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The Executive Summary is produced weekly and contains in-depth analysis.  
International SOS publishes a COVID-19 [Daily Case Summary](#).

### INTRODUCTION

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### NEW CATEGORY “ZERO 14” ADDED TO OUR “LOCATIONS WITH CASES MAP”

International SOS has added the new category “ZERO 14” to our “[Locations with cases map](#)”. The main criterion is “No new cases in over 14 days”

#### CURRENT STATUS

CATEGORY: OUTBREAK	
<b>Definition: Countries have one or more of the following characteristics:</b> <ul style="list-style-type: none"><li>• <math>\geq 1,000</math> cases</li><li>• Locally acquired cases in many areas</li></ul>	
<b>Countries added in last SEVEN days</b>	
<ul style="list-style-type: none"><li>• Guinea Bissau</li><li>• Costa Rica</li></ul>	<ul style="list-style-type: none"><li>• Haiti</li><li>• Albania</li></ul>

## CATEGORY: WANING

### Definition:

- < 100 cases / day
- 2 weeks of declining case numbers
- Sporadic cases or clusters as per WHO
- Some lifting of restrictions

### All countries in category

- |   |   |   |
|---|---|---|
| <ul style="list-style-type: none"> <li>• Australia</li> <li>• China</li> <li>• Czech Republic</li> <li>• Estonia</li> </ul> | <ul style="list-style-type: none"> <li>• Greece</li> <li>• Israel</li> <li>• Luxembourg</li> <li>• New Zealand</li> </ul> | <ul style="list-style-type: none"> <li>• Norway</li> <li>• Slovenia</li> <li>• South Korea</li> <li>• Thailand</li> </ul> |
|---|---|---|

## CATEGORY: ZERO 14

### Definition:

- No new cases in over 14 days
- Sporadic cases or clusters as per WHO
- Some lifting of restrictions

### All countries in category

- |   |  |  |
|---|--|--|
| <ul style="list-style-type: none"> <li>• Anguilla</li> <li>• Antigua and Barbuda</li> <li>• Aruba</li> <li>• Belize</li> <li>• British Virgin Islands</li> <li>• Brunei</li> <li>• Dominica</li> <li>• East Timor</li> <li>• Eritrea</li> <li>• Falkland Islands</li> </ul> | <ul style="list-style-type: none"> <li>• Faroe Islands</li> <li>• Fiji</li> <li>• Fr. Polynesia</li> <li>• Guernsey</li> <li>• Laos</li> <li>• Liechtenstein</li> <li>• Macao</li> <li>• Montenegro</li> <li>• Montserrat</li> <li>• Papua New Guinea</li> </ul> | <ul style="list-style-type: none"> <li>• Saint Barthelemy</li> <li>• Saint Kitts and Nevis</li> <li>• Saint Lucia</li> <li>• Saint Pierre and Miquelon</li> <li>• Seychelles</li> <li>• Sint Maarten</li> <li>• Tanzania</li> <li>• Turks and Caicos</li> <li>• United States Virgin Islands</li> <li>• Vatican</li> </ul> |
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## ARTICLE / JOURNAL ROUNDUP

### Black & Asian people in England are at twice the risk of death than White British people

A study from [Public Health England](#) has found significant differences between the ethnicities and the risk of death from COVID-19:

- “People of Bangladeshi ethnicity had around twice the risk of death than people of White British ethnicity
- “People of Chinese, Indian, Pakistani, Other Asian, Caribbean and Other Black ethnicity had between 10 and 50% higher risk of death when compared to White British.”

This study did not control for the effect of occupation, comorbidities or obesity, which can affect the acquiring or dying from the disease, or both.

## About 17% of people in London and 7% nationwide have antibodies to COVID-19

The Health and Social Care Secretary, Matt Hancock, announced that results of the monitoring of antibody development in the population shows that:

- Around [17% of people in London have antibodies](#) to SARS-CoV-2
  - Testing for antibodies so far has been carried out in a targeted fashion, and the plan is to have much wider testing. The first phase will be increased testing of "health and care staff, patients and residents". As knowledge of the antibody response increases, the aim is to "develop the systems of certification to ensure people who have positive antibodies can be given assurance about what they can safely do."
- Around [7% of a random sample of the population](#) have antibodies to SARS-CoV-2
  - Blood samples were tested from 885 people from randomly selected private households since 26 April. This low level of people who have naturally developed antibodies to the virus is too low to rely on herd immunity protecting the population.

## 10% of diabetics die within days of coronavirus hospitalisation

One in 10 diabetics with coronavirus dies within seven days of hospital admission, according to a study of more than 1,300 patients published Friday in the journal [Diabetologia](#).

- "The presence of diabetic complications and increased age increase the risk of death
- "Increased BMI" -- body mass index, a ratio of height to weight -- "is associated with both increased risk of needing mechanical ventilation and with increased risk of death
- "Worse blood sugar control in and of itself, however, did not seem to impact a patient's outcome."

Two-thirds of the patients were men, and the average age across both sexes was 70.

## Vaccine opponents are gaining in Facebook "battle for hearts and minds"

The magazine [Science](#) has reported on "a first-of-its-kind" analysis of more than 1,300 Facebook pages with nearly 100 million followers:

- "Anti-vaccine pages have fewer followers than pro-vaccine pages but are more numerous, faster growing, and increasingly more connected to undecided pages
- "If the current trends continue, the researchers predict, antivaccine views will dominate online discussion in 10 years—a time when a future vaccine against COVID-19 may be critical to public health".

## Wrong results: how accurate are PCR tests for COVID-19?

There has been significant previous discussion around the accuracy of SARS-CoV2 antibody tests, particularly the lateral flow POC type.

However, a death in a rural Queensland town last week has highlighted that all test results can be incorrect. A 30-year-old man, with comorbidities, died and the first PCR test came back positive. The puzzling thing was that there had never been a COVID-19 case in this small town and the deceased had not left the town for months. Multiple subsequent tests done before and after autopsy were negative. A negative result fitted the epidemiologic picture much better.

But what happened?

### False positive PCR tests:

Dr Ian Mackay, Supervising Scientist in Queensland Health, supporting the detection and characterisation of rare and emerging viral threats, [told the ABC](#) that a false positive could also come from human error. They are “usually due to a lab being contaminated with the virus or with product from a previous test”, he said.

### False negative PCR tests:

Dr Mackay said the virus moved around the body, so where the sample was taken from could be critical. If the virus was lurking in a person's lungs at the time of testing, but the swab was taken at the back of the nose it may not be accurate. Also, the quality of the sampling can lead to false negative tests.

[Science Daily](#) reported on a study published 13 May in the Annals of Internal Medicine titled “Beware of false negatives in diagnostic testing of COVID-19”.

- The researchers found that the probability of a false negative result decreases from 100% on Day 1 of being infected to 67% on Day 4.
- The false negative rate decreased to 20% on Day 8 (three days after a person begins experiencing symptoms).
- They also found that on the day a person started experiencing actual symptoms of illness, the average false negative rate was 38%.
- In addition, the false negative rate began to increase again from 21% on Day 9 to 66% on Day 21.

The study, which analyzed seven previously published studies on RT-PCR performance, adds to evidence that caution should be used in the interpretation of negative test results, particularly for individuals likely to have been exposed or who have symptoms consistent with COVID-19.”

## HOW MUCH PCR TESTING IS “ENOUGH”? CO-AUTHOR: DR. HENDRIK SCHOLTZ

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Data and graphs from: [OurWorldinData](#)

There are various methodologies used to predict if a country is doing “enough” PCR testing. Here we examine the topic. But firstly, what is the role of PCR testing?

1. To stop transmission:
  - Confirm cases (and so their contacts)
  - Seek out asymptomatic or pauci-symptomatic cases
  - Have higher testing rates for those with a higher risk of COVID-19 (e.g. healthcare workers)
2. To inform control strategies by understanding the epidemiology of the epidemic by measuring, for example:
  - The percentage of members of certain groups infected
  - The percentage of residents of certain locations infected
  - The percentage of employees of certain occupations infected.

Testing strategies need to be flexible. They need to make best use of the available resources and may change as the epidemic and resources change. Here we discuss three such strategies:

### 1. PCR tests per 1,000 people

One measure of the adequacy of an individual country's PCR testing used is to measure the ratio of the total tests performed to the population size. Results vary from:

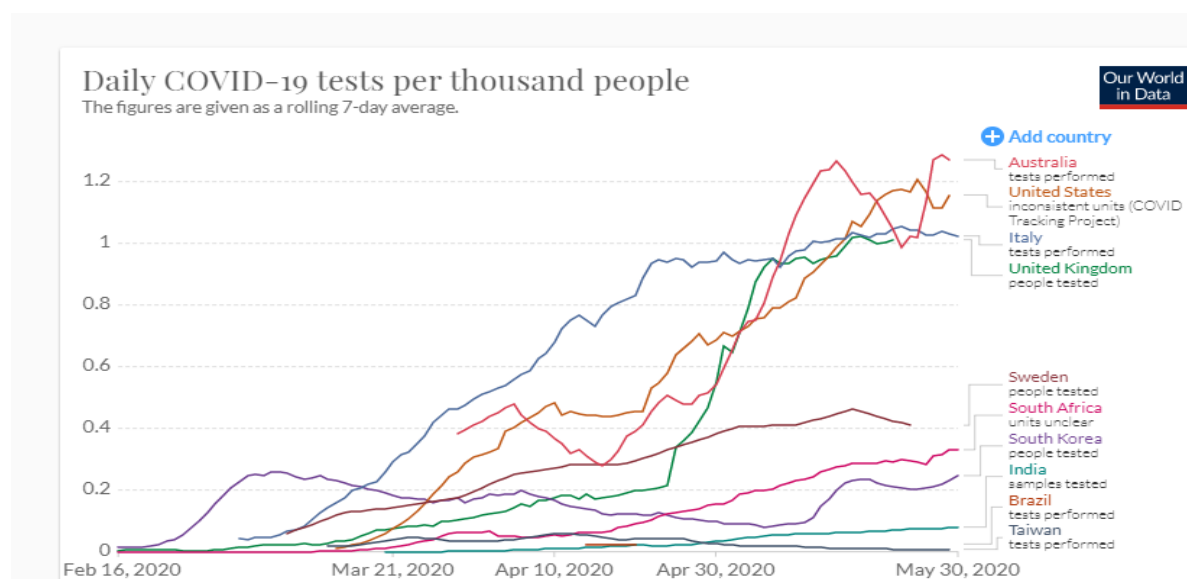
- Russia: 70 / 1,000 to
- Nigeria: 0.02 / 1,000

### 2. PCR tests per 1,000 people per day

Another measure is the calculation of the number of PCR tests performed per 1,000 people per day. Results vary from:

Russia: 1.94 / 1,000 people per day  
Zimbabwe: 0.02 / 1,000 people per day

However, this ratio does not tell a complete story, as this chart from [OurWorldinData](https://ourworldindata.org/covid-testing) shows:



Using that ratio, some of the countries who have been most successful “flattening the curve” have quite low testing numbers per 1,000 population and vice versa.

Country	PCR tests per 1,000 population
Taiwan	< 0.01
India	0.08
South Korea	0.23
South Africa	0.33
Sweden	0.41
Italy	1.03
US	1.16
Australia	1.27

### 3. Ratio of tests performed to cases

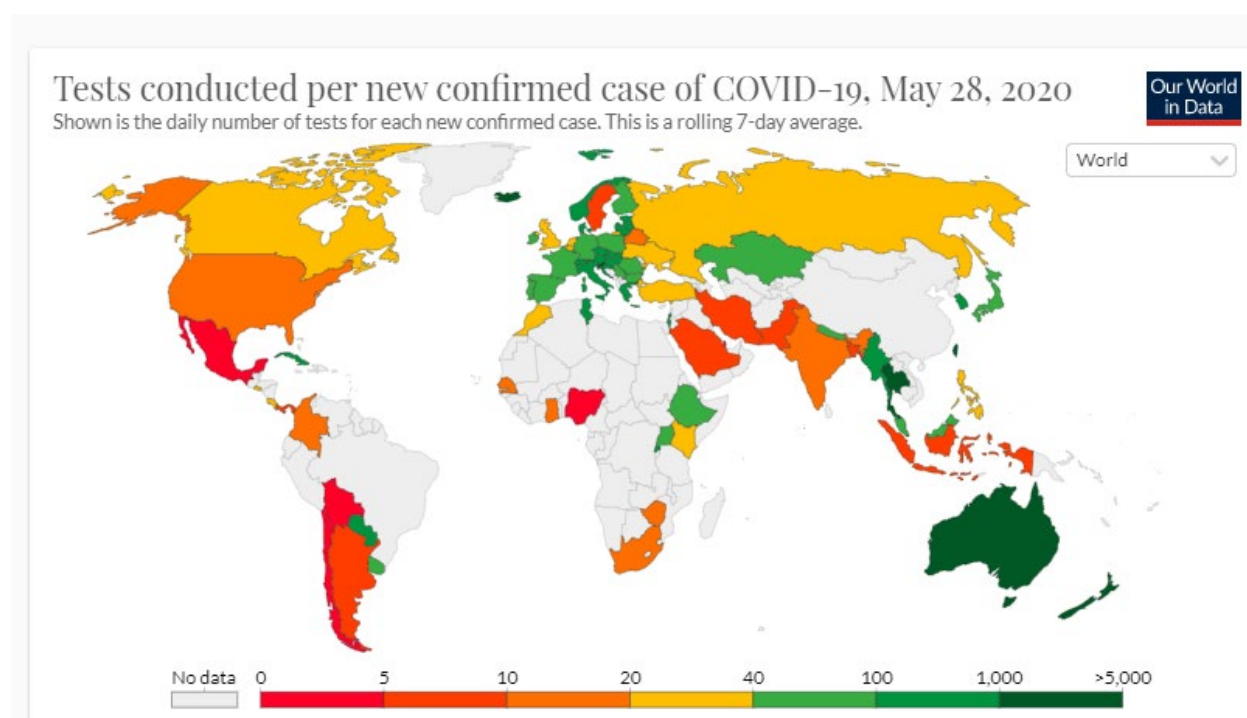
A third and possibly more accurate way of measuring the adequacy of a testing program may be the ratio between the number of tests performed and the total number of cases.

This ratio will be higher where more tests are performed but also higher where there have been less cases.

The [WHO has suggested around 10–30 tests per confirmed case](https://www.who.int/news-room/feature-stories/covid19-testing) as a general benchmark of adequate testing.

Table: Tests performed per confirmed case, Data and map: [OurWorldinData](https://ourworldindata.org/covid-testing)

Country	Tests per case	International SOS comment
Australia	3,000	Has been increasing
Taiwan	1,480	Steady test rate
South Korea	320	Recent increase
Italy	120	Increasing since April
Japan	65	After relaxation of testing criteria on 6 March (see later section)
US	21	Has been increasing
India	16	Adequate if good case finding
South Africa	16	Adequate if good case finding
Hubei	No data	Towards the end of outbreak March 2020 ratio 9:1
Indonesia	9	Low
Sweden	8	Low
Singapore	7.75	Before migrant worker dormitory outbreak



### Exported cases as a measure of testing

The checks and balances confirming that a country is performing enough tests include the case fatality rate and the number of exported cases.

Iran is a good example. Iran's first cases of COVID-19 were confirmed in other countries after infected travelers had left Iran. This revealed an unrecognized epidemic in Iran, partly caused by almost no testing having been done.

## A COUPLE OF THINGS ABOUT TRANSMISSION

### 1. Transmission 18.7 times more likely indoors than outdoors

A [non-peer reviewed study in Japan](#) has investigated 110 COVID-19 cases among 11 clusters. The number of secondary cases generated by each primary case was calculated using contact tracing data.

Results: The odds that primary cases transmitted COVID-19 in a closed space was 18.7 higher than in an open-air environment.

### 2. Indoor spread of COVID-19 can be lessened

The spread of [aerosolized SARS-CoV-2](#), the virus that causes COVID-19, inside public buildings could be suppressed using engineering controls such as effective ventilation, possibly with air filtration and disinfection and avoidance of air recirculation and overcrowding, according to a research letter published yesterday in Environment International.

### 3. Scarce evidence of other modes of transmission

While SARS-CoV-2 transmission has been proposed to occur via touching the face after contact with large respiratory droplets and contaminated surfaces, the [authors noted the lack of direct evidence of this mode of spread](#). Also, the virus has been shown to remain stable in airborne particles for longer than two hours.

"It is scientifically incongruous that the level of evidence required to demonstrate airborne transmission is so much higher than for these other transmission modes," the authors said.

### 4. Swiss hugging experiment key to answers on COVID-19 risk in kids

Swiss authorities plan to [allow children to hug their grandparents](#) and this will act as a test case for the rest of the world on whether physical contact between the young and the old is safe during the COVID-19 pandemic.

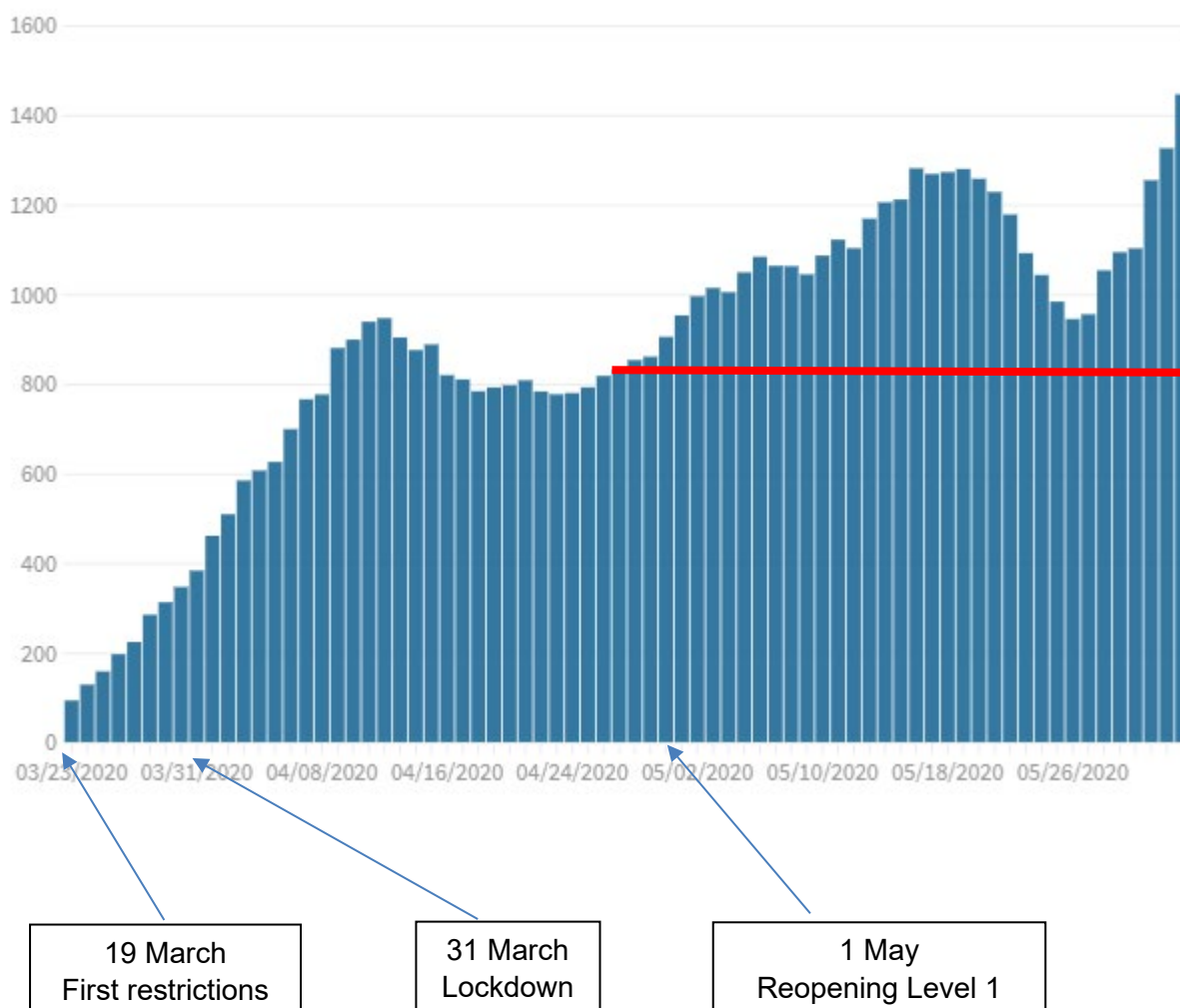
## UPDATE ON TEXAS

This is our fifth weekly report on the number of cases per day in Texas since "re-opening" in stages began on 1 May.

### New cases per day

The graph below from the Houston Chronicle shows a sharp increase in new coronavirus cases. The rate remains higher than when the re-opening began on 1 May (1,425 v's 850 / day).

Texas: Seven day rolling average of new confirmed cases: [Houston Chronicle](#)





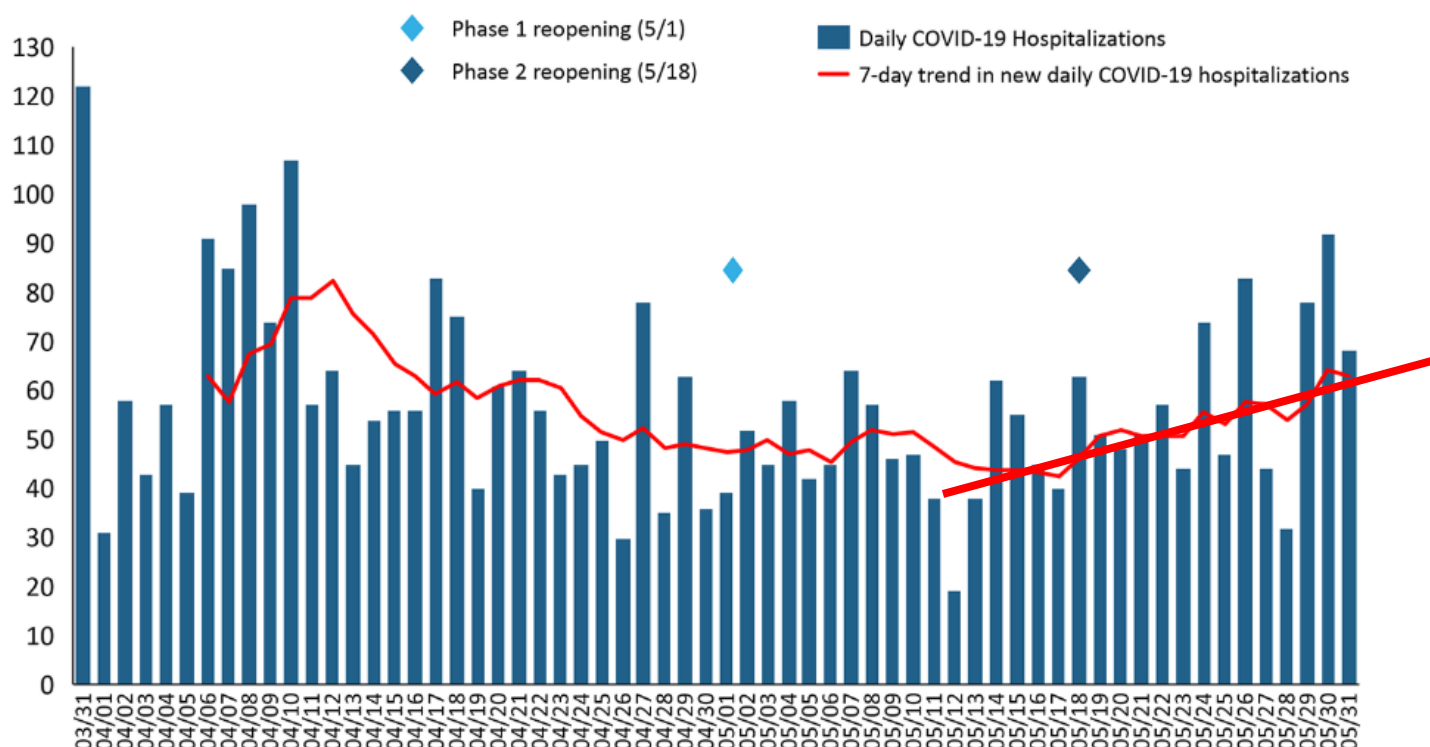
## Hospitalizations in Texas

The State of Texas does not report daily state-level hospitalizations however Texas Medical Centre (Houston) does. The graph shows a continued increase in new COVID hospitalizations in recent weeks. Currently there is a 2.1% growth in daily COVID-19 hospitalizations.

Graph: [Texas Medical Centre](#)

### TMC DAILY NEW COVID-19 HOSPITALIZATIONS

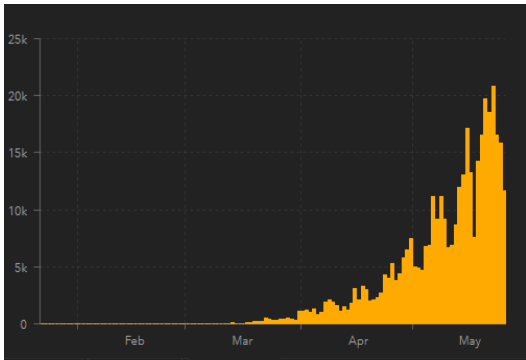
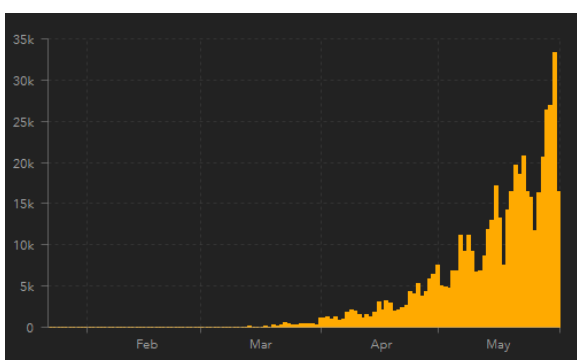
*ICU & Med Surg hospitalizations*





## BRAZIL: EPIDEMIC GATHERING SPEED

Data and graphs: Johns Hopkins [University](#).

	LAST WEEK	THIS WEEK
<b>CASES</b>	375,000	526,000
<b>DEATHS</b>	24,000	30,000
<b>DAILY NEW CASES</b>	21,000	33,000
<b>EPICURVE</b>		

- Making things worse, President Jair Bolsonaro supported protests against the Congress and the Brazilian Supreme Court after the Court supported restrictive measures imposed by the Governors to slow the spread of COVID-19.
- A [University of Washington study](#) warns that the total death toll for Brazil could climb five-fold to 125,000 by early August.

## KOREA: RESTRICTIONS REINTRODUCED / SNAPSHOT OF COVID-19 MANAGEMENT

### Second peak in the first wave – restrictions reintroduced

- Korea has had several clusters recently:
  - Itaewon nightclub cluster: 266 cases
  - Coupang mail-order company: 102 cases
- [Restrictions have been tightened again](#) in Seoul and its outskirts:
  - Public institutions including museums, theatres, and multifunctional halls have been shut until 14 June.
  - More than 500 schools were closed after briefly re-opening.

## Daily confirmed COVID-19 cases

The number of confirmed cases is lower than the number of total cases. The main reason for this is limited testing.

Our World  
in Data



### Quarantine

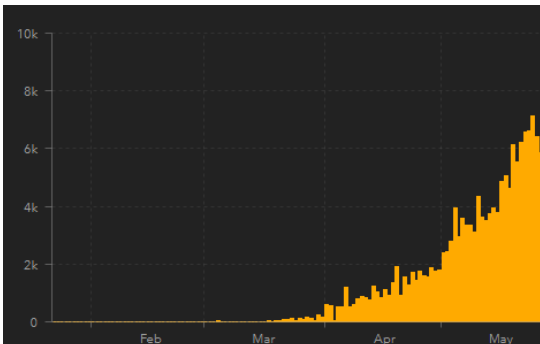
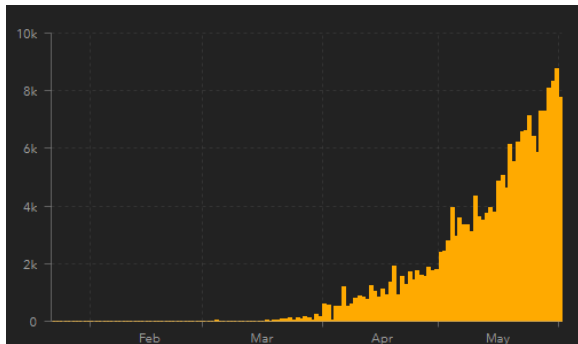
- Korea currently has 823 people in quarantine, having released 10,446

Confirmed Cases	Released from Quarantine	Quarantined	Deceased
11,541	10,446	823	272

**NOTE:** at its peak, China had over 670,000 people in quarantine.

## INDIA: NOT PAST PEAK BUT EASING RESTRICTIONS

Data and graphs: Johns Hopkins [University](#).

	LAST WEEK	THIS WEEK
<b>CASES</b>	158,000	199,000
<b>DEATHS</b>	4,337	5,608
<b>DAILY NEW CASES</b>	5,800	8,500
<b>EPICURVE</b>		

- More than [80% of the active cases](#) are in five states - Maharashtra, Tamil Nadu, Delhi, Gujarat and Madhya Pradesh. More than 60% of the cases are in five cities, including Mumbai, Delhi and Ahmedabad
- [News items](#) from Mumbai indicate that hospitals are overwhelmed. Mumbai has over 37,000 cases and 1,200 deaths making up one-fifth of India's total cases and a quarter of all deaths
- [Slums](#), with crowded conditions and communal showers, are being hard hit.

### India to loosen lockdown

Despite not having passed the epidemic peak, India has announced plans to ease the lockdown.

- From 8 June, restaurants, hotels, shopping centres and places of worship will be allowed to re-open in many areas in the first stage of a three-phase plan
- Hotspots will remain in tight lockdown
- Schools and colleges may open again in July.

## UNDERSTANDING THE DIFFERING NATURE OF COVID-19 EPIDEMICS IN DIFFERENT COUNTRIES

CO-AUTHOR: DR. HENDRIK SCHOLTZ

### Introduction

The nature of the COVID-19 epidemic varies substantially between countries. Noting that SARS-CoV-2 essentially has not mutated, and that all countries are being exposed to the same strain of virus, we examine some of the factors that determine the nature of the outbreak in particular countries and lessons that can be learned.

### Aim is to flatten the curve

A main aim of COVID-19 management is to “flatten the pandemic curve”, keeping the burden on healthcare systems manageable so ensuring all infected persons receive the best care available in that country or location.

### 1. Early lockdown, border closures and mandatory quarantines

Lockdown basically consists of a variety of containment measures designed to restrict the movement of individuals. Many countries in Asia learned from earlier pandemics, especially SARS but also MERS, that early lockdown is important to minimize the size of an outbreak.

China and South Korea introduced lockdowns when they had about 1,000 COVID-19 cases. However, the severity of their lockdowns differed, with China ordering “shelter in place” lockdowns and South Korea having a lighter version based on public education, social distancing, non-mandatory stay at home orders, contact tracing, fast ramping up of testing, high-tech surveillance, and quarantine of contacts. It did not impose a curfew or stop people from going to work.

Taiwan and Vietnam closed “earlier” - with much lower case numbers than China and South Korea - and have limited their epidemics.

South Africa, realizing that its economy could not sustain a prolonged lockdown, also moved early, however, did not “flatten the curve” as successfully as the countries mentioned above due to another factor discussed below: the lack of societal compliance.

In Europe, Germany had the infrastructure to perform adequate contact tracing and testing early on; this was surprisingly lacking in many other European countries and the USA. Germany went into lockdown earlier than neighbours and fared much better from both size of the outbreak and from a case fatality rate perspective.

In Italy, the Chief Medical Officer of the worst hit northern province was severely criticized for the higher amount of testing he instituted as “the numbers make the situation look worse than it is”. Partly due to this restricted testing, lockdown measures were not implemented early. The same CMO later commented that the resulting overwhelming of the healthcare system was like a bomb exploding; he had ten spare ventilators one night and fell short by 500 ventilators the next night. The delayed lockdown, together with the elderly population, contributed to Italy’s high case fatality rate.

In the UK, the government was advised by epidemiologists from a prominent academic institution that, based on their modelling, the pandemic could be handled by establishing herd immunity. It took the government ten days to appreciate the high number of deaths that would occur using this method, and only then did they institute lockdown measures. This delay resulted in the UK having some of the highest case numbers and fatalities in Europe.

Recent modelling has predicted that changes to the date of lockdowns may have had significant effects:

- In Australia, a [one-week delay of lockdown](#) may have caused 35,000 more infections
- In the USA, [starting lockdown one week earlier](#) may have prevented 36,000 deaths.

## 2. Testing

The level of testing undoubtedly influences the local epidemic. What remains unseen remains unsuspected.

### a) Hubei

Towards the end of the epidemic in Hubei province at the end of March 2020, China had performed 700,000 tests against 80,000 cases in Hubei with a population of 60 million. In this province, China was therefore testing at a ratio of 9:1.

### b) South Korea

At the end of the epidemic in Daegu and Cheongdo, South Korea was testing at a ratio of 32:1.

This gave us a clear picture of the history of the epidemic: 1) Daegu and Cheongdo, then 2) Cheongsam 350km southwest of Seoul, then 3) the cluster in suburban Seoul of 80 cases in a call center, and lately, the 4) Itaewon-related cluster

### c) Singapore

In Singapore, before the migrant worker dormitory outbreak, Singapore testing was at a ratio of 36:1

### d) Taiwan

Taiwan started off with a solid testing regime which was initially 39:1. As time progressed and their testing continued at a steady rate while the number of new cases remained low, the testing ratio is now 1,477:1.

### e) South Africa

South Africa started a testing program at a ratio of more than 20:1, but as the total case numbers increased and the testing backlog increased, the ratio is now slightly lower at 16:1

### f) USA

At the peak of the epidemic in the USA, the testing rate was 6.5:1. This has improved to 17.44:1 (over 30 million tests have been performed in the USA). An [article in the Atlantic magazine](#) reports that some states are including antibody testing in the numbers they release for PCR testing.

### g) Japan

Initially, Japan followed the case definitions of the US CDC and implemented a protocol which restricted the amount of tests done; it was almost impossible to get tested unless a person could name the contact from whom they contracted the disease, regardless of their symptoms. This resulted in a unique pattern of scattered and isolated cases around the country, rather than the more familiar cluster pattern.

On 10 March 2020 there was a sudden jump in the number of new cases reported. We then realized that on 6 March authorities had relaxed the testing protocol somewhat.

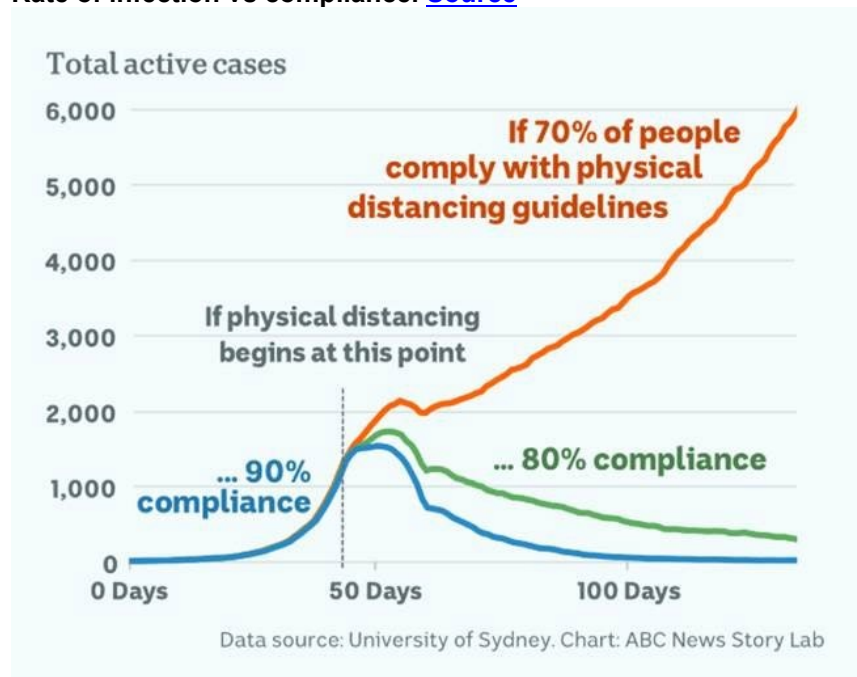
Another jump in case numbers was seen after the announcement that the Olympic Games had been postponed, after which the testing protocol was further relaxed. At this time Japan was testing at a ratio of 11.5:1 and by then a more accurate picture with well-defined clusters had emerged. An example is the large cluster in Hokkaido.

### 3. Societal compliance

A study by the University of Sydney summarized in the graphic Fig.1, clearly explains the importance of societal compliance with the lockdown measures instituted by governments, including social distancing.

Authorities can recommend or mandate certain interventions, but unless 80% of the population comply with the measures, they are likely to be unsuccessful and, as a result, the economic cost of lockdown is wasted.

#### Rate of infection vs compliance. [Source](#)



The factors that affect societal compliance are probably worth studying separately, but observed examples clearly point to the attitude of society and political influence of leaders as major contributors.

In some countries in Asia, such as Japan, Singapore and Taiwan, the common good of society is rated paramount. This leads to a willingness to compromise individual rights and bear discomfort for the greater good of the community. As a result, compliance with lockdown measures is particularly high and enforcement measures tolerated.

In some Western countries, the individual rights culture may trump the greater good of society. This may be due to history and the leadership; the ability of a leader to connect and lead their electorate is of prime importance. The example of the inspirational leadership style of the Prime Minister of New Zealand is a case in point, being able to positively influence society and help them achieve the desired results.

In contrast to New Zealand, South Africa, also a constitutional democracy, lost the support of its people in fighting the pandemic due to poor political leadership. Unscientific measures such as bans on the consumption of alcohol and tobacco, the distribution of prepared meals and takeaway food and restricting online shopping were instituted. There was also abuse of power by the police, military, and politicians. As a result, their testing and early lockdown did not have the hoped-for result, while the economic cost was the same.

### 4. Established societal and cultural norms and habits

Only recently has the importance of mask wearing, in combination with social distancing and personal hygiene, been recognized as a significant factor in limiting the spread of SARS-CoV-2.

In Japan, as in many Asian countries, mask wearing has been an established cultural norm since the 1990s; people with even the mildest flu-like symptoms wear a mask. This, combined with no-contact greetings such as bowing, respecting an individual's personal space and a particular focus on personal hygiene habits such as hand washing and gargling, may have played an important role in combating the spread of the virus.

It remains unexplained how outbreaks have not occurred despite Japanese people being packed into trains. The length of the journey would be one variable, however there may be other societal norms and habits at play.

In addition, we await the publication of analysis of contact tracing data to help us understand higher-risk situations. In much the same way that we learned that choir singing is a particular risk, we may find that outdoor activity, for example, is extremely low risk!

## **5. Innate immunity, public health and population demographics**

A factor needing further study, is the early observation that some low-income countries in Africa, the Indian subcontinent and South East Asia tend to have relatively low case fatality rates.

These findings may be linked to several interconnected factors such as active immunization programs including BCG, regular exposure to infectious diseases ranging from diarrhoea to malaria, and all of this occurring in a population that is much younger compared to populations in Europe and America. In addition, due to annual disease outbreaks, these countries tend to have effective public health systems, possibly being more practical and less theoretical than counterparts in the higher-income world.

The ability of South Africa to train and deploy 20,000 public health care workers shortly after the first COVID-19 case was reported is a good example.

Of all the countries in Africa, Ghana is one of the leading examples of how to deal with the pandemic. It went into lockdown when it only had 250 cases, it has performed about 150,000 tests to date at a ratio of 17:1 and is beginning to lift restrictions on its economic activity while continuing to test.

## **Conclusion**

The real reasons for the different nature of outbreaks in countries will probably only be known when we better understand the virus, including its transmission dynamics, and when we have a clear picture of the actual nature of the outbreaks using serological surveys to confirm number of people infected.

## **A VIEW FROM THE LABORATORY: PROFESSOR JOHN OXFORD**

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### **What does it feel like to live in a country which has the highest excess death rates?**

In a couple of words “not good”. The title above comes from the Financial Times (FT) and the journalists there, who after all are immersed in mathematics analysed data from 19 countries. On 28 May, the FT registered 59,597 deaths since 20 March “indicating that the virus had killed 891 people per million”. But Spain revised its figures upwards to 921 per million and we slipped a little. Now, the USA leads this list. Like the  $R_0$  number, the concept of “excess mortality” has reached the ears of many scientists as a new concept, including some I fear who are interacting with the politicians.

Increased mortality of the aged during influenza epidemics was first given numerical prominence by Farr in relation to the 1847 pandemic (10<sup>th</sup> Annual Report of the Register General, HMSO, London). A formula introduced by Serfling in 1963 embedded “influenza” mortality into already documented recognised seasonal variations in mortality and also long-term trends. Langmuir noted an increase in cardiovascular disease at the time of influenza epidemics. The US CDC used a combination of methods and analysed weekly pneumonia and influenza deaths in large cities in the UK. In the USA, substantial excess mortality was linked with influenza epidemics. In 2015 in the UK there were over 30,000 excess deaths attributable to influenza. ‘Influenza’ is hardly ever written on death certificates. GP’s would write “cardiovascular disease” etc.



I am sure that international comparisons will now begin for mortality from COVID-19 in attempts to analyse what went wrong in some countries. I see no harm in this sort of analysis because it will help preparations for further waves of COVID-19, possibly combined with influenza.

### **Speculation as to whether the epidemic Coronavirus OC43 emerged from cows in 1889 and caused a so-called Russian Pandemic of that year?**

I must say that these days with journalists housebound looking for new projects, there is no end to questions. I am deluged every day about  $R_0$ , incubation times, pathology etc. But today there was something new for me! And there could even be an element of historical and virological accuracy. A group of scientists in Belgium published in the Journal of Virology in 2005, and the article has been re-discovered.

Their hypothesis is a coronavirus emerged from a cow. The virus was OC43 and actually caused the 1889 pandemic.

The virological explanation is based on molecular clock analysis on modern strains of OC43 and back-tracing the same strain to the 1960's. This analysis points to 1889/90 as the time of emergence into the human population. OC43 was one of the first viruses I cultivated in the laboratory as a student and by that time, and ever since, we have all viewed this coronavirus as an epidemic and seasonal and mild agent of the upper airways. To be optimistic, the Russian data, if correct, could be telling us that between 1889 and 1960 the pandemic coronavirus became weakened and attenuated. In the same manner the 1918 Spanish Influenza became much less deadly between 1918 and 1957 when it was completely overtaken by a new influenza pandemic called Asian influenza. **So perhaps with molecular biology we can deliberately weaken current the COVID-19 virus?**

Perhaps though we should be a little less accepting. Is there even evidence of COVID-19 like characteristics of the 1889 pandemic? We know that the current COVID-19 has a definite "neurological" side. But so does influenza and an example is Von Economo disease between 1918-1925 when 5 million people died. It is positioned as a rare complication of the Spanish Influenza.

With Dr Rod Daniels, I visited Novosibirsk in Siberia to search for deep frozen victims of the 1889 Russian pandemic buried in permafrost. Working with scientists at the WHO Smallpox Laboratory there the team located both smallpox and "respiratory virus" deaths of 1889/90. So, exhumation could provide clinical samples for detailed molecular analysis!

### **Imperial College report 25 for South Korea**

I am pleased to see a comment from a UK scientist: "As we exit from lockdown in the UK we need to learn as much from other countries as we can" (Steven Riley, Imperial College). He also noted that there was a need to trace clusters at least as well as in South Korea and then implement quarantine and testing and isolating. It must also be important to understand the relative importance of social distancing in this important and successful strategy. South Korea had a 38% national decrease in movement which occurred voluntarily between 24 February and 11 March. Their epidemic is characterised by large clusters of cases particularly amongst a religious group accounting for 48%

of COVID-19 cases. **Contact tracing for infected individuals was a relatively minor aspect of the programme (11% of cases), while cluster investigations accounted for as much as 45% of all cases.**

It is a fact that each country will have to face this “exit” issue itself but certainly not by ignoring China. I feel also that the attitude of politicians in the USA towards WHO is not helping the USA, and indeed our own country where we need international cooperation and not the opposite. The smallpox eradication campaign (and now polio) is spearheaded by WHO.

### **Face coverings, aerosol dispersion and mitigation of virus transmission risk**

A new piece of data relevant to face masks with a lead author from the School of Engineering, University of Edinburgh, attracted my attention. I must admit though that I may be biased towards Edinburgh. My youngest daughter trained there, and I am a Fellow of the Royal College of Physicians there. The other authors are from the Roslin Institute, Maxwell Institute for Mathematical Sciences and the Paediatric Critical Care Unit.

This huge interaction is something new and rather wonderful as scientists get together to overcome this virus! The team used background oriented Schlieren optical technique to look at air flows ejected by a patient while quietly and heavily breathing and while coughing and testing a variety of face masks and face covers. They anticipate that this sort of data will help inform decision makers. Incidentally, there has been a trend in Europe to use masks. In Spain they become obligatory this weekend, whereas in SE Asia they have been for some time. The UK has suffered from a lack of medical masks in spite of pre-planning. This effort seems to have been dismantled to save money and “make public health establishment more efficient”. This is a warning for the future.

The data using manikins showed that covers without an exhalation valve reduced the front flow of air by 90% or more. More novel, at least to me, was their observation that **surgical and hand-made masks and shields generated leakage jets that presented hazards**. These jets were both downward and backwards. Aerosols generated during intubation was a major hazard for clinicians. The authors remind us that certified masks are N95, FFP2 and FFP3 are designed for inward protection of the person wearing them. **There is consensus that with N95 masks, the smallest particles are filtered through electrostatic attraction whilst the larger particles are impacted.**

In fact, the authors demonstrate that with “the exception of the remarkable lower protection of FFP1 compared to FFP2 while coughing the critical effectiveness should be considered on the generation of secondary leaks rather than an ability to mitigate the front through flow”. All the masks and shields reduced at least 90% of the distance of the front through flow. Leaks were noted from seams and joints in face shields which also generate upwards, downward and backward leakage jets. The authors warn of the sense of false security when standing to the side or behind a person wearing a surgical or homemade mask. **Clinicians working around a patient or in the confined space around an intensive care bed are likely to be exposed to these side and backward leakage jets from surgical masks.** I would note that there are some very important and illuminating photos in the article.

### **The obituary of Robert May (1926-2020): originator of $R_0$**

Probably the single largest transfer of public knowledge about the COVID-19 has been the “ $R_0$ ”. The word is on everyone’s lips, even our own Prime Minister who is not world-known for his interest in science. But we can ask the

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question of how deeply is  $R_0$  embedded in the biological world and the scientific method? It is certainly not like the discovery of "g" by Isaac Newton. Rather  $R_0$  is an aggregate, a composite, a rough estimate of infectiveness of a microbe which is difficult to quantify anyway. It is therefore best viewed as a "comparable indicator". In my own textbook (Human Virology, 5<sup>th</sup> Edition, Oxford University Press) we use it to line up viruses for infectiousness. Top of the list is measles ( $R_0$  of 13) and bottom of the list is rabies, with a  $R_0$  of  $<1$ .

I was reminded of this whilst reading the obituary of the Australian ecologist Robert May. He was undoubtedly a leading scientist here and ended up a Chief Advisor to the government in the UK. Perhaps we could do with him now? But although his friend John Krebs wrote the obituary in Nature, I am not sure of his impact in Virology per se. With R. Anderson he delved into the BSE outbreak. With BSE nearly the whole British herd had to be killed and incinerated. A summer later I met a butcher in Cornwall who had helped with the BSE programme at an abattoir. He said they were working day and night and that each evening there was a queue of vans outside to carry away beef sides. They had not been dyed or labelled. They were not going to the incinerator. No one at the site believed in BSE but they all had economic problems. I did wonder at the time whether the academic paper on  $R_0$  and mathematical modelling was going to help them, or indeed help this crisis itself?

But on the positive side and again working with R. Anderson who as a biologist perhaps had his feet more on the ground. May coauthored the book 'Infectious Diseases of Human Dynamics and Control'.

In reality, we immunize as many young people as can be persuaded to come to a doctor's practice. The bacterial vaccines and MMR are easier to handle, and the parents bring the children to the practices. And the mathematical predictions vs reality? As many vaccinees as is humanly possible and this amounts in practice to 80-90%.

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