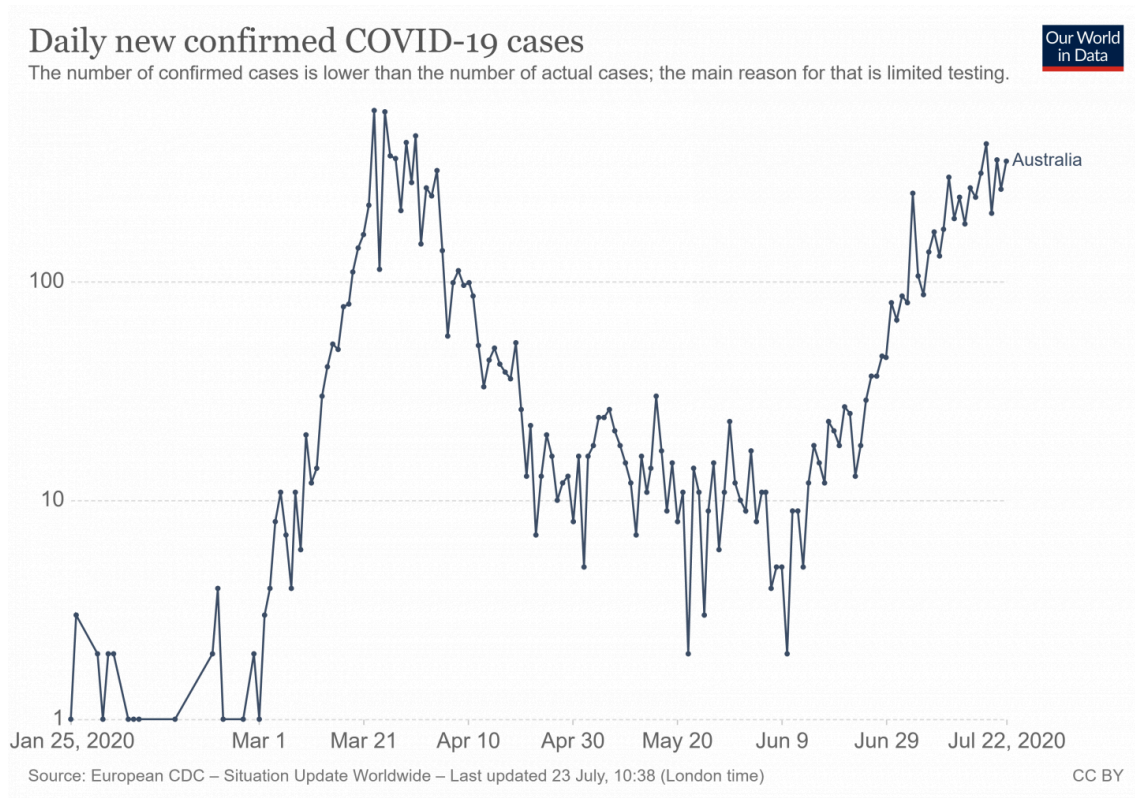
Figure 2 – Daily new confirmed Covid-19 cases, United States



Australia

The number of cases has been rising in Australia, and daily cases in the country have risen above 100 since the beginning of June – numbers not seen since March and early April. Melbourne is now suffering a second peak that is worse than its first.

Figure 3 – Daily new confirmed Covid-19 cases, Australia



Source: European CDC, Situation Update Worldwide/Our World in Data ⁵

Professor Raina MacIntyre, an expert in influenza and emerging infectious diseases at the University of South New Wales, said the situation is more serious than it was in March: “It is possible there has been seeding of infection to other states, and silent epidemic growth which has not yet been detected,” she said. “I would not be surprised to see epidemics detected in New South Wales and other states within the next few weeks.” ⁶

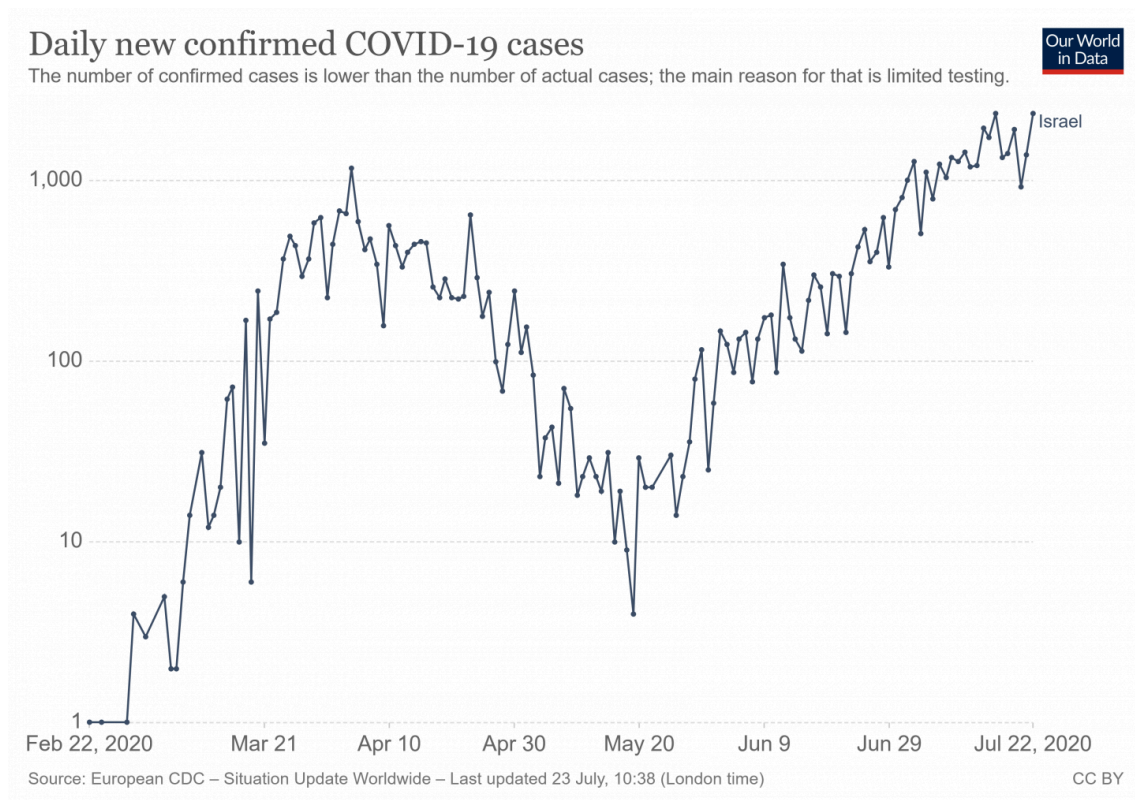
New South Wales reported 14 new cases on Monday 13th July, with a growing cluster linked to a pub used by freight drivers travelling across the country. ⁷

Australia’s national medical association has said the whole of the country should “rethink the pace of easing”. ⁸

Israel

Israel initially responded quickly to control the virus, locking down and flattening the peak of infections. Restrictions were lifted relatively quickly in April and May, but in early July the government had to roll back some of the reopening measures after a rise in cases.

Figure 4 – Daily new confirmed Covid-19 cases, Israel



Source: European CDC, Situation Update Worldwide/Our World in Data ⁹

Israel's head of public health, Dr Siegal Sadetzki, recently said the country was experiencing a second wave of the virus.

More have tested positive for Covid-19 in first two weeks of July than in May and June combined, as the daily infection rate has risen from an average of 20 per day in May to more than 1,300 in mid-July – the highest levels recorded in Israel since the outbreak of the pandemic in February. Furthermore, the percentage of positive tests out of the total number of tests administered has increased from 1.7 per cent in June to more than 6 per cent of all tests in mid-July.

According to data from the Israeli Ministry of Health, the highest occurrence of new infections is among the 20 to 29 age group, which accounts for 22.2 per cent of new cases. People under the age of 29 account for 49.2 per cent of new infections, while the over-60s, the main group at risk, account for only 13.5 per cent of new infections. Experts attribute this to better shielding by the over-60s relative to the first wave, as well as improved protection measures in care homes.

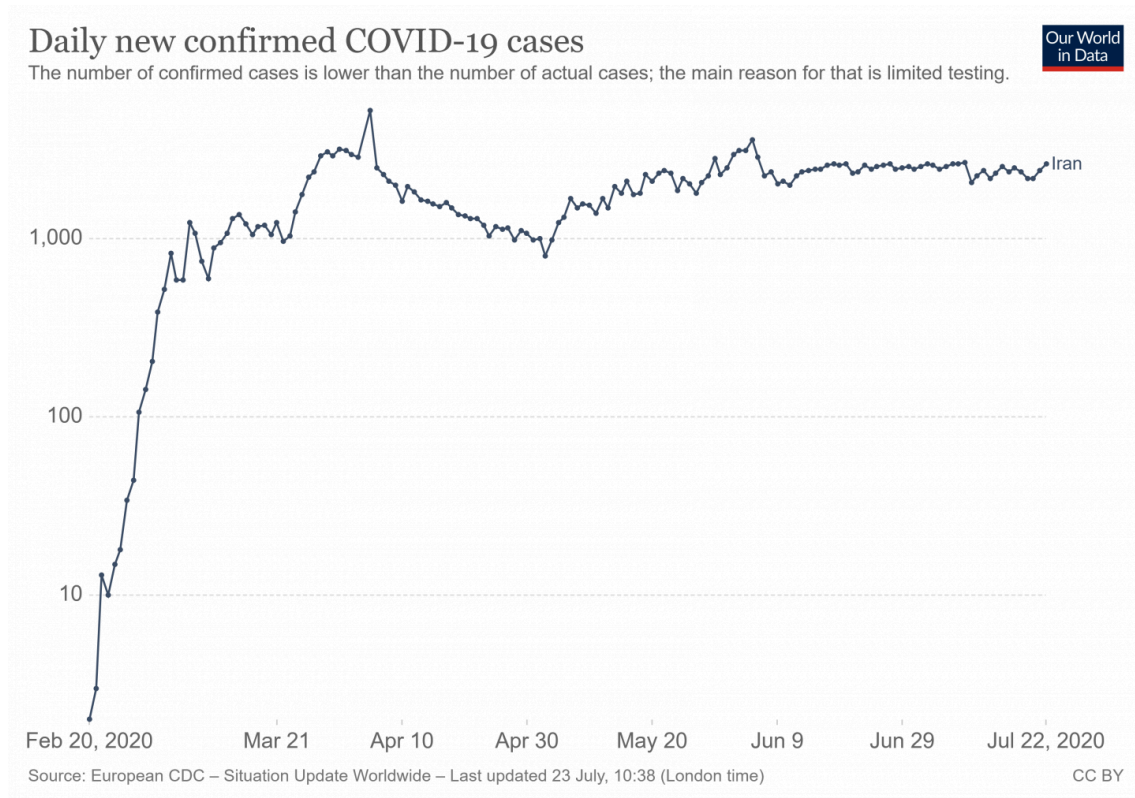
Professor Gabi Barbash, a professor of epidemiology and the former director-general of the Ministry of Health, has said the increase in infection rate is the result of the failure to take adequate preventative measures, and in particular to develop an efficient testing system, and of easing the restrictions too quickly in late April and early May, as a result of public pressure. He attributes the spike in infection rates in particular to the reopening of schools in May without the requisite social distancing measures as well as the rollback on restrictions on gatherings of high density in closed environments in June.

Prime Minister Binyamin Netanyahu has said that, “The pandemic is spreading; it is as clear as the sun,” adding that Israel was, “at the height of a new corona offensive” and Health Minister Yuli Edelstein has said that “barring a miracle”, Israel is heading towards a new lockdown.

Iran

In Iran the virus peaked at the end of March, with, at the time, just over 3,000 cases a day. While official statistics suggest that in April the number of cases had fallen to fewer than 1,000 per day, there is also strong evidence to suggest the regime has been covering up the total number of deaths and cases. For example, in April 2020, a professor of medicine at Tehran University said the actual number of Covid-19 cases was 20 times higher ¹⁰ than the official data being published by the state.

Figure 5 – Daily new confirmed Covid-19 cases, Iran



Source: European CDC, Situation Update Worldwide/Our World in Data ¹¹

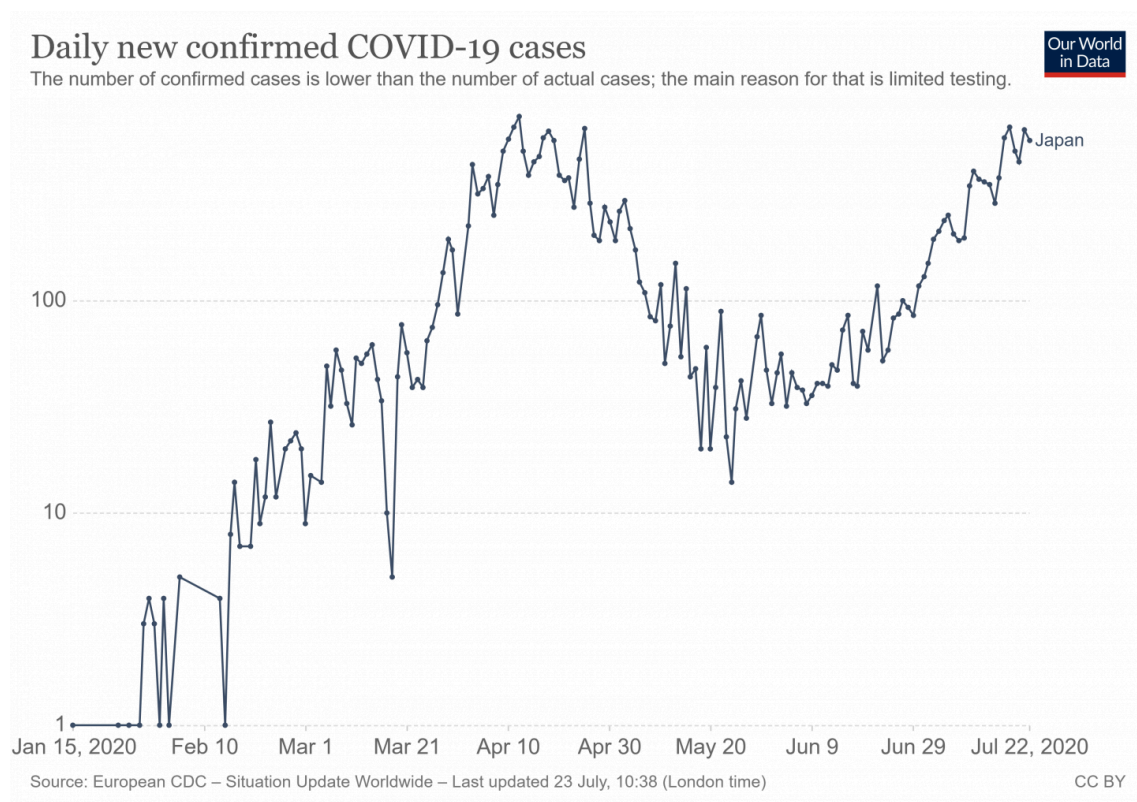
In late April the country began a phased easing of lockdown, and by the end of May it had largely reopened. However, whereas the difficult trade-off between the human and economic cost of the virus has determined different global exit strategies, in Iran, the country's lockdown exit strategy has been dictated by the fear of public unrest. The reopening coincided with an increase in the number of cases, with cases once again surging in July. Despite the sharp rise in the number of cases, on 11 July, Iran's president Hassan Rouhani rejected another lockdown ¹² for fear of unrest – underscoring how the regime's increasing anxiety about protests, rather than public health, is driving its Covid-19 response. Indeed, Rouhani stated: "[T]he simplest solution is to close down all activities, [but] the next day, people would come out to protest the [resulting] chaos, hunger, hardship and pressure".

While the country recently introduced mandatory mask-wearing, this is likely too late to forestall the latest outbreak.

Japan

Japan has recently experienced a spike in the virus in Tokyo. The increase in cases has been linked to Tokyo's entertainment district, where bars and clubs have been extremely busy. Officials in Japan report that the number of confirmed cases linked to nightlife establishments in Tokyo's Kabukicho and Ikebukuro districts have risen recently. ¹³ Some 70 per cent of the new diagnoses are among people in their 20s and 30s.

Figure 6 – Daily new confirmed Covid-19 cases, Japan



Source: European CDC, Situation Update Worldwide/Our World in Data ¹⁴

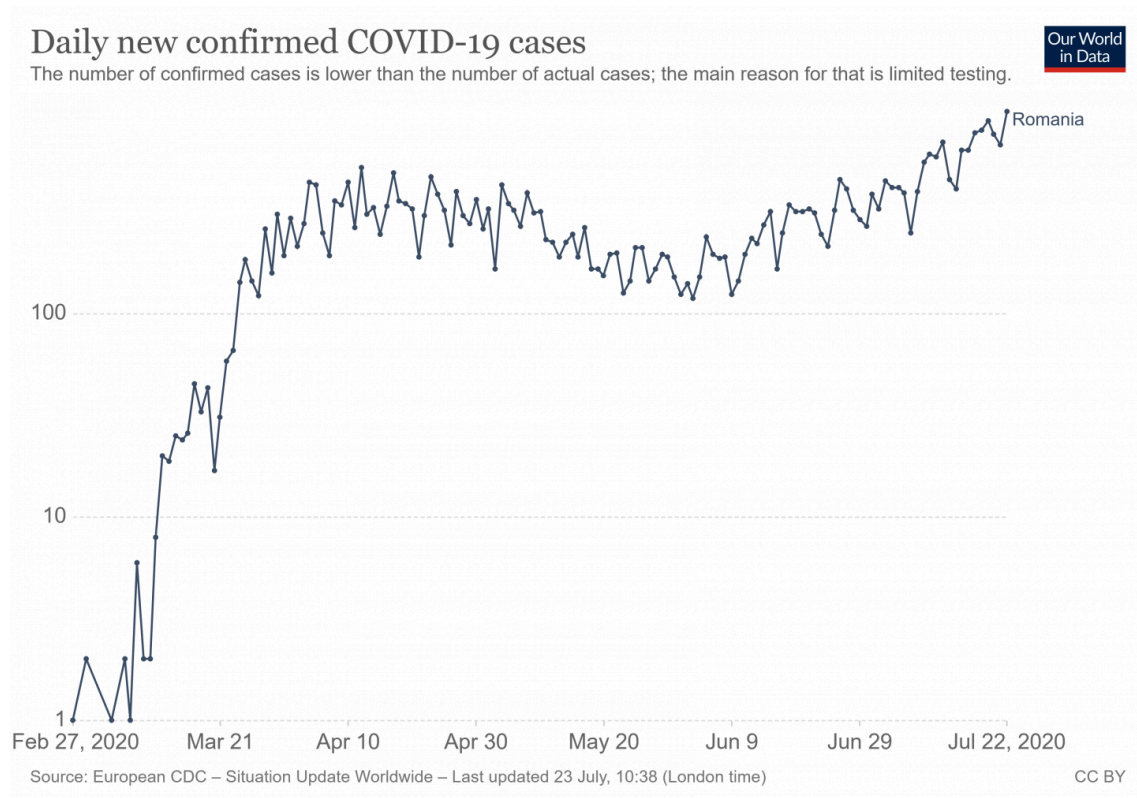
Kentaro Iwata, professor of infectious diseases at Kobe University recently tweeted that Tokyo has entered a second wave of the pandemic. ¹⁵

On 14 July there were 718 new cases, while most of June saw daily new cases of less than 100.

Romania

Romania was particularly affected by the virus in March and April. At that time a strict lockdown was put in place. As cases fell, the government softened the level of alert.

Figure 7 – Daily new confirmed Covid-19 cases, Romania

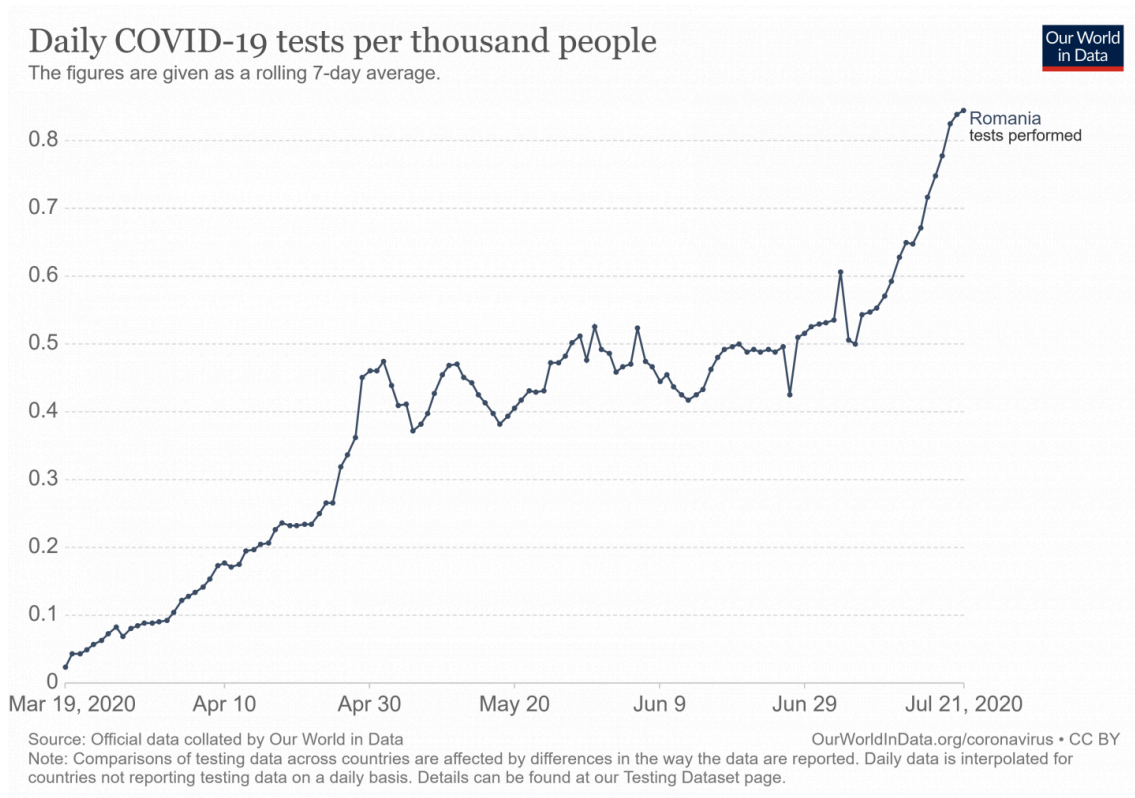


Source: European CDC, Situation Update Worldwide/Our World in Data ¹⁶

At the beginning of June, the number of daily infections began to rise again. On 14 July the country had 413 new cases.

The increase in confirmed cases in Romania is likely attributable to a number of factors. First, the country's testing capacity has been dramatically increasing since March.

Figure 8 – Daily new Covid-19 tests, Romania



Source: Our World in Data ¹⁷

Second, the physical isolation measures imposed by the legal state of emergency have been relaxed, coinciding with recent warm weather.

Finally, public campaigns about the virus appear to have minimised its seriousness and, by proxy, made mask-wearing more casual.

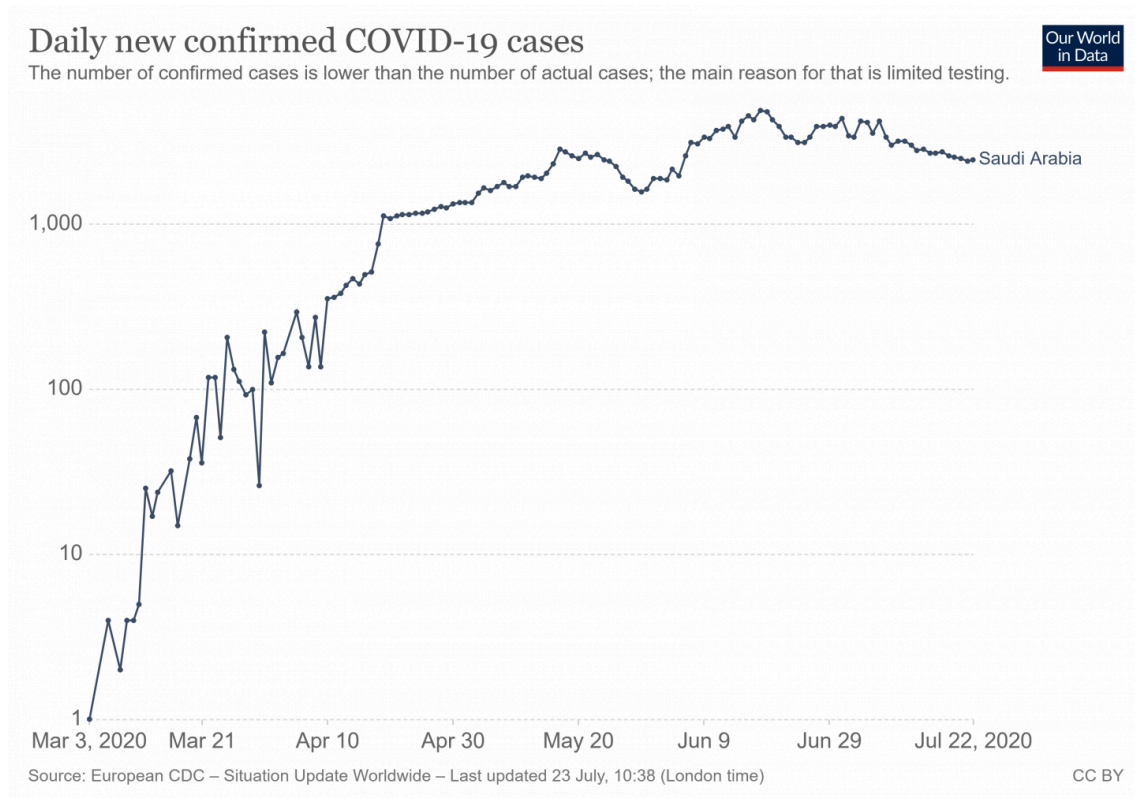
President Klaus Iohannis has said that if this trend continues, the lockdown may have to be reimposed.

Prime Minister Jean Castex said recently that, “The virus is still here... It is time to prepare for a second wave of the epidemic.” ¹⁸

Saudi Arabia

Saudi Arabia has seen a recent spike in cases. The daily number of new cases appeared to be falling from around mid-May but started rising again in June.

Figure 9 – Daily new confirmed Covid-19 cases, Saudi Arabia



Source: European CDC, Situation Update Worldwide/Our World in Data ¹⁹

Saudi Arabia has seen a recent spike in cases. The daily number of new cases appeared to be falling from around mid-May but started rising again in June.

On 18 June the number of cases was 4,919; now the number seems to be fluctuating between 3,000 and 4,000.

The underlying causes of Saudi Arabia's trajectory are unclear, but some argue that one key factor could be the spread of the virus through dormitories inhabited by migrant workers.

CBS news notes that, "According to the latest census carried out by the Saudi General Authority for Statistics (GaStat), there are more than 7,400,000 foreign workers living in Saudi Arabia, the majority from India, Bangladesh, Pakistan, Sri-Lanka and other South Asian countries. Most live in overcrowded, shared accommodation." ²⁰

Health Ministry spokesman Mohammed al-Abd al-Ali said, however, that he believes the rise in the number of infections was principally down to the lack of adherence to precautionary measures. ²¹

Public Fear About The Virus Is High and Enduring

Ipsos MORI polling indicates that almost half of Britons believe the lockdown was introduced too late and that lockdown is being lifted too early.

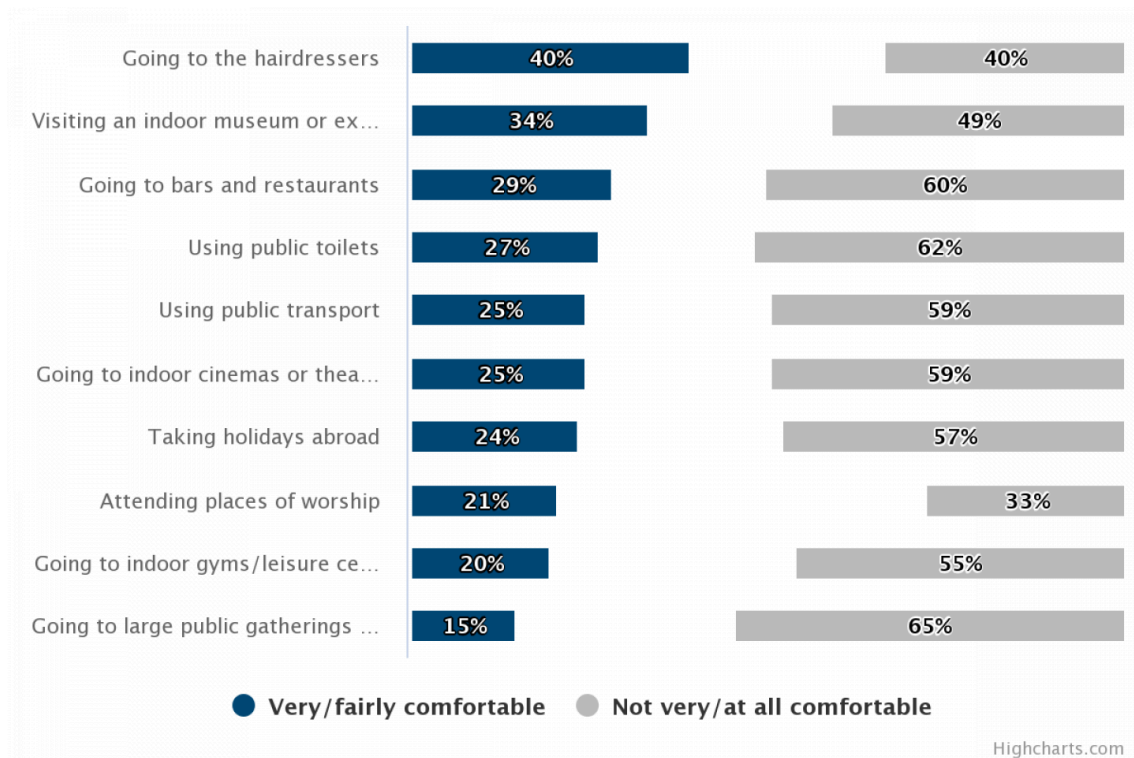
Table 1 – Views on the timing of lockdown in Great Britain

48%	(1) Earlier, longer lockdown The march lockdown was introduced too late and July's relaxation is happening too quickly.
11%	(2) Becoming more cautious The March lockdown was introduced too soon or at right time but now July's relaxation is happening too quickly.
12%	(3) Government got it right then + now Both the March lockdown and July's relaxation were done at the right time.
18%	(4) Started too late, but ready for relaxing March lockdown was introduced too late but it is right to relax them now (or even being relaxed too slowly)
4%	(5) Later, shorter lockdown Very few think March's lockdown was too soon/right and July's relaxation is too slow.

Source: Ipsos Mori ²²

Deeper analysis by Ipsos MORI on the public's level of comfort with returning to normal shows that a majority are still uncomfortable about a wide range of areas of life after lockdown. ²³

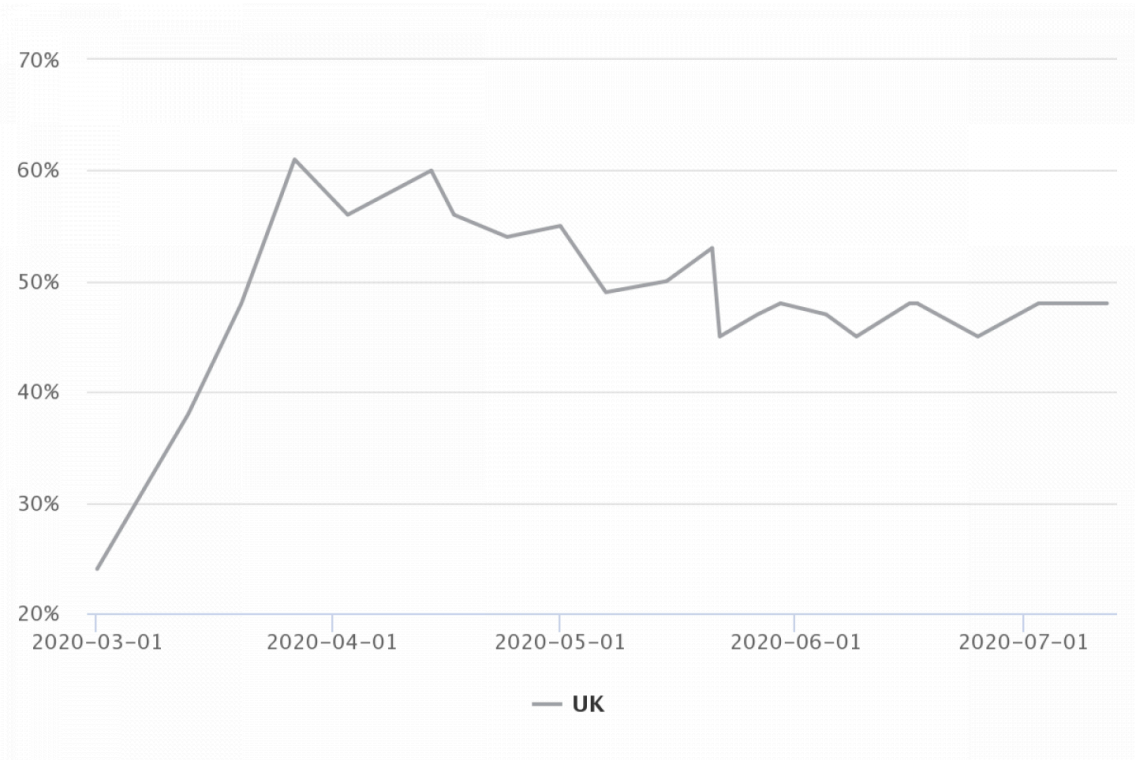
Figure 10 – Comfort level with returning to “normality”



Source: Ipsos MORI ²⁴

Polling by YouGov shows that since early May, around half of the country has remained either “very” or “somewhat” concerned about catching the virus.

Figure 11 – Percentage of people in the UK who are “very” or “somewhat” scared of contracting Covid-19



Source: YouGov [25](#)

What We Know About Covid-19 Health Outcomes and Why It Matters

While there remain a number of unanswered questions about Covid-19, we do now know much more about the virus.

In terms of individual risk, we find that there are identifiable groups who are most at risk from Covid-19. These include:

- Older people, particularly those over 70
- Those with an underlying health condition
- Those in certain roles

Combining this knowledge, we are able to develop a specific set of measures to protect these people whilst still enabling safe economic and social participation. Using these learnings to build the right containment infrastructure will allow us to avoid a big lockdown even if there are spikes and further waves.

So, what do we know?

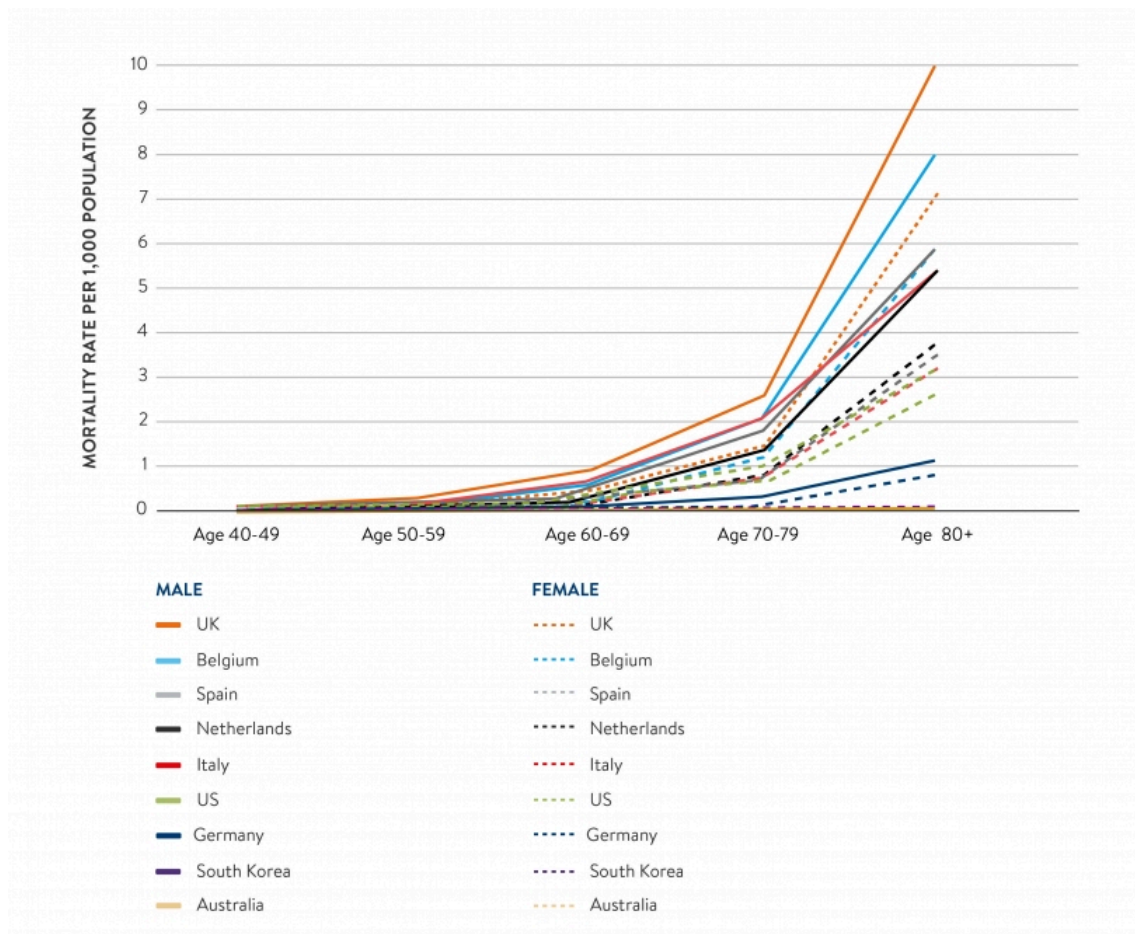
1. Covid-19 has a disproportionate impact on older people

Age is the risk factor with some of the clearest evidence behind it.

Around the world, the parts of the population that have been most dramatically hit are the elderly.

In the UK, the picture is no different. The older you are, the higher the risk.

Figure 12 – Covid-19 mortality rate by age group and country



Source: <https://rgare.com/knowledge-center/media/research/covid-19-mortality-rates-by-age-and-gender-why-is-the-disease-killing-more-men-than-women>

2. Covid-19 has a disproportionate impact on those with pre-existing conditions

A growing body of evidence highlights the risk that pre-existing conditions present.

The elevated risk face by groups with pre-existing conditions was first surfaced by researchers in China ²⁶, who in analysing 1,590 patients with laboratory-confirmed disease calculated that 399 patients with at least one comorbidity had a 79 per cent greater chance of requiring intensive care, a respirator or both – or of dying.

A University of Oxford and the London School of Hygiene & Tropical Medicine (LSHTM) ²⁷ study also presented similar findings, with the following comorbidities as risk factors, even after accounting for age, smoking and poverty:

- Asthma
- Other chronic respiratory disease
- Chronic heart disease
- Diabetes mellitus
- Chronic liver disease
- Chronic neurological diseases
- Common autoimmune diseases
- Solid organ transplant
- Asplenia
- Other immunosuppressive conditions
- Cancer
- Evidence of reduced kidney function

The impact that pre-existing conditions have on risk of fatality has been laid bare in the UK:

- More than 90 per cent of the 33,841 people ²⁸ who died of Covid-19-related deaths in March and April 2020 had at least one pre-existing condition.
- Nearly 6,900 (22 per cent) of these included dementia and Alzheimer's.
- More than 3,600 (11 per cent) had ischaemic heart diseases.
- Those who have diabetes also face a greater risk if they contract Covid-19, with a recent NHS study ²⁹ finding that almost one in three deaths from Covid-19 among people in hospital has been associated with diabetes.

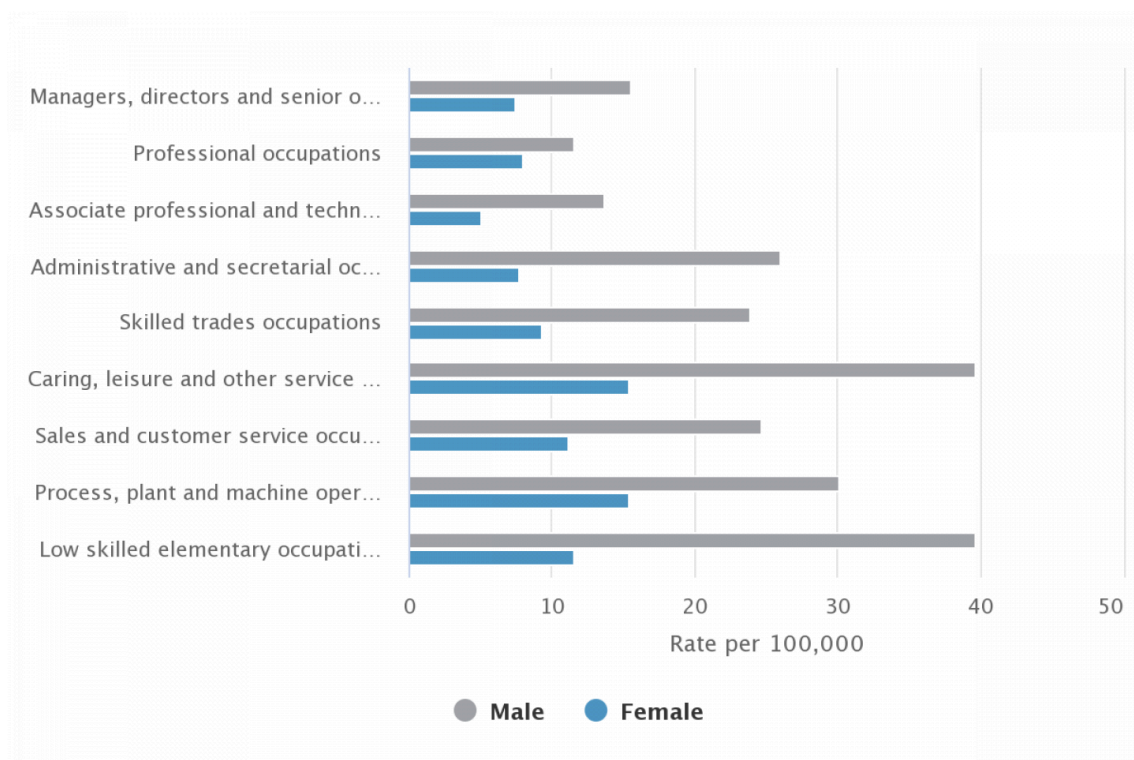
3. Covid-19 has a disproportionate impact on those in certain jobs

Working in certain occupations ³⁰ clearly has an impact on risk, with those working in social care particularly vulnerable to infection. Men in this group also fare worse than women, with more than 23 deaths per 100,000, compared to just under ten per 100,000 among women. Office for National Statistics (ONS) analysis showed that among men, more hazardous jobs also include:

- Security guards (45.7 deaths per 100,000)
- Taxi drivers and chauffeurs (36.4 deaths per 100,000)
- Bus and coach drivers (26.4 deaths per 100,000)
- Chefs (35.9 deaths per 100,000)
- Sales and retail assistants (19.8 deaths per 100,000)

At the other end of the spectrum, some professional occupations had extremely low levels. For example, for those working in science, research, engineering and technology, the rate was 3.9 deaths per 100,000 – ten times lower than the rate for security guards. Across the board, women have lower risks, with the following graph setting out the rates by major occupation groups, and highlighting the risk that men working in “low-skilled elementary occupations”, “process, plant and machine operatives”, and other service occupations face.

Figure 13 – Deaths involving Covid-19 among major occupation groups by sex



Source: ONS ³¹

For that second group – process, plant and machine operatives – the announcement in June of 100 workers at two food factories in Wales testing positive ³² underlined the need for strong containment measures for such workers, in particular as it mirrors experiences in other countries, including France and the US. In Denmark and Germany, slaughterhouses have also been the centre of outbreaks, while in the

US, it's been reported that almost half of Covid-19 hotspots have been linked to meat processing plants. ³³ At least 12 of the 25 hotspots in the US originated in these factories. In Alberta, one meat-packing plant was linked to the largest single-site Covid-19 outbreak in North America. ³⁴

4. Treatment of Covid-19 is becoming more effective

Recent evidence shows that since the beginning of the pandemic, clinical outcomes have improved in the UK. For example, data from the Centre for Evidence Based Medicine (CEBM) at Oxford University ³⁵ has shown that the death rate in April was four times higher than it is now – 6 per cent of Covid-19 patients that are hospitalised died during the peak of the pandemic, but in June this figure had fallen to 1.5 per cent.

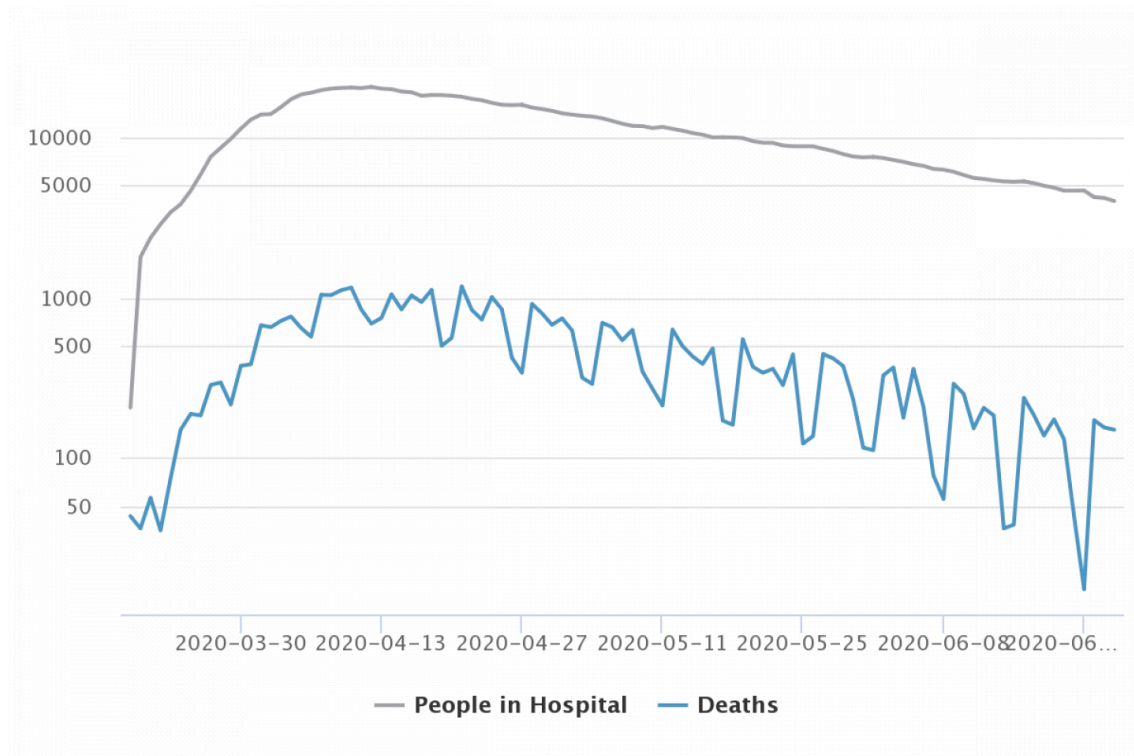
Experts have stated that the reasons are unknown and should be explored, but some of the reasons put forward include: doctors becoming better at treating patients in hospital, patient profiles becoming younger over time and with fewer comorbidities, and because of the presence of drugs that now appear to have an impact on survival.

A comprehensive study released by Gilead, the manufacturers of Remdesivir – a drug used to treat those hospitalised with Covid-19 – have shown that the drug improved clinical recovery and was linked to a 62 per cent reduction in the risk of mortality compared to standard care alone. ³⁶ The drug is currently administered intravenously, meaning patients must be in hospital; but an ongoing trial of inhaled Remdesivir may see treatment more widely applied – including to outpatients, meaning less risk of transmission within hospitals.

Another drug that has been used successfully is dexamethasone, and preliminary data show that, in patients from Europe, low-dose dexamethasone reduces mortality by up to 33 per cent in the most severely affected patients needing invasive ventilation and by 20 per cent in those needing oxygen. ³⁷

A further paper from the CEBM ³⁸ has also shown that fewer people are ending up in ICU, fewer are ending up on ventilators and more are surviving. The authors state that the factors driving this need explanation, but as they note, the findings are striking.

Figure 14 – Deaths and number of people in hospital over time



Source: [UK Government Data](#)

Table 2 – Change in the survival of ICU patients with an outcome reported between ICNARC reports 15 May and 16 June (n=2,647) and ICNARC report 17 April (n=2,935)

Age group	Survival (to 17/4)	Survival (15/5 to 26/6)	Change	p value
16-39	77.9%	92.5%	+14.6	<0.001
40-49	73.4%	83.2%	+9.8	0.005
50-59	57.7%	77.4%	+19.7	<0.001

Age group	Survival (to 17/4)	Survival (15/5 to 26/6)	Change	p value
60-69	42.6%	66.7%	+24.2	<0.001
70-79	31.4%	55.6%	+24.2	<0.001
80+	32.7%	45.8%	+13.1	0.111

Source: CEBM [39](#)

Together, a combination of improved non-drug treatments and effective therapeutics should offer reassurance. We are learning to mitigate the worst outcomes of Covid-19 and the resultant data, demonstrating a reduction in mortality, supports this. Ultimately, alongside the right containment infrastructure, this should inject confidence into the public to exit lockdown and live alongside the virus.

Health Outcomes: Applying What We Know

Knowing that older people and those with underlying conditions have a much higher chance of dying from Covid-19 means that shielding must sit at the heart of our containment measures. Simply, we must protect those who are most at risk. This does not mean confining older generations indoors as we ease lockdown. Our objective should be to safely allow this group to return to social and economic participation. This requires the perception of shielding to evolve from purely preventative measures to proactive measures.

1. A government-issued “Shielder’s N95 Mask” – to protect the wearer

We recommend equipping every person identifying as vulnerable with a reusable N95 mask. This standard of mask – unlike face coverings or disposable surgical masks – can protect the wearer as well as helping to prevent the wearer from spreading the virus.

Government-issued, these “shielding masks” would be available to all who need one and, if produced in a specific colour, would serve as a visual sign someone is shielding. Supported by a communications



campaign, these coloured shielding masks would grant specific rights on the wearer – for example, being able to enter a supermarket at a particular time – and encourage non-shielders to keep distance on public transport.

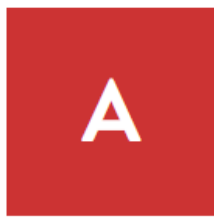
2. Face shields – to protect those in vulnerable roles

Face shields provide a high level of protection for the wearer. Given they cover the whole face – the mouth, nose and eyes – a high percentage of viral particles are prevented from reaching the wearer. Shields can therefore be useful tools for those facing regular close contact with others, for instance those working in medical settings. They are also valuable in professions where nonverbal communication through facial expressions is important, such as teaching. They could be important in giving protection and confidence to teachers, enabling them to return to a classroom environment.



For this reason, we recommend that face shields are procured and supplied to key groups such as teachers, health-care workers, emergency services staff, transport workers and those working in education. Their use should also be encouraged in private-sector settings such as retail, leisure and hospitality.

3. An individual risk score – to constantly evolve as we learn more about Covid-19



While collective action, including the mass wearing of face masks, is critical to reducing the transmission of Covid-19, it is also important for individuals to take ownership of their own risk. By developing a categorisation of people by risk and assigning a letter to this – A, B, C, D – we can develop specific measures for individuals based on their risk level. This could include, for instance, N95 masks for those in category A, as discussed above. This approach also allows categories to be updated as we learn more about the virus or as treatments become more effective. Downgrading categories could play a key role in restoring confidence.

What We Know About Transmission and Why It Matters

1. It is being spread by younger people as lockdown eases

As lockdown eases and more people return to economic and social activity, we have seen a spike in the number of cases and transmissions among younger people. In the UK, the number of positive cases in hospitals (those cases tested through Pillar 1 of the government's testing strategy) remain higher among older people. However, for those tested in Pillar 2 (those outside the hospital environment), 53 per cent of new cases came from those between ages 20 to 50 in the week commencing 8 July. Breaking this age group down further, those between ages 20 and 29 accounted for 17 per cent, and those between ages 30 and 39 accounted for 18 per cent of new cases. ⁴⁰

The story is similar around the world. About half of the clusters in a study in Japan ⁴¹ were traced back to people ages 20 to 39 at karaoke bars, offices and restaurants — and 41 per cent of them did not have symptoms at the time. In the US, in the county of Los Angeles ⁴², nearly 50 per cent of cases are now in people under 40 (compared to about 30 per cent in April). In Harris County, Texas ⁴³, where Houston is located, 43 per cent of the 40,000 cases are in people ages 20 to 39, and in Florida ⁴⁴, the median age of confirmed cases is hovering in the mid- to late-30s, compared to age 65 in March. The same trends have also been observed in Alaska ⁴⁵ and Washington. ⁴⁶

This could be owed to increased mobility among this age group as shops, bars and restaurants open, and more people return to work. This group tends to over index in key worker roles which can't be done remotely, such as teaching ⁴⁷, gig economy roles including delivery and care services ⁴⁸, and retail. ⁴⁹

Increased Covid-19 infection among children and young adults is not without serious risk to them and particularly others they may come in contact with. On the one hand, this means collective measures to prevent transmission are essential, including mass testing and mass mask-wearing, but the significant difference in health outcomes among these groups (see above) also clears the way for younger people to return to education (which we have written about in [a previous paper on reopening schools](#).)

2. It is being spread by asymptomatic and pre-symptomatic carriers as lockdown eases

The effectiveness of symptom-based isolation in preventing a resurgence depends on the extent of pre-symptomatic and asymptomatic transmission. According to mathematical modelling, the majority of

infections may be attributable to silent transmission from a combination of the pre-symptomatic stage and asymptomatic infections. To suppress a future outbreak below 1 per cent of the population, the study identified that one-third of non-symptomatic carriers must be isolated. These results show that symptom-based isolation must be supplemented by rapid contact tracing and testing that identifies asymptomatic and pre-symptomatic cases, in order to safely lift current restrictions and reduce outbreaks. [50](#)

3. It is transmitted in super-spreader settings

Other countries' experiences with reopening also provide lessons on how clusters emerge. As lockdowns have eased, we have learned more about the significance of super-spreading events.

Individuals who infect a large number of people are often referred to as 'super-spreaders'. Rather than attach any biological reason to their infecting of a larger number of people, it is more helpful to see a 'super-spreader' as an 'individual whose circumstances causes them to transmit the virus more widely.' The term 'super-spreader settings' is therefore more appropriate. When the UK saw a localised outbreak in Leicester, a subsequent PHE report suggested clothes factories and food processing plants were circumstances conducive to super-spreading [51](#).

A disease that is transmitted to many by a few has a low k value, a statistical parameter known as dispersion factor. Low values of k indicate that a minority of people are responsible for the vast majority of infections. There is reasonable evidence that Covid-19 transmission is particularly dispersed. For example, a Hong Kong study [52](#) found that 20 per cent of cases were responsible for 80 per cent of local transmission, while an Israeli study mapped the genome of hundreds of Covid-19 sequences in order to identify the origin of infections and how they spread. They found that 1 to 10 per cent of infected individuals were responsible for more than 80 per cent of secondary infections.

Recent outbreaks seem to have followed a similar trend. For example, in Spain, health authorities believe that a recent occurrence in Extremadura is the result of a super-spreading event, while 300 people have had to go into quarantine in Switzerland after an outbreak at a Zurich nightclub. The uptick in cases in South Korea has also been attributed to people being allowed back to crowded spaces such as nightclubs, churches and call centres.

What type of places are hotspots for transmission?

Even though surveillance data is limited and asymptomatic carriers complicate our understanding of hotspots for transmission, a broad picture is emerging. Indoor environments are much more likely hotspots of infection than outdoor environments, particularly households and health-care facilities. A group of researchers mapping clusters, for example, found that the majority were indoors. [53](#)

Music events may pose a bigger risk since singing can project virus particles, while schools appear rarely to be a source of outbreak clusters. Other recent cases in South Korea have been linked to fitness dance classes, while another Japanese study [54](#) connected cases to gyms, karaoke parties, clubs and bars. The following section will therefore look at some of the institutions and industries that are re-opening and what we know about risk.

4. It is transmitted on public transport

Transport also has the potential to be a large source of outbreaks, with one paper finding that city boroughs that reduced their commuting the most had the biggest reductions in Covid-19 infections [55](#). A study in the US, for example, has also found a correlation between commuting via public transport and death rates from Covid-19. [56](#)

Our paper [on pandemic-proofing travel](#) sets out in more detail the specific risks related to underground, bus and train travel and the key measures that can be taken to mitigate them, including the use of face masks and shields, enhanced hygiene and cleaning, and issues around ventilation.

In trying to return to normal, travel is going to be a particularly tough issue, as around 14 per cent of the UK workforce (4.5 million workers) would normally use public transport, while in London this figure is as high as 49 per cent. Encouraging a shift towards cycling, e-bikes and other mobility options is also likely to form part of the solution in urban areas.

Transmission: Applying What We Know

As we ease lockdown, it is becoming increasingly clear that there are identifiable settings where the virus is transmitted. These so-called super-spreader settings include mass indoor gatherings, certain school types and public transport. Understanding this allows for isolated, measures targeted to these settings.

We also know that since easing lockdown, the virus is primarily being spread by asymptomatic and pre-symptomatic carriers. This is mostly younger people, evidenced by the number of cases among those under the age of 40 [57](#). This information is crucial to informing measures that must be in place to stop the spread of the virus. We must have the testing infrastructure in place to identify and isolate non-symptomatic spreaders and reduce transmission among everyone, regardless of their individual health risk. We make three recommendations based on this evidence:

1. Everyone should wear a face mask, regardless of symptoms, in public spaces

While health outcomes may be significantly different for younger people, they still contribute to transmitting the virus. Therefore, mass mask-wearing is essential. It is proven to reduce transmission rates and will enable more people to become economically and socially active. Studies show that to be truly effective, mask usage has to be widespread – with at least 50% of the population wearing them. ⁵⁸ Therefore, mask-wearing should be seen as a measure to protect communities rather than self, and this should be reflected in communications. There is an exception to this. For those who would otherwise be shielding, we recommend they are provided with an N95 mask which does protect the wearer.



2. A system of mass testing should be implemented

Mass testing is the only way we can truly live with Covid-19. To restore confidence, we need to understand our Covid-19 status at given moments. Therefore, the development of a rapid antigen test will be of huge significance. We recommend that the government cultivates an ecosystem of smaller testing providers and couples this with a secure, centrally administered digital identity. The two together will underpin a mass testing regime. This is set out in our forthcoming paper ‘A Blueprint for Mass Testing.’



3. Super-spreader settings should be identified and labelled as such, requiring a specific set of measures

We know that the virus is not spread evenly. There are a number of characteristics that give rise to a setting being labelled as a ‘super-spreader setting’ and enhanced measures should be adopted by places designated as such. These include regular testing of those on site, and the provision of masks and face shields. For schools, a testing regime based on sampling principles should be rolled out to identify the type and location of schools that are designated ‘super-spreader settings.’ This would distinguish between, e.g. inner-city state schools and rural primary schools. This is a route to returning all students to education in September and is set out in more detail in our paper ‘Back in September: A Test for Our Schools.’ ⁵⁹



What We Don't Yet Know About Covid-19 and Why It Matters

It's important to clearly set out the areas where science and understanding is not settled. This will serve two important functions. Firstly, it will direct and focus research efforts, allowing the scientific community to know they are contributing to the key questions that must be answered to inform decision-making. Secondly, stating these known unknowns should provide some level of confidence and prevent mistruths from spreading and further flaming panic and confusion. Below is a selection of areas where there are no clear answers and a flavour of the issues being discussed in each. We recommend that these questions are included in a central repository of data and evidence, maintained by the government, and clearly marked as needing answers.

1. What are the long-term impacts of Covid-19 on survivors?

We are increasingly learning about the long-term impacts of Covid-19. The World Health Organisation has said that people with mild cases can usually expect symptoms for no longer than two weeks, but many people are experiencing symptoms for a much longer period of time.

As the virus is so new, it is difficult to determine what the longer-term consequences will be, but many experts are concerned that some people will suffer long-term damage.⁶⁰ For example, the NHS has assumed that of those that require hospitalisation, 45 per cent will need ongoing medical care.

From what we know so far, the long-term impacts⁶¹ are believed to include:

- Lung scarring
- Stroke, embolisms and blood clotting
- Heart damage
- Neurocognitive and mental health impacts
- Childhood inflammation
- Male infertility

It's clear that we still have a lot to learn about the virus. At present, it is believed that hospitalised patients are most likely to experience severe long-term symptoms. More research needs to look into exactly what kind of people are suffering from long-term impacts. However, the presence of these long-term symptoms emphasises the importance of preventing Covid-19 infection in as many people as possible and not focusing prevention efforts on those who appear to be most at risk of death.

Impact on the Brain

Covid-19 can have myriad neurological symptoms including loss of taste and smell, sleepiness, seizures, coma, strokes and “altered mental state”. Because of this, two US teams studying the brains of deceased patients expected to find high levels of inflammation and virus, but they didn’t. The main cause of brain damage turned out to be oxygen deprivation that seemed to start early in the course of the disease, meaning that the damage had been happening over a longer period. This raises the question of whether there is a lingering impact on the brain among those who survive. ⁶²

Impact on the Heart

Covid-19 can cause heart damage due to a number of factors such as lack of oxygen, myocarditis or stress cardiomyopathy. ⁶³ An early Chinese study ⁶⁴ found that 20 to 30 per cent of hospitalised patients seemed to have potentially fatal myocarditis (thickening of the heart muscle). However, causation is not clear and for those who present with heart failure in the context of COVID-19 infection, we don't know if the heart failure is related to myocarditis or to a response to systemic inflammation from COVID-19 ⁶⁵.

2. How long does immunity last?

This is a fundamental question for vaccine scientists trying to trigger antibody production in the body and for public-health officials hoping that people can’t be reinfected with Covid-19 a second time. But the answer isn’t clear. The detection of antibodies to SARS-CoV-2 does not indicate directly protective immunity and correlates of protection for COVID-19 have not yet been established. However, immunity is conferred from other coronaviruses but these tend to fall over time ⁶⁶.

A Chinese study found that 40 per cent of asymptomatic Covid-19 patients tested negative for antibodies within two months of recovering. ⁶⁷ But the sample size was small and how fast antibody levels fall in patients who have shown symptoms is less clear. Longitudinal serological studies that follow patients’ immunity over an extended period of time would be required to study the duration of immunity.

Other immune responses, including T-Cells, may also play a part. The body’s general defences against invading pathogens include T-cells, which are not specifically adapted to the coronavirus but could help with long-term immunity.

3. What proportion of those infected are asymptomatic?

Even the richest country in the world (the US), with the largest number of confirmed cases (3,483,832, as of 16th July) ⁶⁸ has only the vaguest idea how many go uncounted for lack of symptoms. The same applies to the UK, where PHE estimates of those carrying the virus at any given time can be over ten times the number confirmed on a given day.

We know that there are asymptomatic and pre-symptomatic carriers but we don't know how many. This applies throughout the UK, including in Leicester ⁶⁹. Understanding this is mission critical if we're to live alongside Covid-19. Who has the virus and therefore who can transmit it can only really be understood by mass testing, where everyone – regardless of symptoms – is tested on an ongoing basis.

4. How is the virus usually transmitted?

According to the WHO, the virus is spread via droplets and this has informed reliance on measures such as social distancing and mask-wearing. However, 239 scientists across 32 countries wrote an open letter to the WHO titled 'It is Time to Address Airborne Transmission of Covid-19' ⁷⁰. If the scientists' assertion - that the virus can be spread via aerosols – is correct, it would have a further impact on measures needed, raising serious questions about the role of air-conditioning in spreading the virus through enclosed spaces and the potential for people to be infected regardless of social distancing.

Other studies have explored the idea that the virus is transmitted via surfaces, with one stating it can survive for up to 72 hours. ⁷¹ The unsettled nature of this debate and lack of a firm understanding on how the virus is spread causes confusion and panic.

5. How deadly is Covid-19?

Work continues on the issue of how deadly the virus is. Early estimates on the lethality of the virus appear to have overestimated the risk, while more recent studies perhaps understate it.

Timothy Russell, a mathematical epidemiologist at the London School of Hygiene and Tropical Medicine, said recently that, "Now, numerous studies – using a range of methods – estimate that in many countries some 5 to 10 people will die for every 1,000 people with Covid-19 ... The studies I have any faith in are tending to converge around 0.5–1%." ⁷²

The authors of a recent paper published in *The Lancet*, “Have Deaths From COVID-19 in Europe Plateaued Due to Herd Immunity”, conclude from data on both deaths and antibody levels in Europe that the infection fatality rate is between 0.5 and 1 per cent. ⁷³

A study by Imperial College London of the Covid-19 epidemic in China found an overall infection fatality rate of 0.66 per cent. ⁷⁴

A systematic review and meta-analysis by Australian epidemiologists, who looked at 25 studies from around the world, estimated an infection fatality rate of 0.68 per cent. ⁷⁵

Managing Individual Risk Requires a Collective Effort

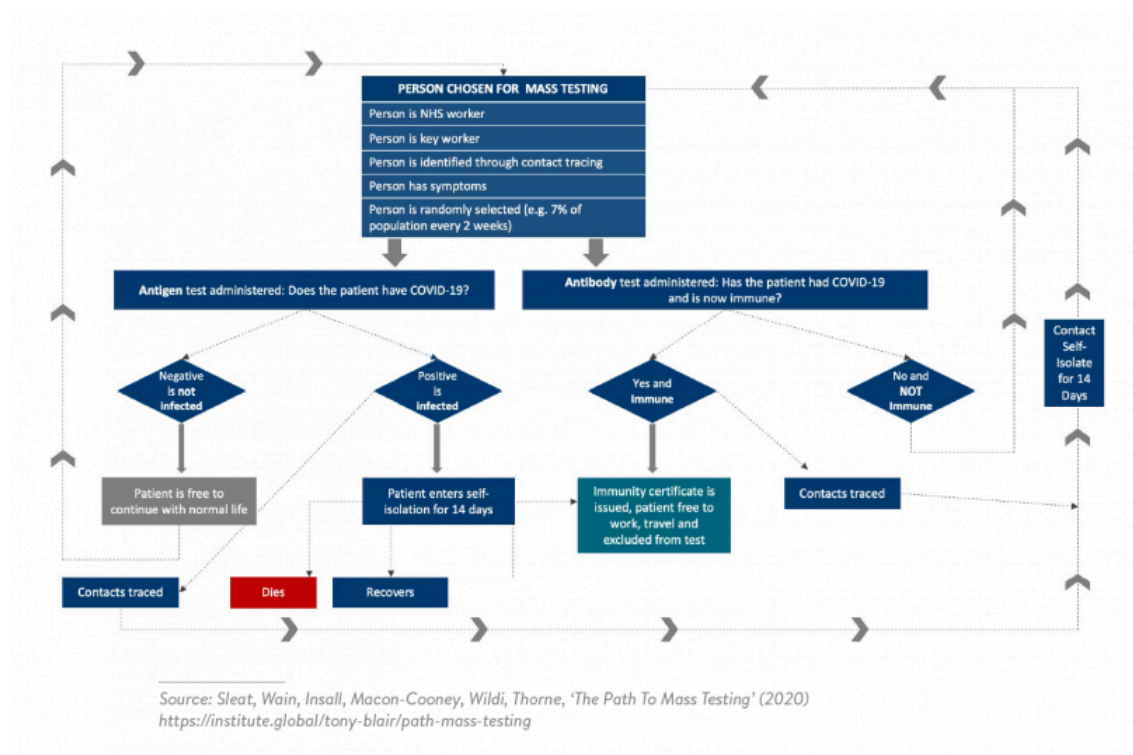
As the evidence on risk factors increases, so too does our ability to manage it.

At the beginning of this crisis, when our knowledge was limited, governments around the world had few choices available to them. Yet as the pandemic has progressed, our knowledge of risk has increased significantly. This has enabled us to increase our knowledge of how to deal with these risks.

Mass Testing

As we have argued in a number of papers, most recently "[Changing the Game on Testing](#)", we believe the government must put mass testing at the heart of its strategy on how we mitigate the risk of the virus. Only through this approach can we get the fullest possible picture of who has the virus (with or without symptoms) and who has had the virus, with conferred short-term immunity.

Figure 15 – Our proposed STIR model for mass testing



Mass Mask-Wearing

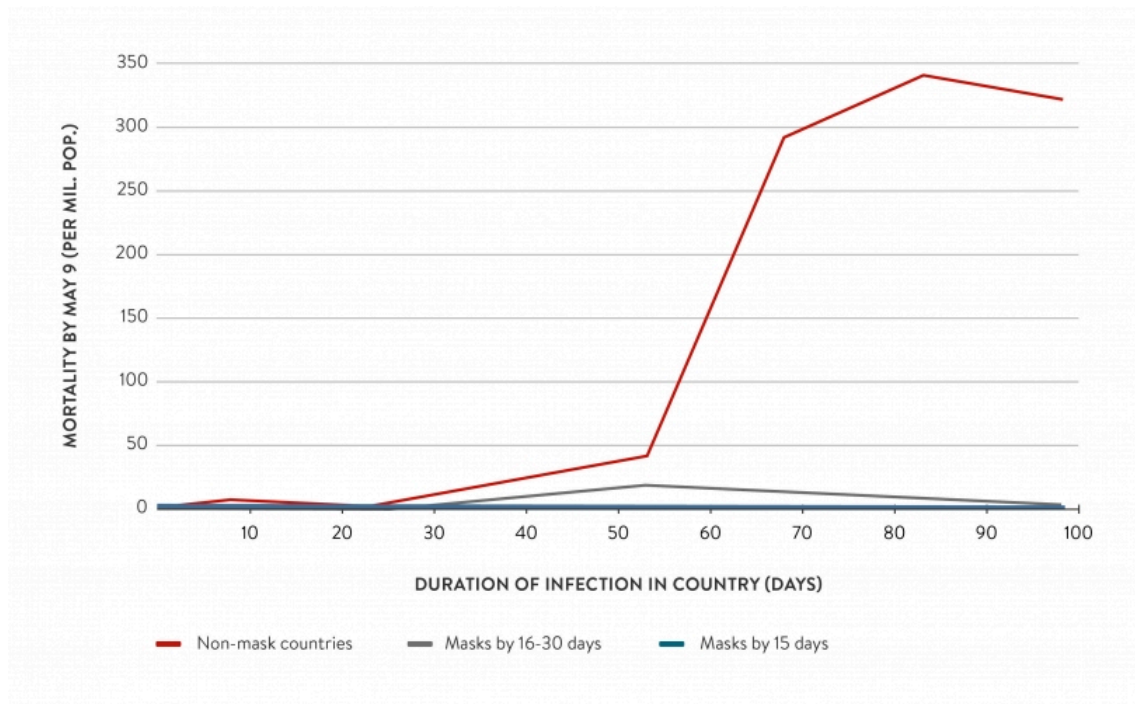
In the early days of the outbreak, many governments, particularly those in the West, did not recommend the use of masks. This position appears to be based on older studies that often showed limited benefit to mask usage in preventing infection.

However, recent evidence suggests the valuable role that masks and eye protection play in preventing transmission. A paper ⁷⁶ published in *The Lancet* found that the use of masks or eye protection substantially reduced the chance of becoming infected, with N95 respirator masks more effective than surgical masks. Another paper ⁷⁷ took a more clinical approach by comparing measured viral shedding for those wearing masks to those who were not. No virus was detected for the participants wearing masks (compared to 40 per cent of those not wearing masks), suggesting they are effective in preventing transmission.

Additionally, it appears that countries in South-East Asia who have generally contained their Covid-19 outbreaks also have strong mask use by their populations. For instance, researchers in Hong Kong who had previously discovered the SARS virus, conducted a novel study that found the rate at which the virus was transmitted through airborne particles or respiratory droplets was lowered by as much as 75% when masks were used ⁷⁸.

But perhaps the most stark research of all was published by a group of researchers recently. ⁷⁹ In particular they identified “18 countries with recommendations or cultural norms favouring mask-wearing by the public within 21 days of the onset of the country’s outbreak,” which included: Thailand, Japan, South Korea, Taiwan, Macau, Hong Kong, Vietnam, Malaysia, Cambodia, the Philippines, Slovakia, Venezuela, Uzbekistan, Mozambique, Sierra Leone and Malawi. The researchers noted that in Mongolia and Laos, people began wearing masks before any cases were confirmed.

Figure 16 – Per-capita mortality by 9 May versus duration of infection in no-mask and early-mask cou

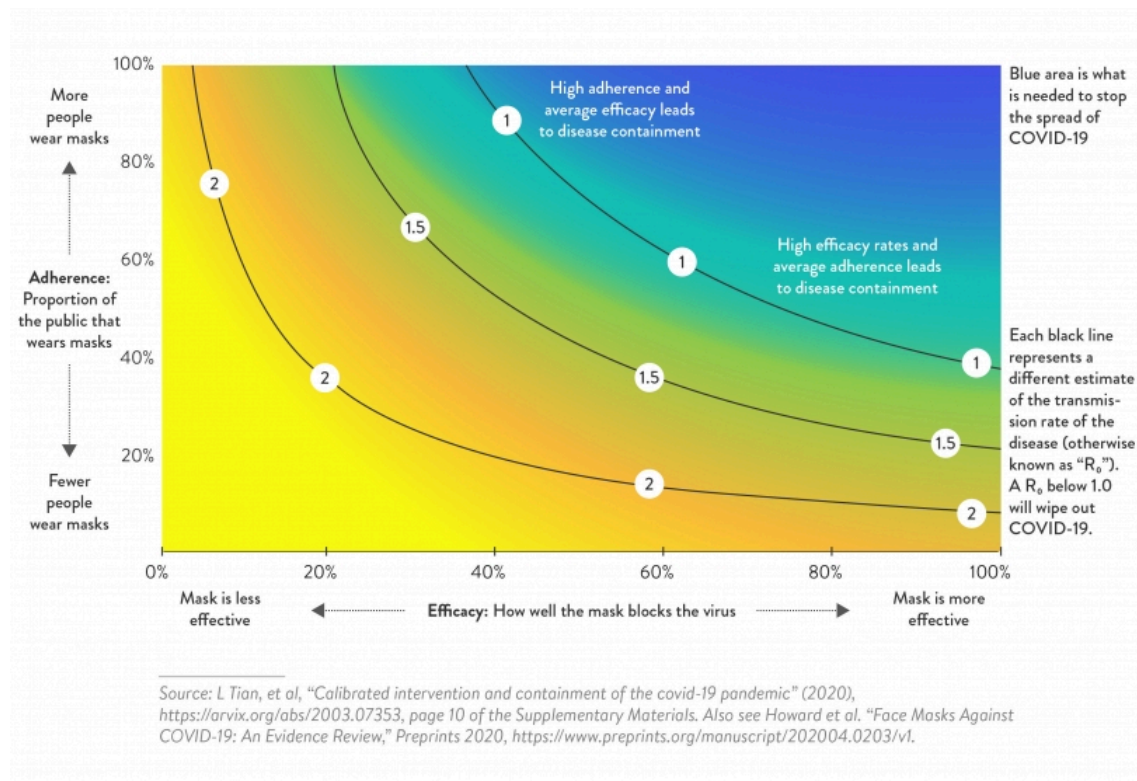


Source: <https://www.medrxiv.org/content/10.1101/2020.05.22.20109231v4.full.pdf>

In our recent report on [the importance of masks in exiting lockdown](#), we set out in more detail how masks can play a vital role in reducing the risks of viral transmission.

In particular, modelling by HKBU, cited by Professor Trisha Greenhalgh and Jeremy Howard in their work [80](#), suggests that if everyone wears a mask in public (including on public transport, at social venues, at work) the rate of transmission of the virus (R_0) can be kept below 1. [81](#)

Figure 17 – Impact on transmission rate of Covid-19 at different levels of mask usage



Alongside other measures we have recommended – particularly mass testing and contact tracing – we believe masks can play a vital role in ending lockdown while mitigating transmission risk.

A recent study published by the US CDC looked at the role of masks in preventing transmission of the virus. It looked specifically at the case of two hair stylists in Springfield, Missouri. The two stylists developed Covid-19 symptoms and tested positive for the virus. During the time they were infectious, they saw 139 clients, for at least 15 minutes each.

The study found that, "Among 139 clients exposed to two symptomatic hair stylists with confirmed COVID-19 while both the stylists and the clients wore face masks, no symptomatic secondary cases were reported; among 67 clients tested for SARS-CoV-2, all test results were negative. Adherence to the community's and company's face-covering policy likely mitigated spread of SARS-CoV-2." ⁸²

Figure 18 – Infographic from the US CDC on the effects of face covering on Covid-19 transmission



We recommend at a minimum that the public is asked to wear a form of face mask while in public and around large groups of people. In the service sector and retail, it should be mandatory. This will have a positive impact on the effective R_0 rate of transmission.

Building Deeper Understanding of the Virus Through Comprehensive Data Capture and Sharing

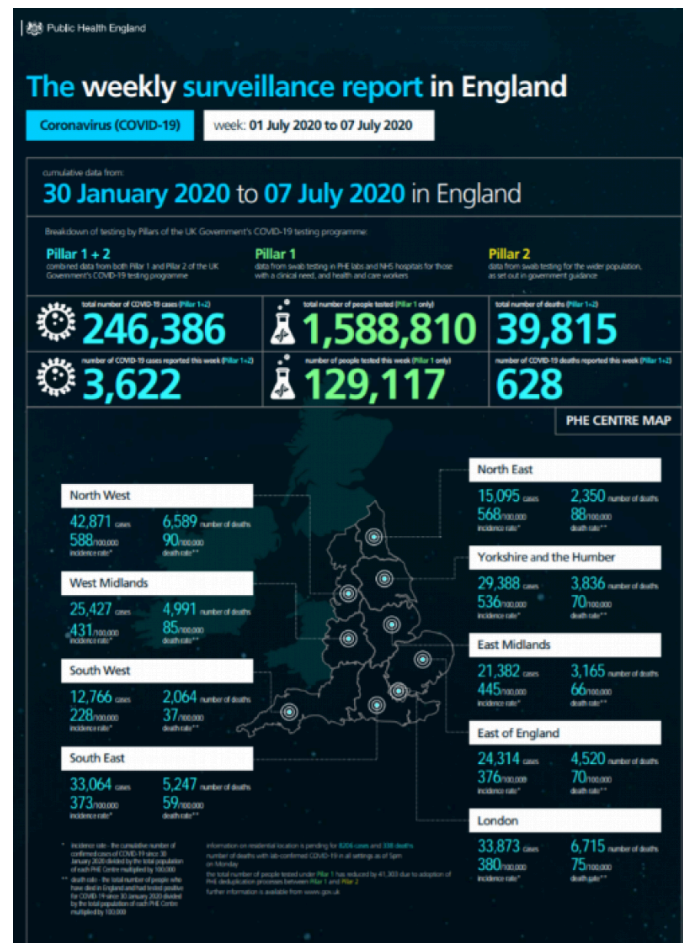
We must use information and data to restore confidence and inform measures for containing the virus as lockdowns are eased. Moving forward, there needs to be a centralised, trusted source of data that allows citizens to understand the latest evidence on health outcomes and transmissions. This should be government-owned and verified, addressing the confusion caused by the many different – and often conflicting – studies being released. It would also include the questions that we don't know the answers to yet, directing research efforts while also reminding citizens that there is no settled science on these issues.

This central repository of information could be combined with other data sources, including testing data, to support an individual risk score, such as that developed by Tech Mahindra, a large India-based technology company with 125,236 employees. ⁸³ Their model is a screening programme open to any employee. It uses AI to pull on different data sources and combines with antibody tests, allowing employees to know their Covid-19 risk and make informed decisions ⁸⁴.

In the UK, Public Health England (PHE) undertakes diligent work on tracking the virus. ⁸⁵ This covers areas such as:

- Weekly surveillance report
- Confirmed cases
- Community surveillance
- Primary care surveillance
- Secondary care surveillance
- Virological surveillance
- Mortality surveillance
- International situation

Figure 19 – Public Health England’s weekly surveillance report



Source: Public Health England

Upping Our Game on Data Collection

While we commend the hard work PHE and others are doing, we believe it is time to up our game in this area. This means an evolution in PHE’s data mission from “Using data to track the virus” to “Using data to track the virus and inform individual risk and support collective measures”.

This would mean:

1. Widening categories of information collected and made available:
 - Severity of symptoms
 - Length of symptoms




- Type of symptoms
2. Collaborating internationally to bring together the best information on the virus.
 3. Drawing on the information gathered through the type of dramatically increased testing we recommend in the UK.
 4. Broadening sources to include private testing data. (Every day, thousands of tests are conducted privately but the data is not being captured by the government.)
 5. Making this information accessible, centrally and publicly.
 6. Demonstrating, in real time, the impact of collective measures such as mass mask-wearing on the R rate and prevalence of infections.

Towards an Individual Risk Score

The Covid-19 risk screening programme underway at Tech Mahindra on the HealthCube platform, uses patient risk factors – age, gender, medical conditions, potential exposure, recent travel or being in a crowded place, public-health data, aggregations from previous screenings, patient symptoms, etc – to create a risk score for patients.

Such an approach could be adopted in the UK. Its design must not undermine the need for collective action, which is an inherent danger when it comes to focusing on the perceived risk of an individual. This could be addressed by defining a clear set of measures that must be adopted by those in each category.

Table 3 – Our proposed model for categorising individual risk

Risk Category	Definition	Example of persons in this category	Example measures
	Those who are most vulnerable and at risk from Covid-19.	Elderly people and those with severe underlying conditions.	Shielding measures, including provision of colour-coded N95 reusable masks.
	Those who have a heightened level of risk due to one or more known factors.	People who are overweight. People who work in certain public facing jobs.	Access to a regular test. Mandatory mask-wearing in public spaces.
	Those with low health risks but high risks of transmission.	Healthy people aged 18 to 60.	Mandatory mask-wearing in public spaces. Participation in mass testing.
	Those with low health risks and low risks of transmission.	Children under age 10.	Limited measures, allowing return to school, etc.

The Gamechangers: Not Ready. Yet.

There are two clear gamechangers in the battle against Covid-19. These are:

1. A scalable **vaccine** that immunises individuals against the virus
2. A **therapeutic** that is easily administered and significantly reduces the harm caused by the virus

There is third, near-gamechanger, in the form of a **rapid, on-the-spot test** that is made widely available. This would allow mass, regular testing to take place, enabling individuals to know their Covid-19 status and to identify and isolate any non-symptomatic carriers of the virus.

We are not at the stage where any of these gamechangers are available to the standard and scale required. Intense research and funding must continue to be poured into each area but, for now, it is critical that we focus on the containment measures we can introduce and for these to be continually optimised and informed by the data in front of us.

Vaccine

At the end of June the Institute published a detailed [paper](#) on the search for a vaccine.

Globally there are more than 100 Covid-19 vaccine development projects underway, with several candidates already being tested in human trials. They are:

Inovio (US)

Inovio had already been working on a DNA vaccine for MERS when Covid-19 appeared in December. This allowed the company to quickly develop a potential vaccine, which is already in Phase I clinical trial, with Phase II/III due to start this summer. However, the company is currently facing challenges with both its manufacturing partner and shareholders.

China's Sinovac Biotech's Covid-19 vaccine candidate, CoronaVac

CoronaVac recently showed promising results in Phase I/Phase II clinical trials. The Beijing-based company has already submitted Phase III protocols to China's drug regulator and is seeking to collaborate with Brazil's Instituto Butantan for a Phase III clinical trial.

Codagenix

US-based clinical-stage biotechnology company, Codagenix, is collaborating with Serum Institute of India to develop CDX-005. Successful pre-clinical animal studies have cleared the way for the manufacture of CDX-005 to be tested in a Phase I clinical trial that begins in the autumn of this year.

At the same time, the Indian manufacturer will scale production in preparation for large-scale efficacy and safety studies, while also planning to supply vaccines at the global level.

Moderna (US)

Moderna began testing its mRNA vaccine in March. The early safety test, in 45 human subjects, indicated the vaccine was safe and that it generated the right kind of immune response with only minor side effects. In early May, the company received FDA approval to start a Phase II study with 600 participants, half of whom are over 55, and expects to start a Phase III clinical trial in early summer.

University of Oxford (UK) partnering with AstraZeneca

Oxford and AstraZeneca began clinical trial with more than 500 participants in late April, using a modified virus to trigger the immune system. In May, they reported the vaccine was effective after success with six rhesus macaque monkeys (although this does not necessarily guarantee that the same result will be seen in humans). They expect to begin a late-stage clinical trial within weeks.

Other pharmaceutical companies

Pharmaceutical companies Johnson & Johnson and Sanofi are both working on vaccines, while Pfizer has teamed with a German company and began human testing in early May. GSK is manufacturing adjuvants “at risk” even as it seeks funding from global institutions and governments to support production. Merck has two vaccine development projects. One is through its recent acquisition, Themis, which is part of a consortium with The Center for Vaccine Research at the University of Pittsburgh and the Institut Pasteur, while the other is through its partnership with IAVI, which is leveraging the recombinant vesicular stomatitis virus (rVSV) technology.

Therapeutics

In [a paper we published at the end of May](#), there were no approved therapeutic drugs to treat the general public for Covid-19 in the UK. However, since then, Oxford University’s ground-breaking RECOVERY – Randomised Evaluation of Covid-19 Therapy – identified the immunosuppressive drug dexamethasone. As a result, the government announced an order of 240,000 doses of the drug and that it would be made available with immediate effect. As the team’s pre-print study set out [86](#), the drug cuts deaths in ventilated patients by one-third and deaths in other admitted patients receiving oxygen by one-fifth.

Initial results from the recent clinical trial of a protein treatment from Southampton-based Synairgen has shown it reduces the number of patients needing intensive care. The treatment uses a protein called interferon beta, which the body produces during a viral infection. The protein is inhaled into the lungs of patients, using a nebuliser, in order to stimulate an immune response. The findings of the trial suggest the treatment cuts the odds of a hospital patient developing severe disease by 79%.

As of 10 July, three therapeutics have been approved to treat Covid-19 globally:

1. Dexamethasone
2. Avigan
3. Remdesivir

Testing

As we set out in a previous paper, [*"Changing the Game on Testing"*](#), progress is being made on bringing onstream a range of rapid, point-of-use tests. These tests include both rapid antigen and rapid antibody tests. Some innovations we are aware of cover both.

Having a mass-testing regime in place, built upon the foundations of rapid point-of-use tests, would change the game on how we deal with the virus.

As yet we, especially the UK, are some way off from that ambition. In particular, we believe rapid progress is required in bringing onstream the widest possible range of viable antibody and antigen tests.

Conclusion & Recommendations

Covid-19 is not going away any time soon. Until there is a game-changer, a vaccine or a wonder drug, we will continue to see new outbreaks across the globe. This does not have to mean a cycle of damaging lockdowns that impact our health and lead to economic ruin. Instead, with the right containment infrastructure in place, underpinned by an ever-evolving knowledge of Covid-19, we can learn to safely live with the virus.

This sustained return to something resembling “normal” requires public confidence, which can only be built on the knowledge that every possible step has been taken to mitigate risk.

Measures should include:

- Mass testing using rapid, on-the-spot tests
- Mandated use of face masks in all public environments
- Provision of face shields for those in high-risk jobs
- Enhanced cleaning regimes and testing in super-spreader environments (e.g. public transport and schools)
- New ways of working to take pressure off of public transport
- Enforcement of social distancing guidelines
- Proactive shielding for those most susceptible to Covid-19
- The continued use of available therapeutics

Importantly, the right mitigative steps can only be taken on the basis of acquiring a deeper understanding of the virus. This will involve:

- Continuing to optimise measures based on evidence as to who transmits the virus and who is most adversely impacted by it.
- Prioritising building evidence on key “known unknowns”, such as the length of immunity and long-term effects of the virus.
- Collecting, domestically, all possible information, from all available sources, on the virus and its effects. This should encompass all the data being collected every day by those doing private tests for the virus.
- Systematically collecting and sharing this information with our international partners.

As we build a deeper understanding of the virus and how it differs in transmission and impact among certain groups, we should introduce a system of individual risk categorisation, ranging from A (those most at risk) through to D (those who are not at risk and unlikely to transmit the virus). This doesn’t exempt any group from responsibility for collective measures such as mass mask-wearing, but it does

mean that other protective measures – such as shielding or higher-grade face masks – can be targeted towards those who need them.

Ultimately, in the absence of a gamechanger on Covid-19, such as highly effective therapeutics or a vaccine, the need for containment infrastructure underpinned by mass testing is more important than ever. It is the only route towards living, as safely as possible, alongside the virus.

Footnotes

1. ^ <https://ourworldindata.org/coronavirus-data-explorer>
 2. ^ <https://www.telegraph.co.uk/global-health/science-and-disease/resurgence-covid-19-around-world-tells-us-risk-second-wave/>
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 7. ^ <https://japantoday.com/category/world/australian-pub-cluster-adds-to-second-wave-coronavirus-fears>
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