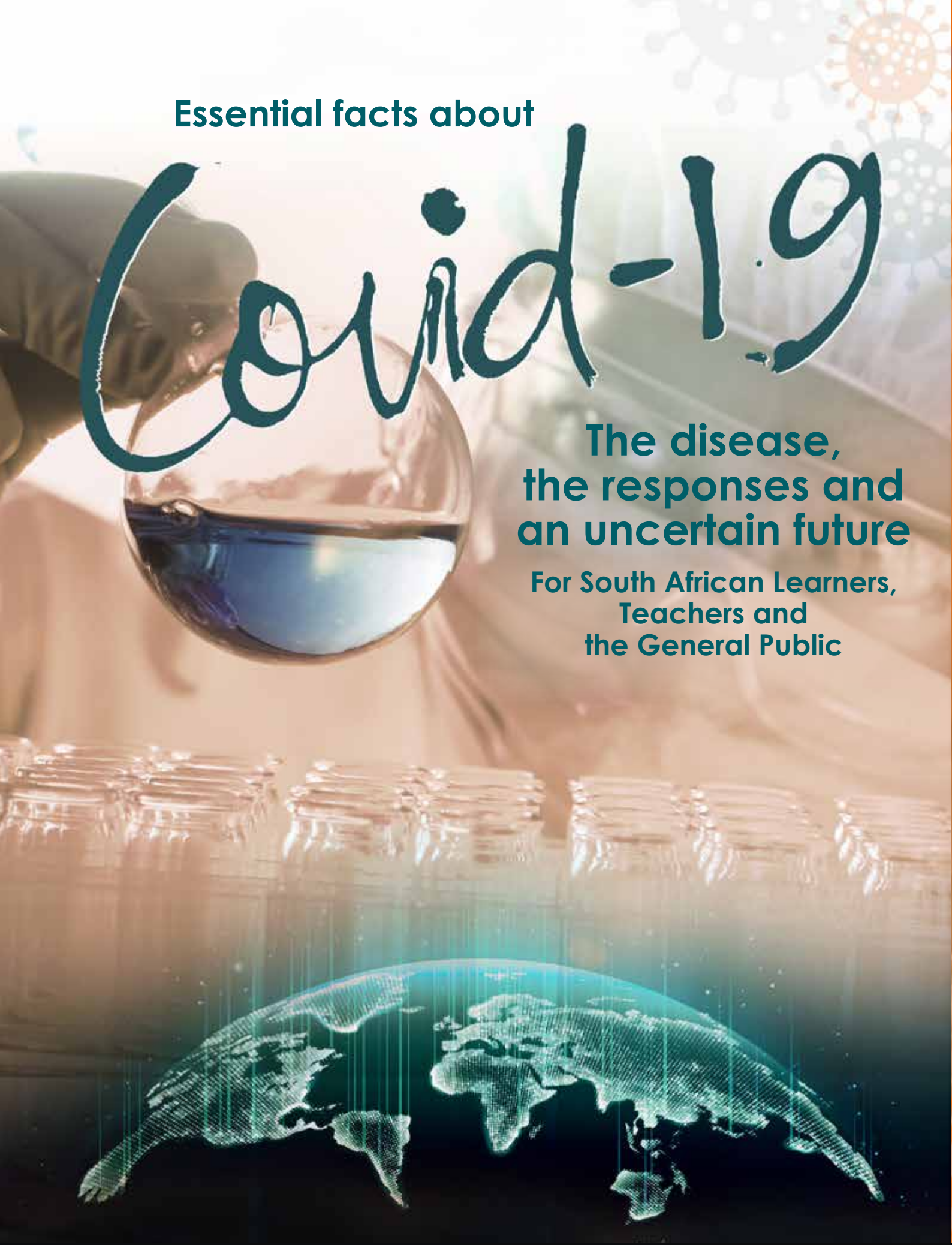
Essential facts about

Covid-19

The disease, the responses and an uncertain future

For South African Learners, Teachers and the General Public



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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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EPILOGUE

As this report reaches press, the Covid-19 crisis will still be unfolding. We remain in the midst of a long pandemic, which has taken over our lives, the South African and global economies, and our concern for the health of ourselves, our families and those around us. Here we have tried to present, as concisely and understandably as possible, the science underlying Covid-19 and viruses more generally, the dynamics of how this disease and other infectious diseases spread, and impact on the healthcare system and the economy. We also discussed the sociological and psychological effects of the epidemic, focusing particularly on adolescent learners. We also presented some basic facts about how the South African health system is organised. In the coming years, debate will continue in South Africa, as elsewhere in the world, on how better to deliver healthcare, in a more efficient, equitable, and affordable way. It is important that this debate is not left to specialists exclusively, but rather that everyone takes part and understands the background and available options.

The devastating consequences of the coronavirus pandemic have been staggering. At time of writing (22 July 2021), there have been 14 million tests for the virus done, 2.3 million positive cases identified and 52 111 deaths recorded in our country. Moreover, 2.1 million people have recovered from the virus. Since an initial hard lockdown at the start of the pandemic, the government relaxed lockdown restrictions to varying degrees over the course of the pandemic, which meant greater freedom of movement, the opening of more businesses and schools, the resumption of flights, and many interventions to kick-start the economy.

Knowledge matters, that science or scientific research is absolutely crucial.

However, the danger is not yet over. In fact, many countries, including South Africa, have seen a resurgence of infections as lockdowns and other measures have been eased. This has led to debate and controversy about whether or not or how to re-introduce lockdown rules and other measures. The danger remains with us. We have been told that life can return to normal only once this coronavirus has been completely eradicated. And this can occur only when a vaccine against the virus has been widely distributed. A solid scientific approach is required to deal with this pandemic. A serious on-going concern is the effectiveness of the present vaccines against new strains of the virus, and new or modified vaccines may become necessary to counter resistant strains of the virus.

The crisis is a lesson to us all. We have been able to reach this situation of the easing of strict lockdown levels because many South Africans of all backgrounds have

complied with governmental regulations, which included staying at home, regular hand-washing, social distancing and the wearing of masks. These very positive interventions were as a result of scientific thinking. Scientists first determined the source of the virus, isolated, and identified it as the coronavirus and studied the models of how it is spread. Based on these findings, scientists advised the governments how to proceed. This resulted in a mass worldwide campaign to test people for the virus, identify positive cases, perform contact tracing and, in the case of sick people with severe coronavirus disease, provide adequate hospital care, including ICU admission for the most serious cases. Given that several effective vaccines have now been found, the challenge now becomes massive production and distribution throughout the world.

What does all of this tell us?

It tells us that knowledge matters, that science or scientific research is absolutely crucial and, perhaps, as it yields positive results, it is the only hope we have of saving the world from the devastation this virus can cause. Decades of painstaking research in epidemiology, virology, clinical medicine, and laboratory medical research has brought the world to a point in which people's lifespans have been extended and huge pandemics have been eradicated through vaccines (for example mumps, rubella and measles) and medication (tuberculosis and anti-retrovirals for HIV-AIDS).

We believe that the Covid-19 crisis has very clearly demonstrated the relevance of science in our everyday lives.

With the advent of primary healthcare and public health research, common sources of disease and infection such as contaminated water, poor sanitation, risky sexual practices, smoking, and alcohol abuse have been highlighted. Public awareness of such matters and other interventions have increased life expectancy and quality. All these scientific achievements must be accompanied by good leadership and governance. Climate scientists also remind us that the risk of pandemics is exacerbated by climate change, brought on by our lack of care for our environments. We burn fossil fuels, discard all kinds of pollutants into our rivers and seas, chop down our forests, and, more generally, show little concern for our planet.

Since the outbreak of Covid-19 in late 2019, much has been learned about the virus and how to treat the disease better, thanks to the work of countless doctors and medical researchers. There still is no cure. For those most seriously afflicted, those needing hospitalisation, in some cases in an intensive care unit, the supportive care staves off the worst effects and buys time so that the body eventually can fight off the virus on its own. Due to a better understanding of the disease and efficacy of different treatment options, the number of fatalities per serious case has been brought down to about half of its initial rate.

We would like to point out that Covid-19 will not be the last pandemic the world will ever face. Chapter 4 has shown how, throughout history, new diseases come along, often causing great disruption and destruction. Experts in public health have long pointed out this risk. Had their warnings been heeded, the world would have found itself better prepared to face this pandemic.

The Covid-19 has led to a surge in activity to understand, treat, and stem the spread of the disease. As expected, much of this activity has taken place within the traditional medical research and public health communities. But given the crisis, new actors have been inspired to explore how they can apply their expertise toward fighting Covid-19. Two examples in Africa, are: (1) the idea of pool testing, where mathematics has shown how a population largely Covid-19-free can be tested most efficiently–that is, with the fewest numbers of tests. Rather than testing each person individually, samples are combined and tested in pools, the combined results indicating who is positive. This technique, developed at the African Institute for Mathematical Sciences in Rwanda, is now being applied by researchers at the University of KwaZulu-Natal. (2) The South African Radio Astronomy Observatory has successfully applied its expertise in engineering and manufacturing to produce low-cost ventilators for Covid-19 patients requiring artificial ventilation. Often progress in science and technology is inter-disciplinary, resulting when experts consider problems traditionally considered outside their range of expertise, often in collaboration with experts from other fields.

The tremendous success of mass vaccination relies on more than a certain threshold fraction of the population being vaccinated, in order to benefit from 'herd immunity'.

Finally, we hope that we may have inspired you to want to learn more about viruses, medicine, and epidemiology. Appendix A indicates some resources for further study. Often science and mathematics may seem like abstract school subjects, not so obviously relevant to our everyday lives. We believe that the Covid-19 crisis has very clearly demonstrated the relevance of science in our everyday lives. We also stress that it is often hard to foresee in advance which areas of science will be most important for tackling society's new problems and challenges. Often seemingly abstract and highly specialised areas of science, with time, become the foundations of the technology of tomorrow. Who would have predicted that the work begun by Jenner and Pasteur would have allowed such a decrease in childhood mortality? Who would have predicted that the work of James Clerk Maxwell, Michael Faraday, and others would have led to the omnipresence of electrical machinery and electronic devices in our everyday lives? In the 1850s, the British Chancellor of the Exchequer William Gladstone questioned Michael Faraday about the practical use value of electricity, and Faraday famously replied: "One day, sir, you may tax it." And that is exactly what happened.

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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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