

Essential facts about

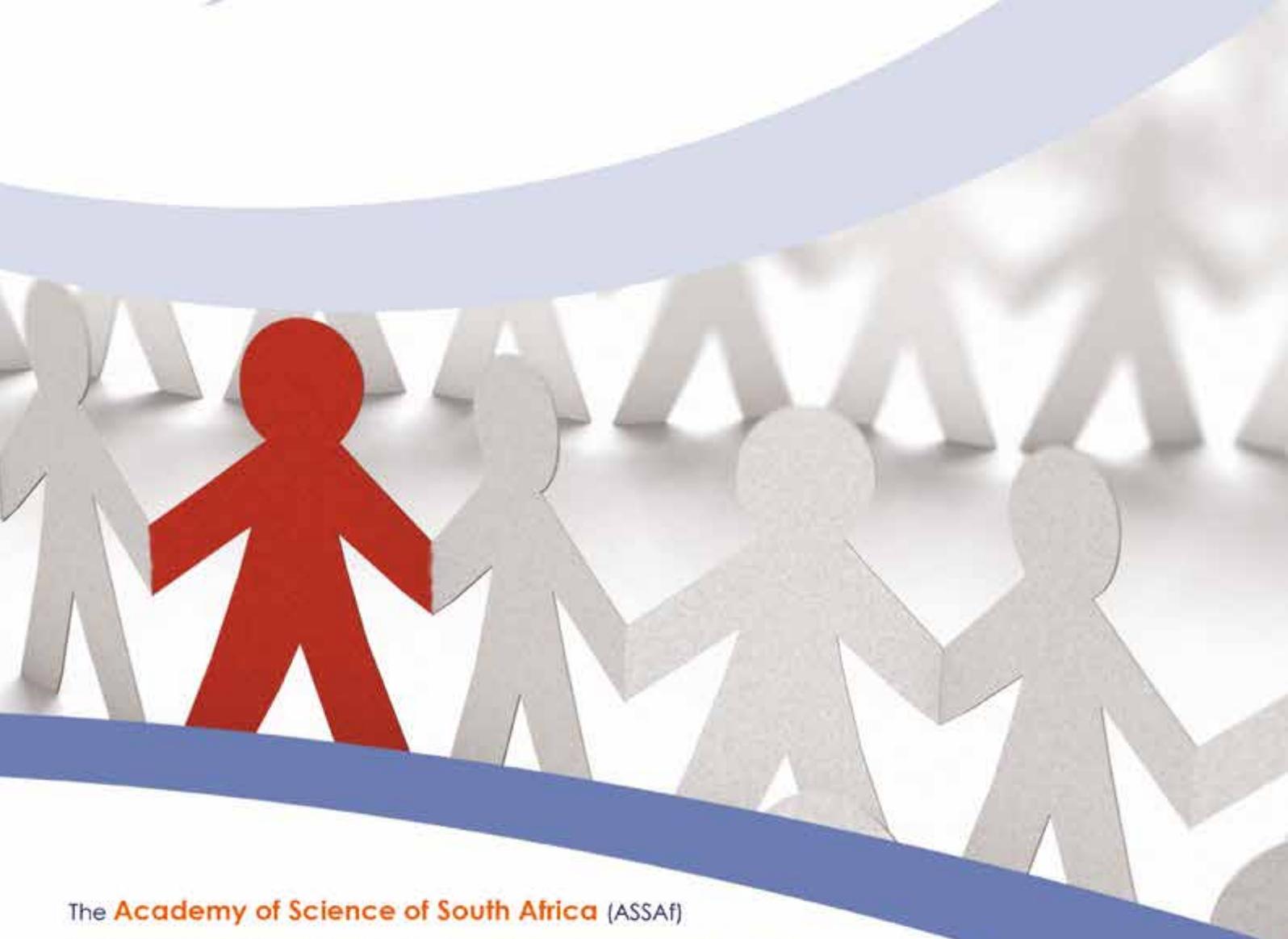
COVID-19

**The disease,
the responses and
an uncertain future**

**For South African Learners,
Teachers and
the General Public**



Commissioned by the Academy of Science of South Africa (ASSAf)



The **Academy of Science of South Africa** (ASSAf)

was inaugurated in May 1996. It was formed in response to the need for an Academy of Science consonant with the dawn of democracy in South Africa:

activist in its mission of using science and scholarship for the **benefit of society**, with a mandate encompassing all scholarly disciplines that use an **open-minded** and **evidence-based** approach to build **knowledge**. ASSAf thus adopted in its name the term 'science' in the singular as reflecting a common way of enquiring rather than an aggregation of different disciplines. Its Members are elected on the basis of a combination of two principal criteria, **academic excellence** and **significant contributions to society**.

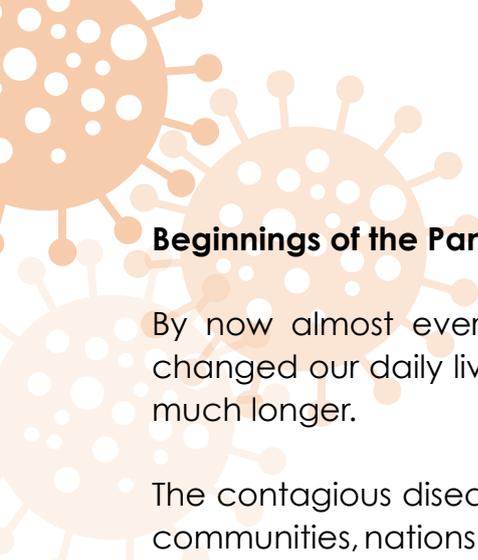
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CHAPTER 1

The Rise of Covid-19: The World Faces a New Pandemic

The world has been facing a coronavirus pandemic since late 2019 and it shows no sign of abating. Some countries are experiencing a second wave of infections. The pandemic began in China and spread all over the world. Some governments, like the South African government, in consultation with scientists, took immediate steps to halt the spread of the virus. These involved an immediate lockdown (beginning 26 March 2020), including behavioural interventions such as the wearing of masks, regular hand-washing and social distancing, curfews, the banning of gatherings and the sale of cigarettes and alcohol, the latter in preparation for our health services to be ready to deal with a health crisis. As of 1 July 2021, South Africa has suffered over 60 000 Covid-19 deaths.





Beginnings of the Pandemic

By now almost everyone has heard of Covid-19. The Covid-19 pandemic has changed our daily lives and will continue to do so in the coming months and likely much longer.

The contagious diseases that are already well-known and regularly spread around communities, nations, regions and sometimes globally (the last are called pandemics) are not the same forever. New diseases emerge from time to time as disease-causing microbes evolve by changes in their genetic code. These microbes, which you can only see with a microscope, can be viruses, bacteria, or other micro-organisms. Some of these changes give microbes the ability to infect new species, for example jumping from animals to humans. Further evolution of the genes may then occur to enable the organism to jump from one human host to another, creating the spreading situation we call an epidemic.

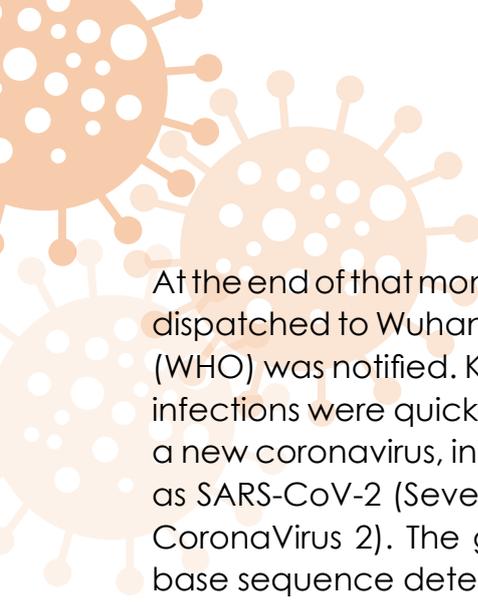
Thus, new contagious diseases arise by evolution as the disease-causing organisms adapt to their environment by natural selection, as originally described by Charles Darwin. The organisms will continue to evolve over the course of an epidemic as new mutations arise, and may be selected for, during the rapid reproductive cycles of the organisms in their infected human hosts.

In the case of Covid-19, it is believed that the disease-causing micro-organism, a human virus of the family called coronaviruses, originated from bats, likely through some other intermediate species of wild animal, maybe the pangolin.

Outbreak in Wuhan

Around December 2019 hospital doctors in Wuhan, China, observed the arrival of a large number of patients suffering from an atypical pneumonia. These cases resembled each other, but they did not fit any known pattern. Since there was a number of other respiratory diseases going around at the time, it took a little while for doctors to recognise the connections between these cases and to conclude that they were dealing with a new disease. An important clue was that many patients were in one way or another connected to the Wuhan Huanan Seafood Wholesale Market, where many live animals other than fish are slaughtered and sold. However, there is some evidence that the Covid-19 virus could have originated from a lab accident, and this hypothesis cannot be ruled out. The origin of this new virus remains under investigation.

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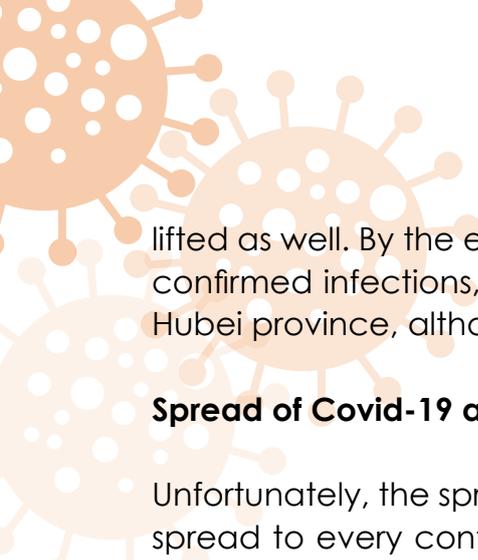


At the end of that month, a team from the China Centre for Disease Control (CDC) was dispatched to Wuhan to investigate the outbreak and the World Health Organization (WHO) was notified. Known diseases such as SARS, MERS, and a number of other viral infections were quickly ruled out, and by 7 January the cause was determined to be a new coronavirus, initially called 2019-nCoV (for novel coronavirus) and now known as SARS-CoV-2 (Severe Acute Respiratory Syndrome caused by the new version of CoronaVirus 2). The genome of this RNA-virus was rapidly decoded (its complete base sequence determined) and a sensitive, but unfortunately slow and expensive, genetic test was developed.

Initially the risk of spread had been underestimated, but after the number of cases exceeded 500, the Chinese government imposed drastic measures, limiting the movement of people in and out of Wuhan, closing markets, restaurants and parks, and isolating people suspected of being infected in large makeshift hospitals. These kinds of strict and compulsory infection-containment measures have become known by the rather vague metaphoric term 'lockdown'.

The number of daily new cases peaked in mid-February at around 700 per day, but when the number had dropped to around 20 per day, China partially lifted the lockdown outside of Wuhan, and on 8 April 2020 the lockdown in Wuhan was





lifted as well. By the end of the lockdown, mainland China had experienced 81,907 confirmed infections, mostly concentrated in Wuhan and surrounding areas of the Hubei province, although the disease had also spread to every province in China.

Spread of Covid-19 around the world

Unfortunately, the spread of the disease did not stop in China. By now Covid-19 has spread to every continent of the world - and to every country. Different countries have adopted different strategies for responding to the disease, with varying success. What the right strategy is has not become completely clear, and it is very likely that the different context of each country may mean that no single strategy could be applied successfully everywhere. Some countries have been initially successful, only to see a second wave reappear.

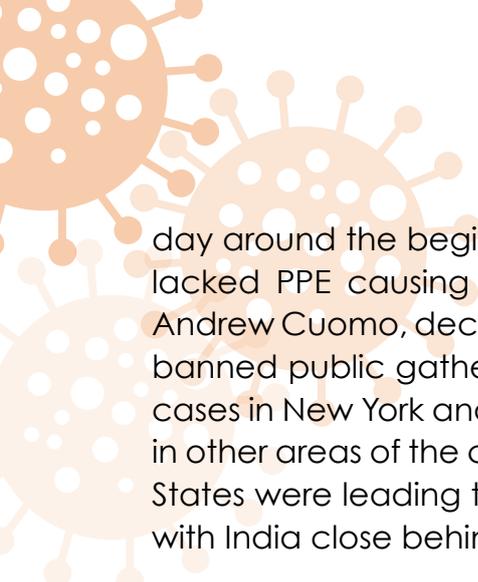
Many countries closed their borders, hoping this would suffice to keep the disease out. Many did not prepare well and were faced with numbers of serious cases so large that hospital workers and other essential workers could not get enough masks and other personal protective equipment (PPE). There were also shortages of tests and testing supplies, making it impossible to decide whom to isolate.

Covid-19 arrives in Europe and in the US

After China, the epicentre of the disease spread to Europe. On 31 January 2020, the first Covid-19 cases in Europe were recorded in Rome, and shortly thereafter the disease spread to northern Italy, France, Spain, the United Kingdom, and elsewhere. By 13 March, the number of cases in Europe exceeded that of China. On 4 March, Italy 'locked down'. They took steps to close all sites where people were in close contact, including schools, universities, factories, concert halls, and recreational facilities. They were followed by France, Spain, the UK, and other countries shortly thereafter. In many parts of Europe, hospitals overflowed, especially in the intensive care units. Patients had to be transported elsewhere where there was capacity for treatment, and hospitals had to be reorganised. As the result of 'lockdowns', Europe managed to bring its numbers down, although many countries have experienced second, third, and further waves.

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On 20 January 2020, the US saw its first confirmed case, and shortly thereafter the country banned travel from China. But little else was done to prepare for a possible spread of the epidemic within the US, and the first test kit developed in the US proved to be defective. Starting in mid-March, the daily number of new cases in the northeastern states began to climb exponentially, especially in New York, where the peak number of cases reached 10,000 per day and the daily number of deaths reached around 1,000 per



day around the beginning of April. Hospitals were overflowing and hospital workers lacked PPE causing many caregivers to become infected. New York Governor, Andrew Cuomo, declared a state of emergency on 13 March and, shortly thereafter, banned public gatherings, later (on 22 March) issuing a 'shelter-in-place order'. As cases in New York and neighbouring states of the US northeast subsided, cases grew in other areas of the country initially less affected. On 15 September 2020, the United States were leading the world with 6.7 million confirmed cases and 200,000 deaths, with India close behind with 5 million confirmed cases and a higher growth rate.

Covid-19 reaches Africa

Africa is a relative latecomer, with the first infections occurring in mid-February 2020. The first cases in Africa occurred in Egypt and in Nigeria, and the first case in South Africa, reported on 5 March 2020, involved a traveller returning from Italy. The early cases all involved people returning from abroad but soon it became apparent that 'community transmission' was taking place. In other words, people were becoming infected from others within South Africa rather than bringing the disease, one-by-one, from abroad. Initial hopes of being able to stem the spread simply by restricting entry into the country and closely following up those testing positive were dashed.

On 23 March, a national 'lockdown', taking effect on 26 March, was announced by President Cyril Ramaphosa. Under this 21-day lockdown all persons not taking part in 'essential services' were ordered to stay at home. Gatherings were banned, and

Daily new confirmed COVID-19 cases

Shown is the rolling 7-day average. The number of confirmed cases is lower than the number of actual cases, the main reason for that is limited testing.

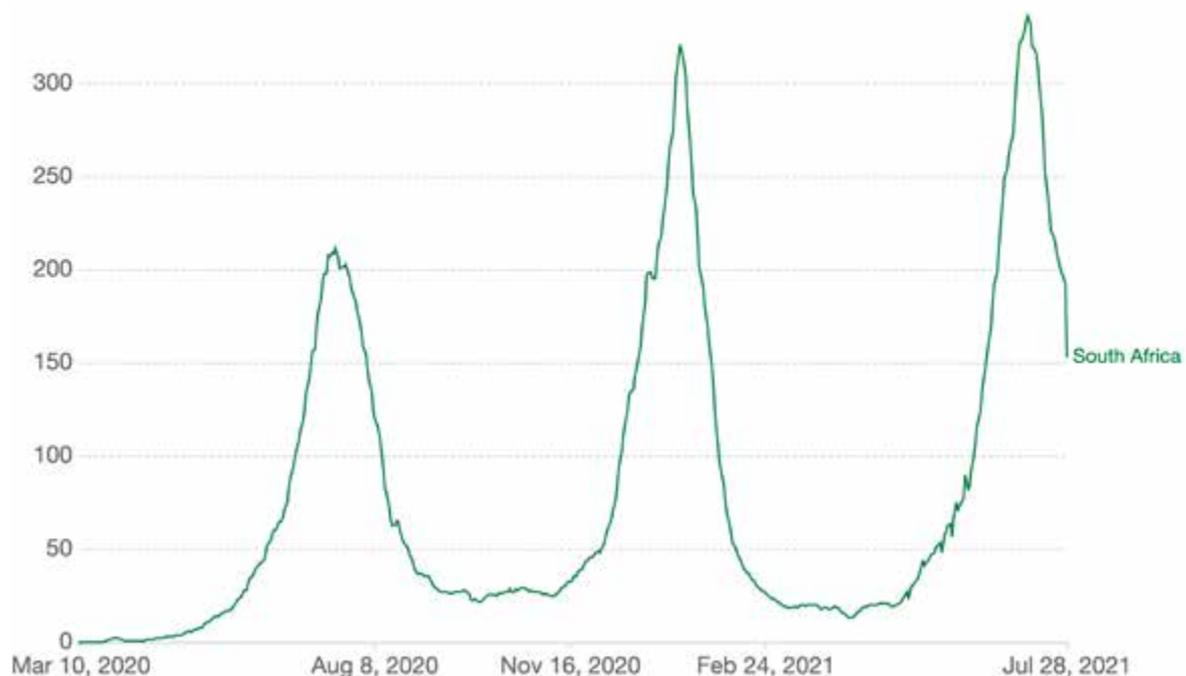
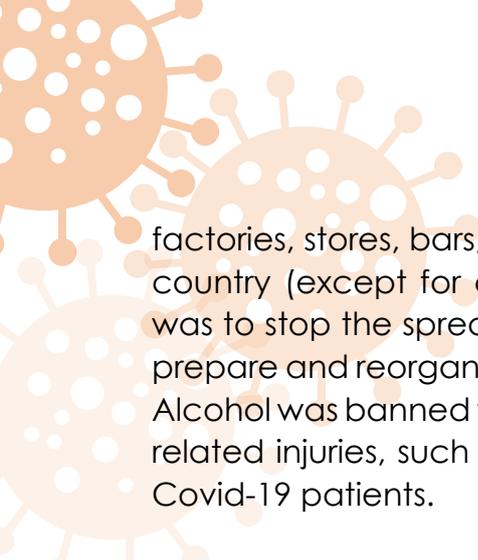


Figure 1.1: New daily cases

Source: <https://ourworldindata.org/covid-cases>. Creative commons license.



factories, stores, bars, and restaurants were ordered closed. Travel in and out of the country (except for cargo) as well as between provinces was banned. The idea was to stop the spread of the disease and also to buy time, so that hospitals could prepare and reorganise to receive the large number of Covid-19 patients expected. Alcohol was banned to reduce the number of people coming to hospitals for alcohol related injuries, such as car accidents, and thus allow hospitals to concentrate on Covid-19 patients.

Despite measures put in place to lessen the economic impact of people not being able to work, maintaining the 'lockdown' proved challenging and also generated quite a lot of controversy. Representatives from various business groups argued that they should be exempted from the restrictions, and at times the debate on the details seemed to overlook the overall challenges presented to the country by the pandemic. Starting on 1 May, these restrictions began to be lifted gradually. Deciding the right balance between public health and economic survival has proved difficult, not just in South Africa but almost everywhere throughout the world.

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After the easing of the 'lockdown', the number of new daily cases started to greatly expand, reaching a peak in mid-July and dropping somewhat after that time (see Figure 1.1), and then reaching a second peak in early January 2021.



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The Parliament of South Africa passed the Academy of Science of South Africa Act (No 67 of 2001), which came into force on 15 May 2002. This made ASSAf the only academy of science in South Africa officially recognised by government and representing the country in the international community of science academies and elsewhere.

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