

Ricky's Afterthought:**COVID-19: The pandemic that brought the world to a standstill****A.C. (Ricky) Metaxas**

Life Fellow St John's College Cambridge UK

Email: acm33@cam.ac.uk

It is not an exaggeration to say that the covid-19 has stopped the world functioning. This is a highly contagious disease with many symptoms but predominately a fever, dry cough and compromised breathing which was announced to the world by China on 31 December 2019. It is believed that wet markets (markets dealing with live animals) may have been the source of which finally mutated to infect humans. As we now all know, it is spread by droplets in the air, exacerbated by sneezing and coughing and also by touching surfaces which have been contaminated with Covid-19 and which can remain contagious for up to 3 days.

During the past several months, practically the whole world has been in various stages of lockdown. Schools shut their doors, businesses stopped operating and travel restricted for all workers except those in essential areas fighting the virus: medical, health and care service staff. The only other businesses that were allowed to remain open dealt with food production and its distribution to keep the world fed and transport to support essential workers. The economic impact of this will be devastating, many businesses have already gone under and some large ones also are warning that they too may cease to operate altogether or at least will be forced to make many of their workers redundant. Some economists predict that unemployment rates in the UK by the end of this calendar year may reach up to 10% while the EU predicts that the region will contract by as much as 7.4%, which is worse than the economic shock of the 1930's. The ensuing recession, lasting a number of years, will have a devastating effect on our wellbeing. Putting it

bluntly, it will very likely cause economic paralysis and mass unemployment.

People all over the world are asking a simple question: "Could all this have been foreseen and therefore measures taken to alleviate the effect?" We may think that killer viruses, plagues and pandemics are extremely rare but here is a list of the most virulent since Plato's and Socrates' time which will be discussed in a book to be published later this year on pandemics by Dr Liam Fox, a medic and former cabinet member of the British Government.

- The **Plague of Athens** around 430 BC killed up to a third of Athenians during the Peloponnesian war.
- The **Antonine Plague** around AD (165-180) wiped out inhabitants of Rome by returning troops bringing back a smallpox-like plague with the emperor Marcus Aurelius Antoninus a victim.
- The bacterium yersinia pestis carried by flies was responsible for the **Justinian Plague** (541-549) AD, which wiped 1/3 to 1/2 of all Europeans, initially spreading through the Byzantine Empire.
- The **Black Death** which is believed to have killed 30-60% of the world's population took place during (1347-51) AD and was due to the bacterium yersinia pestis.
- Europeans arriving in the Americas brought with them diseases such as flu, smallpox and measles, which wiped out nearly 90% of native Americans. It started around 1492 and is termed the **Columbian Exchange**.

- The bacterium *Yersinia pestis* strikes again during the **Great Plague of London** of 1665 AD killing a quarter of all Londoners.
- Bubonic Plague starts in Yunan, China, (1855-1859) and spreads all over the world killing one million people. This is referred to as the **Third Pandemic Plague**.
- The **Russian Flu** in (1889-90) kills up to a million people in the northern hemisphere aided by transatlantic travel by rail and sea
- The **1918 Flu pandemic** after the WW1 caused by the influenza H1N1 kills 50 million people, old and young alike. By the way, Spain was neutral and had not imposed any censorship in the media so its newspapers were free to announce the pandemic which had originated in France and were free to announce the grave illness of King Alfonso XIII, so many people erroneously coined the term **Spanish Flu** for this pandemic.
- The **Asian Flu** of (1957-8), caused by the influenza H2N2, started in China and quickly reached Europe and America and only killed 1-2 million because a vaccine was quickly developed.
- The **Hong Kong Flu** of 1968-70 was a sub-strain of H2N2 but lower numbers of killed people are recorded because many were exposed to the Hong Kong Flu, developing antibodies which gave them immunity.
- The **Bird Flu** known as H5N1 during 1997-2000 in Hong Kong and spread to humans. The disease was curtailed by killing millions of birds.
- The **SARS** (Severe Acute Respiratory Syndrome) **epidemic** was detected in 2002-3 and is a form of coronavirus. It spread to around 8000 people with 10% dying of it. The World Health Organization (WHO) warns that this virus may strike again in the near future.
- The **Swine Flu** of 2009-10, was detected in Mexico and is once again due to the influenza H1N1 but due to a rapid lockdown it affected few people.
- The **Ebola outbreak** started in Africa and caused little over 11000 deaths by acting extremely quickly.

We cannot therefore claim that we have not been warned regarding a new pandemic such as Covid-19. Governments should have been better prepared to deal with such an eventuality and it is true to say that some did, such as South Korea, Germany, some of the Baltic states and Greece for example. Warnings by eminent scientists and medical experts, first sounded after Wuhan was locked down in January 2020, should have been taken extremely seriously. In fact, the lack of preparedness so exposed by the shortage adequate PPE (Personal Protection Equipment) such as gloves, masks and overalls is hard to understand. Initially some advisers were postulating that we ought to fight this pandemic using the **herd immunity** approach: by offering up the population to become infected thereby, ensuring a majority would be only slightly affected thus building substantial immunity to the virus. This was, however, a very dangerous approach as it might have entailed an unacceptable number of deaths and also there was (and still is) no evidence that people who had suffered the virus would have lasting antibody immunity. Also, such an approach may have overwhelmed the hospitals as there were not enough intensive-care beds to accommodate those infected.

A measure of how the virus spreads is given by a factor R (reproduction rate) hoping that this will be $R < 1$, meaning that every person who has contracted the virus affects less than one other person. However, in many countries it quickly transpired that $R \gg 1$ rapidly approached $R = 4$. Such an exponential increase squashed the idea of allowing a herd immunity to build as the number of deaths showed a rapid rise forcing the governments to order social distancing and staying at home except for purchasing food, medicines and allowing the not too vulnerable the occasional walk for exercise. In early May in the UK the reproduction rate was within 0.6 and 0.9, in other words just about safe but much lower limits were sought.

So apart from a very small number of countries, such as Sweden for example, we were all in a state of perpetual lockdown, putting our homes to order, carrying out small DIY jobs that were neglected over the years and finding ways to communicate with students, families, friends and colleagues using Zoom, Skype, Teams and other similar media platforms. To use Shakespeare's expression in "A

Merchant of Venice”, over the past few months we have waited with **bated breath** the daily briefing from the Government informing us of the number of people who have succumbed to this deadly disease with some of us plotting our own daily deaths against time on an Excel spreadsheet or, better still using the old fashion way of graph paper and pencil, hoping that the curve flattens to show a downward trend which gradually it has. At the time of writing the Statista website gives an interesting toll of fatalities as shown below:

Table: Coronavirus (COVID-19) deaths worldwide per one million population as of July 15, 2020, by country [1]

	Confirmed deaths (absolute)	Population (in millions)	Deaths per million
Belgium	9,787	11.42	856.85
United Kingdom	44,968	66.49	676.32
Spain	28,409	46.72	608.02
Italy	34,984	60.43	578.91
Sweden	5,545	10.18	544.53
France	29,943	66.99	447
USA	136,284	327.17	416.56
Peru	12,229	31.99	382.28
Chile	7,069	18.73	377.43
Ireland	1,746	4.85	359.74
Netherlands	6,135	17.23	356.04
Brazil	74,133	209.47	353.91
Ecuador	5,130	17.08	300.27

It is interesting to note Sweden’s position given that the authorities did not adopt a lockdown policy, relying on herd immunity to combat the virus. Such data are of course still being obtained and no doubt, the order in the above table will change as different countries adopt different policies to combat this virus.

While huge efforts are currently taking place in a number of countries to finding a vaccine the one aspect on which all Governments agree is boosting their test and trace facilities, initially focussed on front-line staff, care workers and staff in essential businesses and eventually to the wider public. Labs all over the world are desperately trying to design a

molecule that destroys the virus with a number concentrating on RNA which is capable of instructing the body what proteins to produce. The link between antibodies and immunity is still to be achieved. Some efforts have reached the pre-clinical and clinical trials but realistically we are a long way to first finding a vaccine that works and then manufacturing it the vast scale required to benefit mankind. Of course, regulatory bodies such as EMA (European Medicines Agency) as well as the FDA (Food and Drug Administration) in the USA have to approve the vaccines once clinical trials have been performed.

A number of small private companies have switched their operations in order to contribute towards fighting the corona virus by altering their production to make PPE and other companies produced equipment to check whether a person has contracted the virus. I came across a paper published in late April stating that scientists at Manchester University’s Graphene Engineering Innovation Centre had developed a graphene-based biosensor that can detect SARS-Cov2 (Covid-19 virus) at concentrations as low as 1 femtogram/ml (that’s a thousandth of a picogram!) Using a graphene field-effect transistor (GFET), the sensor can make highly sensitive, instant at point-of-care diagnosis for virus and antibody testing [2]. That is the kind of effort that brings people together in times of global crisis.

The energy sector is facing new challenges coping with the huge reduction in electricity due to Covid-19 trying to balance conventional and renewables power stations.

By the beginning of June, some countries were able to lift some of their restrictions giving greater freedom for people to leave their homes, exercise more frequently and for some sporting activities to take place, golf being an example which everybody accepts is the safest as you play with your own ball and need have no contact with your partner. Some European countries have allowed coffee places and some schools to reopen and visitors from the least affected countries to visit their touristic places, such as the Greek islands. The universal advice remains to continue to observe safe distancing and to wear of masks when using public transport.

One does not need a crystal ball to anticipate that life as we know it post-pandemic will be somewhat different with some restrictions lasting for

years or until an effective vaccine is found and tested and available on general release. Working from home will become more the norm as CEO's and their workers realize that there is no need to pay extortionate office rents when you can be as effective carrying out your work at home. There were reports that this was already happening in Silicon Valley. Of course, with only a fraction of people travelling on aeroplanes, trains, buses and on cars the big winner during the current lockdown is the environment where pollution levels have dropped dramatically since the beginning of March. However, as sure as eggs are eggs, when restrictions are finally lifted, we will no doubt revert to our bad old ways and start once again polluting our skies. But one thing is for sure, many companies will not survive and those that do will adopt different scenarios while governments may have to inject substantial funds into new infrastructure projects to boost employment.

What about the educational sector? It is muted that even next October we may find that many universities worldwide may still be closed and online teaching may continue. I have just conducted an online examination using Microsoft Teams on a fourth-year undergraduate manufacturing

engineering student that I was asked to supervise on a microwave vacuum project where the student presented her work and myself and her internal supervisor quizzed her before finally assessing her. However, prospective students are starting to question why they should pay substantial fees to universities when one cannot benefit from meeting face to face with the dons and benefit from their extensive knowledge and unique expertise while also missing the camaraderie and networking with fellow students.

All this is speculative and the next few months will show whether easing of the lockdown and relaxing the restrictions throughout Europe was handled properly pointing perhaps to further lessening of the restrictions. The greatest fear is to have relaxed the restrictions too speedily without an adequate test, trace and contact process, which may result in a second peak of the virus in the months to come.

For further reading

1. <https://www.statista.com/statistics/1104709/coronavirus-deaths-worldwide-per-million-inhabitants/>
2. <https://pubs.acs.org/doi/pdf/10.1021/acsnano.0c02823>