New Scientist

WEEKLY 7 March 2020

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Special report: Coronavirus

DAVID RYDER/GETTY IMAGES

A number of cases of covid-19 have been linked to a nursing home in Kirkland, Washington

Covid-19 spreads in US

Multiple outbreaks worldwide have led to countries stepping up their responses. By **Debora MacKenzie** and **Press Association**

WITH cases detected in more than 70 countries, and significant outbreaks not only in China but also in South Korea, Italy and Iran, the novel coronavirus first detected in Wuhan, China, has truly gone global.

This week, it emerged that the covid-19 virus could already be circulating in the US. Similar genetic sequences were detected in viruses from two people who contracted the disease weeks apart.

One comes from a case in Snohomish County, Washington, in which the infected person had no contact with another known case or outbreak location. Despite this, the virus sequence closely matches that in the first infection detected in the US, on 21 January, in a man in the same county who had visited Wuhan.

Both sequences share a rare single mutation. "This strongly suggests that there has been cryptic transmission in Washington State for the past 6 weeks," tweeted Trevor Bedford at the Fred Hutchinson Cancer Research Center in Seattle.

Testing in the US has been limited. China is doing 1.6 million tests a week, South Korea is testing upwards of 10,000 people a day and the UK had tested about 13,000 suspected cases by 28 February. By then, the US had tested only about 2500 people, partly because only those with links to China were being tested.

On that day, however, the US Centers for Disease Control and Prevention issued new testing guidelines, to permit testing of potentially locally acquired cases. Three were immediately reported in California, Oregon and Washington, including the latest Snohomish case.

Caitlin Rivers at Johns Hopkins University in Maryland says the US should now test hospitalised patients with severe respiratory disease of unknown cause, to see if they have covid-19. On 3 March, 105 US cases had been confirmed.

On Tuesday, the UK government published a 27-page document setting out the UK's response to the virus. The report warned that a coronavirus outbreak could lead to school closures, police dropping low-priority cases and the National Health Service delaying non-urgent care.

The document acknowledges the potential impact on businesses. "In a stretching scenario, it is possible that up to one fifth of employees may be absent from work during peak weeks," it says.

The UK government's response is focused on containment and planning for delaying and mitigating the outbreak.

UK officials hope to delay the peak of the virus until the warmer spring and summer months when health services are less busy.

If the disease becomes established, mitigation measures will be introduced. These could include police concentrating only on serious crimes and maintaining public order if faced with a significant loss of officers and staff, and the NHS calling retired staff back to duty.

Local authorities may have to deal with "an increase in deaths", particularly among vulnerable and older people, and the government is considering how to distribute the UK's stockpiles of key medicines and equipment such as protective clothing.

In a sign that the military could be called in to help, the document says there are "well-practised arrangements for defence to provide support to civil authorities if requested".

The number of people in the UK who have tested positive for the virus stood at 51 as *New Scientist* went to press.

The latest coronavirus news online
Keep up to date with the science of the outbreak
newscientist.com/article-topic/coronavirus

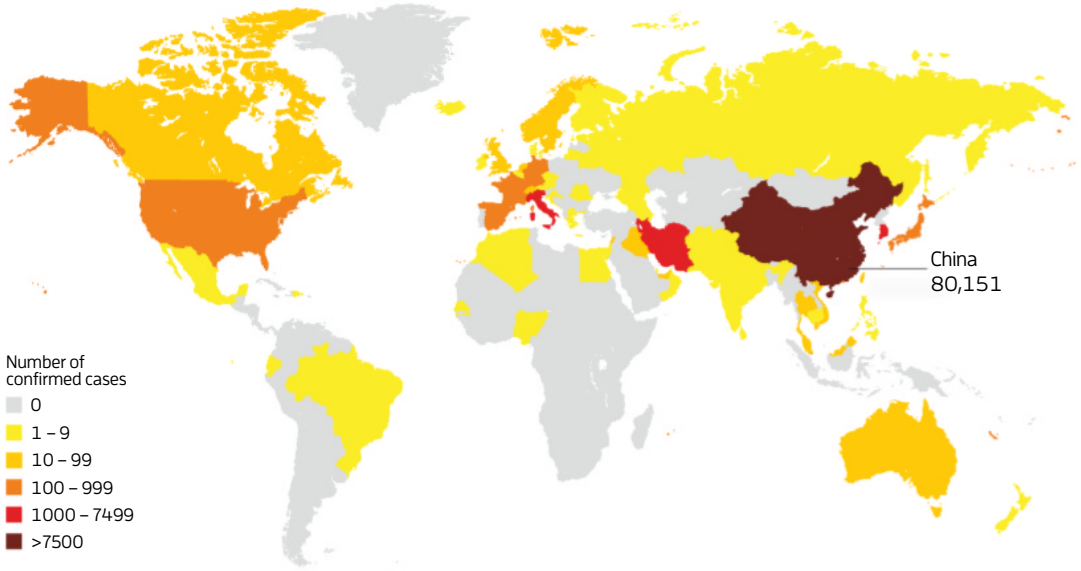
Pandemic readiness

How well prepared are we?

Covid-19 is rapidly spreading around the world during a period when many healthcare systems are already under pressure, reports **Debora MacKenzie**

Coronavirus cases

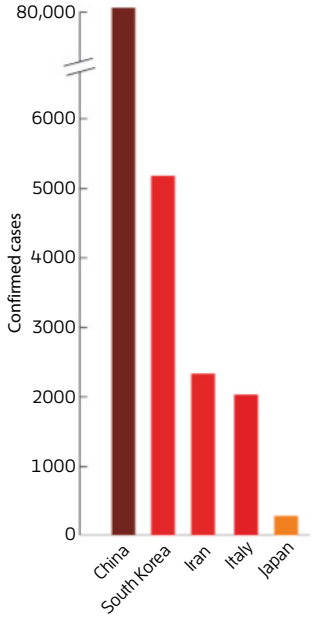
By 3 March, the covid-19 virus had been detected in more than 70 countries



SOURCE: JOHNS HOPKINS UNIVERSITY, 3 MARCH 2020

The largest outbreaks

China still accounts for the majority of covid-19 cases worldwide



LAST week, the World Health Organization raised its assessment of the global risk from the novel coronavirus to Very High – its maximum level. The virus has escaped containment in at least four countries.

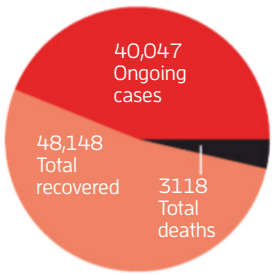
But the WHO is eager for nations to keep practising containment measures (see "Why the WHO won't use the p-word", right). These can slow the spread of the virus in countries that only have a few cases. But as long as it is circulating somewhere in the world, new cases will continue to crop up in countries even if they have effective containment practices.

Mike Ryan of the WHO said on 28 February that the goal isn't to stop the virus spreading, but "to slow its spread so health systems can prepare". But what will that take? Can countries around the world handle a pandemic? The short answer is no. "Health systems, north and south, are just not ready," Ryan said emphatically.

Systems under strain

When the epidemic started in the city of Wuhan, in China's Hubei province, a rapid build-up of severe cases overwhelmed medical staff. There wasn't enough medical protective gear

There have been 91,313 confirmed cases of the covid-19 virus so far



SOURCE: JOHNS HOPKINS UNIVERSITY, 3 MARCH 2020

and there were insufficient intensive care beds – along with oxygen and ventilators needed to help people with severe pneumonia breathe – to meet the high demand. It also strained the delivery of ordinary medical care.

Bruce Aylward of the WHO, who led an international mission to study China's response, noted last week that containment stopped the virus spreading generally and overwhelming healthcare in every Chinese province but Hubei, and mitigation measures aimed at preventing contact between people are driving case numbers down in Hubei. But this isn't permanent: China is still building hospitals, growing public health capacity and buying more ventilators for when cases rise again, he said.

Countries whose health systems struggle during a bad winter flu season, or which can't build new hospitals in days or lock down whole cities, could struggle to repeat China's success in slowing an outbreak.

In theory, the world has been preparing for a pandemic since concerns about bird flu spiked in 2006. "There has been some progress," says Tom Inglesby of the Johns Hopkins Center for Health Security in Maryland. "Many governments have done some kind of pandemic planning, improved their labs, set up emergency operations centres and improved surveillance systems."

Yet progress has been patchy. In 2017, the Coalition for Epidemic Preparedness Innovations was launched to develop vaccines for potentially pandemic viruses, and it has candidates for the covid-19 virus. However, it will take months to develop and test these.

In the meantime, we could do with treatments to help those

who develop severe covid-19. But an effort to set up a similar international project for antiviral drugs failed for lack of investment. Fortunately, some researchers have found possible anti-coronavirals, and these are currently being tested.

Even in advanced economies, the coronavirus is striking at a time when many health systems are under pressure due to ageing populations and increasingly expensive health technologies. Between 2000 and 2017, global health spending grew only slightly faster than economies overall, despite increasing demand.

Health systems that could be strained by a pandemic include those in Australia, the US and the UK, as well as those in many developing economies. According to a 2015 report, 56 countries – rich and poor – cut health expenditure as part of austerity measures after the 2008 financial crisis. Some of the poorest countries have cut public sector wages, affecting public hospitals and healthcare workers.

In the US, emergency capabilities have been dismantled under president Donald Trump, who shut down the National Security Council's global health unit, which was put in place after the 2014 Ebola crisis, and disbanded the team charged with coordinating government agencies in a pandemic response.

To get better prepared, Inglesby lists where the world needs to invest more money: the development of drugs, vaccines and rapid diagnostics, and their fast mass manufacture and distribution; disease surveillance; building stockpiles of protective equipment; and expanding capacity so that demand for ventilators doesn't outstrip the number of machines available.

An unexpected area that needs more understanding is quarantine. Of the more than 3000 people quarantined aboard the cruise ship Diamond Princess in Yokohama, Japan, after they were exposed to an infected passenger, at least 31 have fallen ill since leaving the ship. But the quarantine period was long enough that anyone infected should already have fallen ill by the end of it.

This suggests that, while most of the 634 cases detected while still on board or when disembarking were infected before quarantine began, the virus must also have spread during quarantine, says Stephen Lauer of Johns Hopkins University. That shouldn't be possible.

Clearly we have work to do. "Hopefully this tragic epidemic will galvanise not only a very strong response to the coronavirus at hand, but will also bring about major positive changes in our level of investment and commitment to pandemic planning going forward," says Inglesby. Until then, it could be a rough ride. ▮

DREW ANGERER/GETTY IMAGES

"Since the start of the outbreak, my administration has taken the most aggressive action in history to protect our citizens"

Donald Trump

The US president on 2 March

Analysis When is it a pandemic?

Why the WHO won't use the p-word

There are no criteria for a pandemic, but covid-19 looks like one, says **Debora MacKenzie**

FEATURECHINA/BARCROFT MEDIA VIA GETTY IMAGES

An isolation ward in a Wuhan hospital for critical covid-19 cases

PREPARE for a pandemic, said the World Health Organization, as the global spread of covid-19 began to soar. Yet so far the WHO isn't calling covid-19 a pandemic. Why?

The answer may lie with what kicks into gear when we deploy the p-word. Countries have pandemic plans that are launched when one is declared, but these plans may not be appropriate for covid-19.

There are no global criteria for a pandemic. There used to be for flu, but the WHO abandoned them when it was criticised after declaring a flu pandemic in 2009 that triggered expensive countermeasures in some countries.

That could be one reason the WHO seems anxious to avoid the word pandemic for now. But there is a more important one.

There are two responses to a growing pandemic. The first is containment: as cases appear, you isolate each person then trace and quarantine their contacts. The second is mitigation, such as cancelling mass gatherings. If containment only slows the virus, eventually you get "community spread": people are infected without knowing how they were exposed, so you can't quarantine all contacts. All you can do is try to slow the epidemic so it won't overload health facilities.

Normal flu skips between people so quickly that containment is a non-starter. Pandemic plans are mostly designed for flu, and they go straight to mitigation. The UK plan suggests containment only if a new pandemic flu isn't yet able to spread as fast as normal.

In this light, statements from the WHO start to make sense. "It's not either/or," said WHO director Tedros Adhanom Ghebreyesus last week. "We must focus on containment while doing everything we can to prepare for a potential pandemic."

Meanwhile, the WHO seems to have a third problem with the p-word. "Using the word pandemic now does not fit the facts but it may certainly cause fear," said Tedros. Asked about the WHO's reluctance to declare a pandemic, a spokesperson said: "It is important to focus on actions and not on words."

True – but words matter. Reluctance to tell the public the truth for fear of causing panic has plagued responses to other disease emergencies, notably BSE in the UK. ▮

Briefing

What you need to know

From symptoms and fatality rate to stockpiling and caring for family, **Michael Le Page** and **Jessica Hamzelou** have the answers

AS CONCERN increases worldwide, unscientific information about covid-19 and how to protect yourself is now rife, proliferating on social media and through messaging apps. Here's what we really know about it.

What are the symptoms?
More than 80 per cent of cases appear to be mild-to-moderate. The most common symptoms include fever, dry cough and tiredness, but some people may get just a sore throat or runny nose. Other individuals may not notice symptoms at all, but some go on to develop difficulty breathing and may ultimately experience organ failure.

Who is most at risk?
A report covering 82 deaths linked to covid-19 in Wuhan, China, found that 80 per cent of those who had died were over the age of 60, and three-quarters of these had other disorders that may have made them more vulnerable, including high blood pressure, diabetes, heart disease and cancer (medRxiv, doi.org/dnww).

However, no deaths have been reported in children under 9 years old. A report by the World Health Organization (WHO) and China, based on more than 75,000 cases, found that only 2.4 per cent were in those aged 18 or under (*JAMA*, doi.org/ggmq43). We don't yet know if children are less likely to catch the virus, or if they don't develop as strong symptoms.

How deadly is the virus?
Most estimates put the fatality rate at somewhere between 1 and 2 per cent of infections. This is higher in older populations. A report covering more than 44,000 cases put the fatality rate at 8 per cent for those in their 70s and 14.8 per cent for people aged 80 or over. But the precise figure is difficult to calculate because we can't be sure how many people have caught the virus, says Mark Woolhouse at the University of Edinburgh, UK.

ZUMA PRESS INC/ALAMY

The WHO says there is no need for healthy people to wear face masks

How do people catch the virus?
The covid-19 virus is thought to be transmitted by droplets emitted when people sneeze, cough or even just talk, says David Heymann at the London School of Hygiene and Tropical Medicine.

LINDSAY BROADBENT

"I'm a virologist, so I know what are on people's hands, so I don't shake hands at the best of times"
Lindsay Broadbent
Research fellow at Queen's University Belfast, UK, on BBC News, 3 March

If you are within 2 or 3 metres of an infected person, you can breathe in those droplets directly. The longer you are near them, the greater the risk.

Surfaces can be contaminated by falling droplets, or by people coughing into their hand before pressing a button, say. If you touch a contaminated surface and then touch your eyes, nose or face, you can become infected. Faeces from infected people might also be infectious.

How can I avoid catching the virus?
You can minimise your risk through "social distancing" and good hygiene. Move at least a metre away from anyone who appears ill if you can. Don't shake hands, hug or kiss people as a greeting. Wash your hands often with soap and water, or use an alcohol hand rub, especially after touching surfaces that might be contaminated.

The WHO says there is no need for healthy people to wear face masks, and the US surgeon-general has warned that a rush on buying them could lead to a lack of important supplies for healthcare professionals.

According to the WHO, there is no evidence that pets can get and spread the covid-19 virus, or that it can be passed on via letters, packages or food.

How can I protect myself?
It is being claimed that all kinds of things can protect you from the covid-19 virus, from vitamins to garlic. There is no evidence to support most of these claims. But there is evidence that moderate exercise, adequate sleep and a healthy diet help keep your immune system in shape generally.

We don't know if smoking raises the risk of people with covid-19 becoming severely ill, but previous studies have shown that smoking increases the risk of being hospitalised if you get flu. Now may be a good time to give up.

It might also be worth booking flu and pneumococcal vaccines, which are already recommended for people over the age of 65 in the UK. These won't prevent infection with the covid-19 virus, but by protecting you from other infections they should ease the burden on health services.

How can I avoid infecting others?
If you are ill and think you might have covid-19, don't go to a doctor or to a hospital – you might infect others. Stay at home and call your local heath authority. If you have a fever, cough and difficulty breathing, you should seek medical attention, says the WHO.

If you feel ill but have to go out, wear a face mask. Cover your mouth and nose with a tissue when you cough, and throw it away afterwards. If you don't have a tissue, cough into your bent elbow, not your hand.

There are various viruses circulating in the northern hemisphere right now, and if you come down with norovirus, for example, it is a good idea to stay at home for several days after symptoms finish. This will help reduce the spread of infections that would exacerbate the strain on health services, and make it easier to track those who really have covid-19.

What happens if my family or flatmates get sick?

Now is the time to think about what happens if you or people you care about become ill. "Plan who will check up on who," says Michael Osterholm at the University of Minnesota.

There is a high risk of the virus spreading among people who live together. Ideally, people who are ill should stay in a separate room and use a different bathroom, although this will be difficult in many situations.

If ill people require care, both they and the carer should wear masks, says Heymann. The carer should also wear gloves.

Should I stockpile food or medicine?

There are differing views on this. "I don't think it is necessary, and I certainly don't advise it," says Woolhouse.

Virology blogger Ian Mackay recommends slowly building up a "pandemic stash". "[But] don't buy things you won't eat later, don't hoard and don't buy more than you'll need for a 2 week period," he writes. "We're not talking zombie apocalypse and we very probably won't see power or water interruptions either."

Osterholm says don't try to stock up on your prescription medicine. "You might create a shortage for others who need it," he says. ▮

We were warned, so why couldn't we prevent it? SARS and MERS gave us ample warning of the risk of new coronaviruses, but we failed to set up sufficient defences, reports **Debora MacKenzie**

THE world dodged a bullet in 2003 when a global effort contained the SARS coronavirus, after it jumped from bats to humans in China and then spread to 26 countries. We nearly had another close call when MERS, another bat coronavirus, spilled over into people in 2012.

A year later, Chinese scientists found SARS-like viruses in fruit bats that could infect human cells. And in 2016, the World Health Organization put coronaviruses among the top eight known viral threats requiring more research.

So you would think we would have some coronavirus drugs and vaccines by now. But there are none licensed. That is why we are hurriedly testing drugs designed for other viruses to see if they can help, and running expedited trials for experimental vaccines. Why were we so unprepared for a threat we knew about?

After 2003, there was a burst of research, but it was short-lived. "From 2005, it became really difficult to get funding for work on SARS coronavirus," says Rolf Hilgenfeld at the University of Lübeck, Germany.

MEDSTOCKPHOTOS/ALAMY

We have vaccines for flu but not for the covid-19 virus yet

This was partly because, when SARS disappeared, there was no obvious market waiting for drugs or vaccines to treat it, says David Heymann at the London School of Hygiene and Tropical Medicine. Only big drug companies have the money and expertise to get drugs or vaccines through human trials, and without a market they can't invest. But Hilgenfeld says agencies that fund research also lost interest, because "prominent virologists believed that SARS coronavirus was a one-time only thing".

Compared with other coronaviruses, SARS had an extensive genetic mutation that prompted some virologists to guess that this was what allowed it to suddenly spread in humans – and that such a mutation was unlikely to happen again. They were right about the second part. The covid-19 virus doesn't have this mutation, but it spreads even better in humans than SARS did.

SARS did inspire some global measures. MERS was rapidly identified in 2012 because the European Union had started funding labs to sequence mystery respiratory viruses. In 2007, a revamped version of the International Health Regulations, a treaty designed to reduce the spread of diseases internationally, required advanced economies to help developing ones improve their capabilities for detecting and controlling disease. But nations mostly invested in global initiatives and "not enough in helping countries take care of themselves", says Heymann. No countries now meet the requirements of the 2007 treaty.

Another problem is getting people other than doctors and scientists on board. After SARS, China set up a network to spot mystery clusters of respiratory disease. It spotted covid-19 in Wuhan – whereupon local officials stifled efforts to raise the alarm.

Public health experts have warned for years that we need to do better. The next new disease might be worse and, unlike covid-19, totally unexpected. ▮

Epidemiology

What happened in earlier pandemics?

It wasn't that long ago that the last pandemic struck. In 2009, a flu virus from pigs jumped to people. The first serious cases were identified in Mexico but containment efforts were soon abandoned. The virus went on to infect a quarter of the world's population within a year.

Fortunately its impact was relatively mild. That virus killed only about 1 in 5000 of those it infected. But the covid-19 death rate appears to be around 1 in 100, more in line with the 1918 Spanish flu pandemic.

Almost all those people who survived that infection just over a century ago had normal flu symptoms. But with coronavirus it is different: around 20 per cent of cases fall seriously ill, and many of these people require ventilation to keep them alive until their immune system kills the virus.

If there was a rerun of 1918, in which half the US population was infected within a year, millions might need intensive care in that country alone.

Michael Le Page

Finance

World braces for economic impact

The repercussions for businesses, workers and supply chains could be severe

Adam Vaughan

GLOBAL economic growth could halve this year in a worst-case scenario for the covid-19 outbreak, the Organisation for Economic Co-operation and Development (OECD) said on Monday, as the financial impact of the disease becomes clearer.

At one point last week, $5 trillion was wiped off share markets globally in their worst week since the 2008 financial crash, although shares had since begun to rebound as *New Scientist* went to press.

The OECD downgraded its global GDP forecast for 2020 from 2.9 per cent to 2.4 per cent, but warned that a more intense and longer-lasting outbreak might restrict growth to just 1.5 per cent.

A pandemic lasting six months could knock $1.1 trillion off the expected growth of global GDP, according to a report by UK research firm Oxford Economics.

Consumers will spend less, people will be unable to work, travel and tourism will drop sharply and investment will fall, said the firm, which based its analysis on past outbreaks including SARS and swine flu.

"$1.1 trillion would be much less than the financial crash impact, the world economy would still be growing. Our forecast is 2.3 per cent GDP growth," says Ben May at Oxford Economics.

Calculating the economic damage so far is hampered by a lack of data, he says. Figures for industrial activity emerge slowly and efforts to extrapolate from what is happening in China are made harder by the changing timings of Chinese New Year – the initial outbreak in Wuhan coincided with the annual holiday.

However, there is evidence from some sectors, such as travel and tourism. Thailand, which normally gets just over a quarter of its visitors from China, saw numbers down 70 per cent in the first 10 days of February, compared with that period in 2019.

KYODO NEWS VIA GETTY IMAGES

"Clearly there will be big impacts on tourism, which we are seeing," says May. "You will also see weaker trade, which will lead to supply chain issues. Some businesses will be fine, others badly affected."

Airlines anticipate that demand will drop 4.7 per cent this year, which would be the first overall decline in global air travel since the 2008 crash. Around $29 billion is expected to be wiped off airlines' global revenues this year, with those in Asia-Pacific most affected, said trade body the International Air Transport Association.

Car firms have seen demand hit, says David Bailey at the University of Birmingham, UK, who notes that companies like Jaguar Land Rover have said they aren't currently selling any cars in China. "We might even see global car s ales decrease this year for the first time in many years," says Bailey.

Although car manufacturers use a "just-in-time" production model, meaning parts arrive at a factory shortly before they are needed rather than being stored on site, those in the UK source relatively few components from Asia, less than 10 per cent.

However, they could still face disruption, as shown by Jaguar Land Rover flying parts from China to the UK in suitcases. If and when production restarts in Chinese factories that have currently downed tools, there will still be a delay to restoring supply chains because parts take six to seven weeks to reach Europe.

The effect on the UK economy remains to be seen, but health secretary Matt Hancock has told firms to issue sick pay to staff who self-isolate from the virus on National Health Service advice.

Sickness from the outbreak could cost the UK billions, a Department of Health report suggests. Though only illustrative, the 2011 analysis of a potential flu pandemic found that GDP would take a £28 billion hit if half of employees had to be absent from work.

Depending on how long a pandemic lasts, the economic fallout for some could be lethal. Aaron Reeves at the University of Oxford, who was part of a team that found the financial crash was linked to an extra 10,000 suicides in Europe and North America, says the recent stock market fall could result in additional suicides.

We are starting to feel the financial effects of the covid-19 outbreak

$5 trillion

Amount wiped off global share markets last week

"There is a real chance this leads to rises in unemployment in the next three to six months," he says. "We would expect some mental health implications, and the hard edge of that is suicide."

It would be surprising if a coronavirus pandemic led to as many suicides as the 2008 crash, but the number is still likely to be significant, says Reeves.

How bad the effect is will depend on where the economic damage lands: countries with stronger social welfare provisions mitigate the knock-on impact on suicides, he says. ▮

Need a listening ear? UK Samaritans: 116123 (samaritans.org). Visit bit.ly/SuicideHelplines for hotlines and websites for other countries.

FRANK AUGSTEIN/PA WIRE/GETTY IMAGES

"Our country remains extremely well prepared, as it has been since the outbreak began"

Boris Johnson

The UK prime minister at a press conference on 3 March